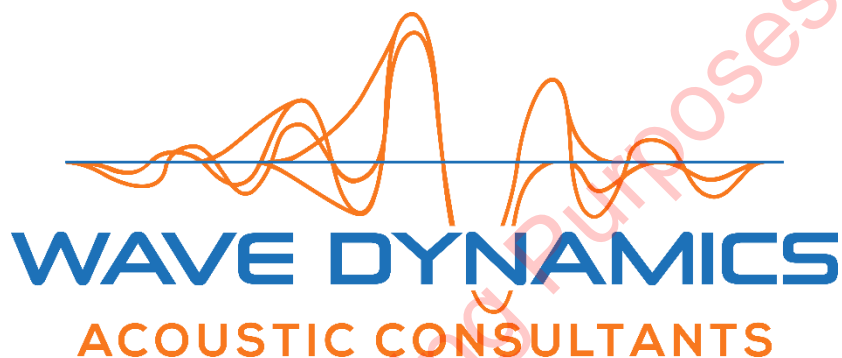


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Johnstown Estate Extension

Acoustic Design Statement
21 March 2025

WDA250202RP_A_01

www.wdacoustics.com

Meath County Council



Notice

This document is prepared on behalf of Lefgem Limited to demonstrate compliance with the noise planning conditions of the current planning application Ref. 2461047 for Construction of a three-storey extension to the rear of the existing hotel comprising 90 no. guest bedrooms with an area of plant at roof level of the extension, and one storey restaurant construction to the front of the existing leisure centre. This report should not be reproduced, edited or copied in any form without the permission of Wave Dynamics. This document relates to the acoustic design elements of the project which Wave Dynamics were engaged on, it does not consider any of the other engineering services on the project including but not limited to fire, structural, mechanical and electrical design. Wave Dynamics assumes no responsibility to any other party arising in connection with this document and its contents.

Document Information

Project Name:	Johnstown Estate Planning RFI
Address:	The Johnstown Estate Hotel, Johnstown, Enfield, Co. Meath A83 V070
Project Number	WDA250202RP_A_01
Report Title	Acoustic Design Statement
Client	Lefgem Limited

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Executive Summary

Wave Dynamics were engaged by Lefgem Limited to provide an Acoustic Design Statement including an Operational Noise Assessment and Construction Noise Assessment to assess the noise impact of the proposed hotel extension and restaurant construction at The Johnstown Estate Hotel, Johnstown, Enfield, Co. Meath A83 V070 in response to a further information request from the planning authority.

The request for further information requests the following:

6. *The applicant shall submit the following with regard to waste management as follows;*
 - f. *A Noise Assessment and Management Plan should be provided for this application for both sites' construction and operational phases. This should also include noise assessment and management from the outside plant located on the roof and any associated mitigation measures.*

This report outlines noise impact assessments conducted for the proposed development during the construction phase and the operational phase.

The proposed development includes:

- i. Construction of a three-storey extension to the rear of the existing hotel comprising 90 no. guest bedrooms with an area of plant at roof level of the extension;
- ii. Creation of opening in rear façade of the existing hotel at ground floor level with the omission of one existing guest bedroom to allow for a new single-storey connection to the proposed extension;
- iii. Modifications to the existing floor plan of the tenor suite at the ground floor level of the existing hotel to provide for a new restaurant, extend the existing kitchen, provide bathrooms and to separate the restaurant from the spa and gym;
- iv. provision of single-storey extension to the proposed restaurant at ground floor and a new entrance to the existing leisure centre;
- v. provision of extension to the basement level to the north-west corner of the existing hotel and provision of storeroom;
- vi. removal of existing external escape staircase from ground floor level to basement level and provision of a new entrance and reception area to gym;
- vii. provision of new replacement external staircase from ground floor level to basement level and alterations to existing openings and partition walls;
- viii. modifications to 6 no. car parking spaces comprising the provision of 4 no. accessible spaces to serve the restaurant and relocation of the remaining 2 no. spaces. Car parking numbers remain the same;
- ix. provision of 14 no. additional bicycle parking spaces for staff;
- x. provision of 2 no. external signs above new restaurant and gym entrances;
- xi. The development also includes all other associated engineering works, landscaping, lighting, and ancillary works necessary to facilitate the development. The subject property is within the curtilage of a Protected Structure (MH048-103).

Baseline Noise Survey

An attended and unattended noise survey was conducted for The Johnstown Estate Hotel, Johnstown, Enfield, Co. Meath A83 V070 to measure the existing noise environment. The purpose of the measurements was to quantify the existing noise environment to assess the potential noise impact of the proposed development on the surrounding noise sensitive locations. Following the baseline survey, construction noise and operational noise assessments were conducted as requested by the planning authority via a request for further information document.

Construction Noise

A construction noise assessment was conducted on the proposed development to predict the potential noise impact of the construction phase on the surrounding noise sensitive receptors. Using guidance from BS 8233 and

BS 5228-1 the predicted construction noise is in exceedance of project criteria. Suitable mitigation measures have been proposed in order to reduce the noise impact on the surrounding noise sensitive receptors.

Operational Noise

An operational noise impact assessment from the noise generated in the communal amenity space, existing and proposed plant and equipment noise and car parking for both the restaurant and hotel extension. It is predicted that the development will not cause a negative noise impact on the nearby noise sensitive locations. The mechanical plant and equipment specification should be reviewed by an acoustic consultant at design stage to ensure noise levels remain in compliance with criteria outlined in this report.

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1 Introduction

Wave Dynamics were engaged by Lefgem Limited as the acoustic consultants to provide an Acoustic Design Statement including an Operational Noise Assessment and Construction Noise Assessment to assess the noise impact of the proposed hotel extension and restaurant construction at The Johnstown Estate Hotel, Johnstown, Enfield, Co. Meath A83 V070 in response to a further information request from the planning authority.

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- vii. provision of new replacement external staircase from ground floor level to basement level and alterations to existing openings and partition walls;
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- ix. provision of 14 no. additional bicycle parking spaces for staff;
- x. provision of 2 no. external signs above new restaurant and gym entrances;
- xi. The development also includes all other associated engineering works, landscaping, lighting, and ancillary works necessary to facilitate the development. The subject property is within the curtilage of a Protected Structure (MH048-103).

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 the Ireland the UK and Europe.

This assessment and report were completed by Cathal Reck | Acoustic Consultant, Cathal has experience of numerous operational noise impact assessments. Cathal's qualifications include: BSc (Hons) in Music Technology & Production, IOA Certificate of Competence in Environmental Noise Measurements, and a certificate in Building Acoustics and Noise Control. Cathal is a member of the Institute of Acoustics (TechIOA) and a SITRI certified sound insulation tester.

This report was peer reviewed by James Cousins, Managing Director | Principal Consultant with Wave Dynamics who has extensive experience in assessing operational noise impacts. James is an experienced consultant. His qualifications include; BSc (Hons) in Construction Management and Engineering, Pg Cert in Construction Law and Diploma in Acoustics and Noise Control (Institute of Acoustics) and an IOA Competence Cert in Building Acoustic Measurements. James is a member of both Engineers Ireland (MIEI) and the Institute of Acoustics (MIOA) and is the current SITRI Chairman.

2 Site Description

The proposed hotel extension and restaurant is located at The Johnstown Estate Hotel, Johnstown, Enfield, Co. Meath A83 V070. The site is bounded by the existing Johnstown Estate Hotel to the west, with residential dwellings to the north and south. The M4 motorway located to the north and forest land to the south. The proposed restaurant is located to the northwest of the existing Johnstown Estate Hotel.

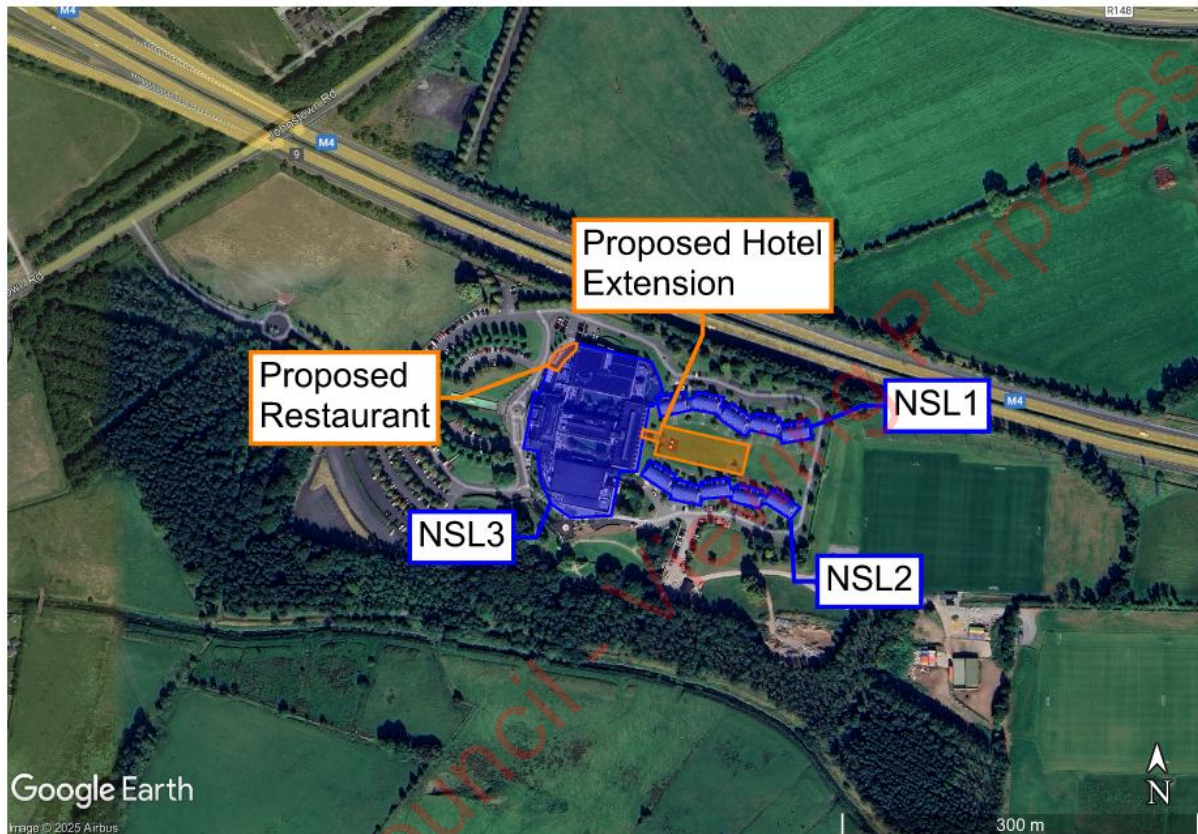


Figure 1: Site location, hotel and restaurant extensions, noise sensitive locations and the surrounding area.

3 Project Criteria

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

- Construction noise from the proposed development.
- Operational noise from the proposed development.

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

- Construction noise.
- Operational noise.

Assessment Standards

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

- ✓ BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.
- ✓ BS 8233:2014 Guidance on sound insulation and noise reduction for buildings.
- ✓ BS4142 2014 A1+ 2019 Methods for rating and assessing industrial and commercial sound.
- ✓ EPA NG4: Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4).
- ✓ Meath County Council Draft Noise Action Plan 2024-2028.
- ✓ 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 Construction Noise Assessment Criteria

There is currently no statutory Irish guidance for construction noise requirements from noise during the construction phase of a project.

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

The standard (BS5228-1:2009+A1) provides examples of acceptable limits for construction and/or demolition noise in both subjective and objective form. For example, paragraph E.2 of the standard states:

“Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut.”

Paragraph E.2 goes on to state:

“Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:

- 70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;
- 75 decibels (dBA) in urban areas near main roads in heavy industrial areas”.

Typically, the local councils refer to BS 5228 Part 1 as a method to control construction noise from sites on the local environment. This standard is therefore the de facto appropriate standard in the absence of regulatory guidance.

Based on paragraph E.2 of BS 5228 the following criteria is adopted for this project:

- For residential properties it is considered appropriate to adopt the 70dB(A) criterion for
- non-residential locations it is considered appropriate to adopt the higher category values of 75dB(A) during the day. These will only be assessed as noise sensitive during office hours.

For the purpose of this assessment buildings other than dwellings which have a residential function will be considered for the lower noise limit, this includes Hotels, B&B's, Student Accommodation, Co Living Developments etc. This is in line with the guidance and definition of noise sensitive residences of EPA NG4. Table 1 below outlines the project criteria in tabular form.

Table 1: BS 8233:2014 threshold levels.

Assessment category and threshold value period	Threshold value, in decibels (dB) (L_{Aeq})		
	Category A ¹	Category B ²	Category C ³
Daytime (07:00 – 19:00) and Saturdays (07:00 – 14:00)	65	70	75
Evenings and weekends ⁴	55	60	65
Night-time (23:00 to 07:00hrs)	45	50	55

- 1) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
- 2) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
- 3) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category B values.
- 4) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

3.2 Operational Noise Criteria

Local authorities can set noise limits from typical hotel developments pertaining to noise however there is currently no national policy for operational noise limits from hotel developments for planning noise assessments. Noise limits for new developments are typically sought from local council's noise action plan, EPA NG4 or BS4142. On review of the Meath County Council Draft Noise Action Plan no specific guidance has been outlined for noise limits from commercial premises and therefore the criteria from EPA NG4 and BS4142 has been adopted for the project.

BS 4142:2014+A1:2019

The standard describes a method for the assessment of commercial, industrial and background noise to quantify its impact on persons outside of a residential dwelling. BS 4142 has become the de facto standard for compliance investigation. In addition to the specified broadband noise levels the standards provide objective and subjective methods for the assessment of the impulsivity and tonality of the noise sources. This allows for a penalty/ correction to be applied to the measured noise level of the source (L_{Aeq}) to give the rating level ($L_{Ar,T}$).

It considers the likelihood of complaints by considering the margin by which the noise source exceeds the background noise level.

BS 4142 states that an exceedance of the noise source of the background noise by:

- +10 dB or more indicates that complaints are likely,
- + 5 dB is of marginal significance, and;
- The rating level is more than 10 dB below the measured background noise level, then this is a positive indication that complaints are unlikely.

BS4142 outlines guidance for penalty corrections to be applied to the noise sources in question should the noise source have one of the following characteristics:

- The noise contains a distinguishable, discreet, continuous tone (whine, or hum);
- The noise contains distinct impulses (i.e. bangs),
- The noise is intermittent or:
- The noise is irregular.

EPA NG4

EPA NG4 outlines that noise attributable solely to onsite activities from a licenced premises should not exceed the following limits:

- *Daytime (07:00hrs – 19:00hrs) – 55dB $L_{Ar,T}$*
- *Evening (19:00hrs – 23:00hrs) – 50d $L_{Ar,T}$*
- *Night time (23:00hrs – 07:00hrs) – 45dB $L_{Aeq,T}$*

During daytime and evening periods rigorous efforts should be made to avoid clearly audible tones and impulsive noise at all sensitive locations. A penalty of 5dB for tonal and/or impulsive elements is to be applied to the daytime and evening measured $L_{Aeq,T}$ values to determine the appropriate rating level ($L_{Ar,T}$). In all cases, an assessment by a competent person will be required.

During the night-time period no tonal or impulsive noise from the facility should be clearly audible or measurable at any NSL.

4 Baseline Noise Survey

An attended and unattended noise survey was conducted to measure the existing noise environment. The purpose of the measurements was to quantify the existing noise environment to assess the potential noise impact of the proposed development on the surrounding noise sensitive locations.

4.1.1 Site Description and Measurement Locations

The proposed hotel extension and restaurant is located at The Johnstown Estate Hotel, Johnstown, Enfield, Co. Meath A83 V070. The site is bounded by the existing Johnstown Estate Hotel to the west, with residential dwellings to the north and south. The M4 motorway located to the north and forest land to the south. The proposed restaurant is located to the northwest of the existing Johnstown Estate Hotel.

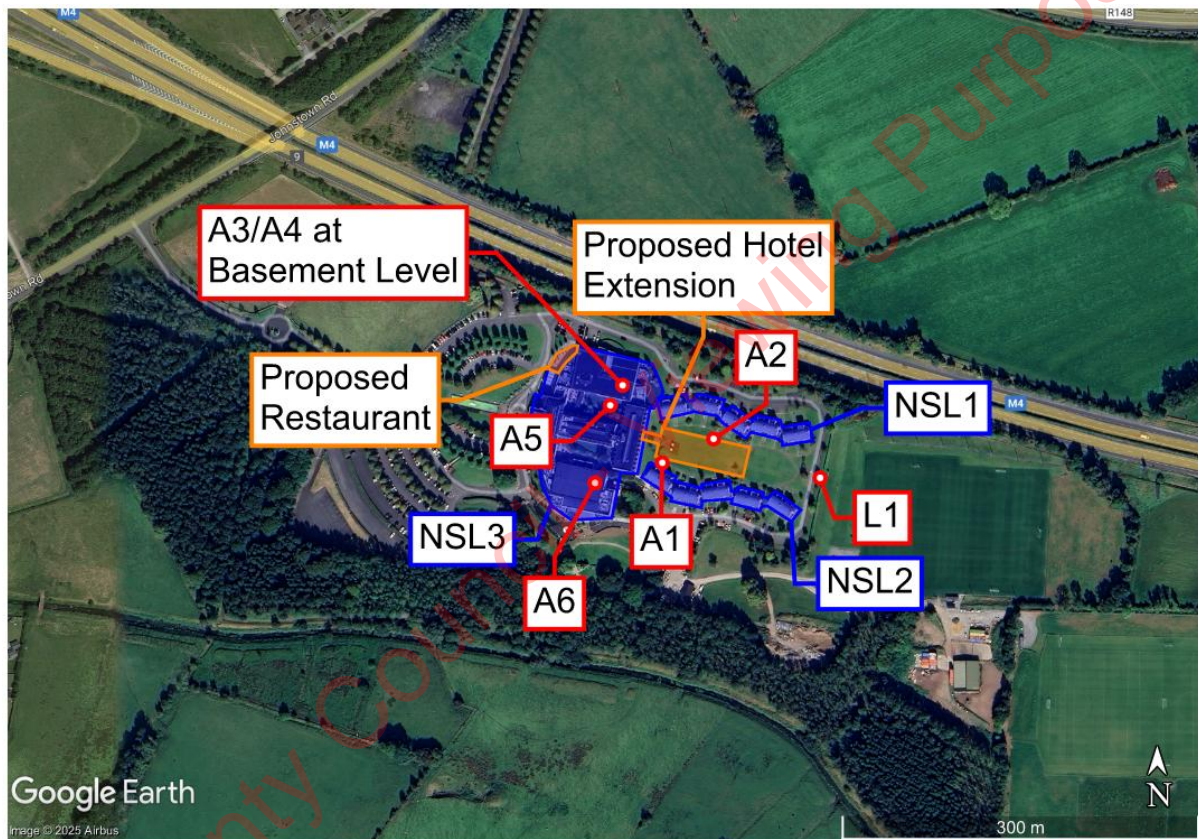


Figure 2: Site locations, noise sensitive locations and measurement locations A1-A6 and L1.

4.1.2 Survey Methodology and Personnel

The unattended and attended survey was completed by Daniel Cousins (Field Engineer). The unattended survey was conducted from the 25th of February 2025 at 14:15hrs to the 27th of February 2025 at 13:30hrs. Attended measurements were taken on the 25th and 27th of February 2025.

Attended Noise Measurements

Noise measurements were undertaken in general accordance with ISO 1996-1:2016 using ISO Class 1 sound analysers. Attended measurements were taken for a duration of 15/60-minute periods in various locations as noted in Figure 2. 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 the ground level. The weather conditions were calm (wind less than 5m/s) with no

rain, a wind shield was used for the duration of the attended surveys. The noise logger was calibrated before and after the survey and no significant drift was noted.



Figure 3: Attended measurement setup at location A1.

Unattended Noise Measurements

An unattended noise logger was deployed in location L1. The monitor was deployed on the 25th of February 2025 at 14:15hrs and collected on the 27th of February 2025 at 13:30hrs. The logger was securely anchored to the ground with sandbags and extended to an approximate height of 1.5m above ground level. The logger was calibrated before and after the measurements and no significant drift was noted. Measurements were filtered for periods of unsuitable weather conditions (where appropriate).

4.1.3 Noise Measurement Equipment

A Class 1 sound level meter/noise logger in general accordance with IEC 61672-1:2013 was used for the attended measurements. Table 2 below summarises the measurement equipment used.

Table 2: Noise Measurement Equipment

Description	WD Asset Number	Model	Serial No.	Calibration Certificate No.	Calibration Due Date
Sound Level Meter	SLM7	Nor 140	1405924	U48184/ U47386	25/07/2026
Sound Level Meter	SLM8	Nor 140	1403345	U44270/ U44269	16/05/2025
Weather Enclosure (Mic in enclosure)	WE1	Nor1211	14155	48186	25/06/2026
Calibrator	CAL3	Nor 1251	32096	AC240251	03/07/2025

4.1.4 Subjective Noise Environment

During the attended noise survey, the following noise sources were identified:

- Road traffic noise from the M4 and local roads,
- Distant construction noise,
- Birdsong.

4.2 Noise Measurement Results

Attended measurements were taken to measure the noise levels across the site. This section outlines the results of the attended noise measurements.

Attended Measurement Results

Table 3 outlines the results of the attended measurement survey.

Table 3: Attended Noise Measurement Results

Measurement					Measured Noise Levels		
Location	Date	Time (hrs)	Period	Duration (mins)	L _{Aeq} dB	L _{AFmax} dB	L _{A90} dB
L1	25/02/2025	13:51	Day	15:00	57	70	54
A1	25/02/2025	12:36	Day	15:00	53	67	50
A2	27/02/2025	12:26	Day	60:00	55	64	52
A1	27/02/2025	13:29	Day	15:00	53	64	50
L1	27/02/2025	13:50	Day	15:00	58	70	55

Unattended Noise Measurements

Table 4 outlines the results of noise measurements at the unattended monitoring location L1.

Table 4: Unattended Measurement Results at Location L1.

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
25/02/2025	57 ⁽¹⁾	54	60	72	44
26/02/2025	59	55	63	64	45
27/02/2025	59 ⁽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}.

4.2.1 Existing Plant & Equipment

This section outlines the attended measurements taken of the existing plant and equipment located on the grounds of The Johnstown Estate Hotel. Table 5 below outlines the measured noise levels of the operational plant at the time of the attended noise survey, based on conversations with staff on-site, certain plant is only operational at certain times. For example: Roof level plant above the banquet hall is only operational when the hall is in use and is not included in this assessment.

Table 5: Attended Noise Measurement Results

Measurement					Measured Noise Levels		
Location	Date	Time (hrs)	Period	Duration (mins)	L _{Aeq} dB	L _{AFmax} dB	L _{A90} dB
A3	25/02/2025	14:48	Day	02:00	75	80	74
A4	25/02/2025	14:52	Day	02:00	81	82	80
A5	25/02/2025	14:58	Day	02:00	61	68	60
A6	25/02/2025	15:04	Day	02:00	75	77	75

4.2.2 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 4 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}.

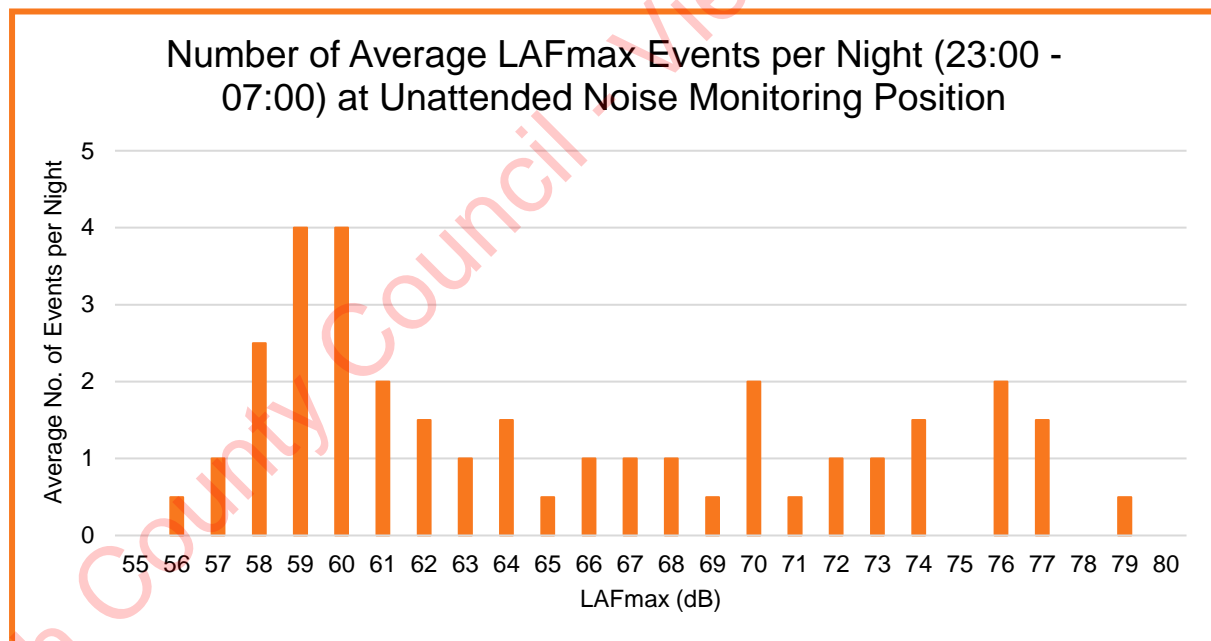


Figure 4: Average recorded L_{AFmax} events per night based on 15min measurement intervals.

Discussion of Measurement Results

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

The dominating noise source in the surrounding area was road traffic noise from the M4 motorway. Based on a comparison of the attended measurements around the site it can be determined that road traffic noise is the dominating noise source in the area.

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 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 for the attended surveys.

5 Construction Noise Assessment

5.1 Noise Sensitive Locations and Noise Limits

Based on the location of the site, the construction works and its proximity to the residential and hotel receptors the following noise sensitive receptors have been identified:

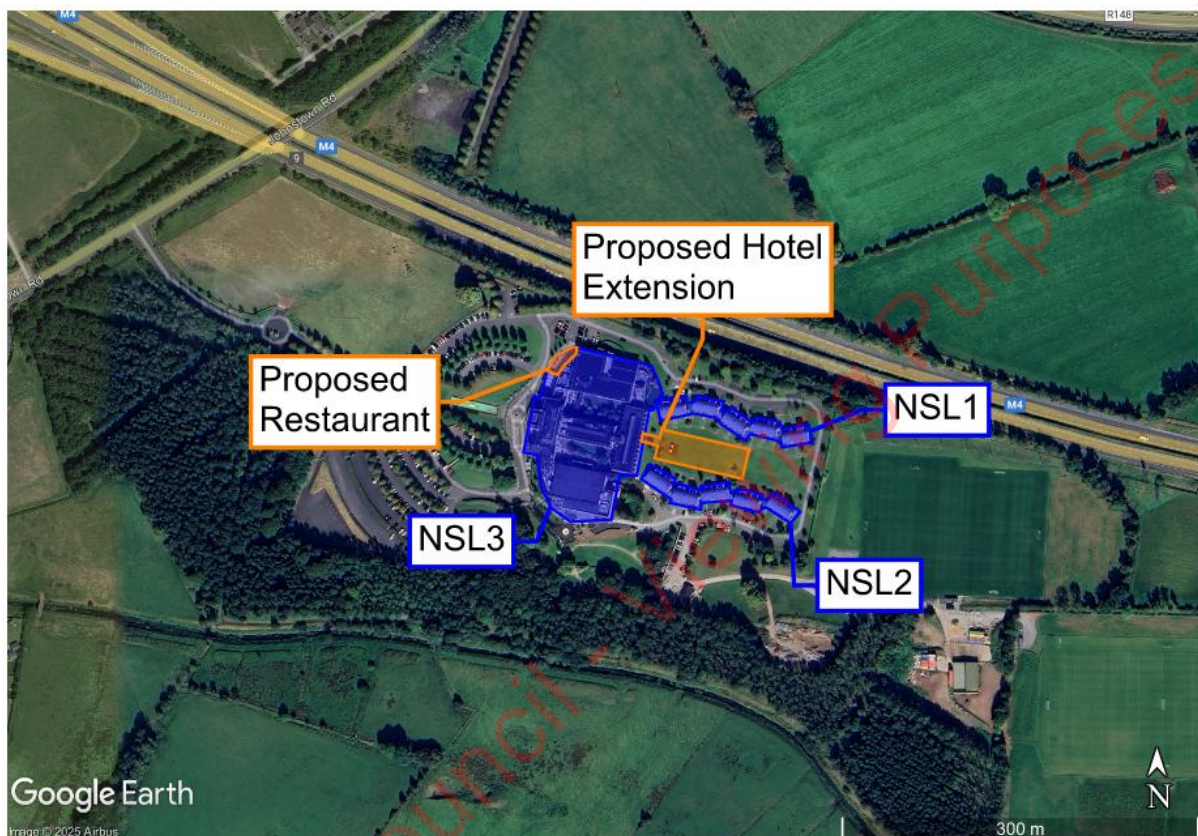


Figure 5: Noise Sensitive Receptors 1-3

Noise Limits

The criteria for the project based on the criteria outlined in section 3 and the background noise in the area the project criteria for construction noise is outlined below in Table 6. Reference to the baseline survey results and guidance contained in BS 5228 Part 1 for construction noise levels threshold for significance affect from construction activities is set as follows for the closest noise sensitive locations:

Table 6: Project Criteria

Construction Noise Limits				
Noise Sensitive Location	Distance To the Hotel Extension	Distance To the Restaurant Extension	Ambient Noise dB(A)	Noise Limit dB(A) 1
NSL1 (Existing Houses)	20	100	55	65
NSL2 (Existing Houses)	20	125	53	65

Construction Noise Limits				
NSL3 (Northeastern Guestrooms)	50	40	53	65
NSL3 (Northwestern Guestrooms)	65	40	53	65

(1) 65 dB (A) lower threshold limit

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

For large infrastructure projects a limit of 75dB(A) is set as the appropriate the upper limit for construction noise within urban areas near main roads in heavy industrial areas. This is considered an appropriate upper limit for construction noise.

5.1 Construction Noise Predictions

Construction noise for the site has been predicted based on the information provided by Lefgem Limited. A summary of the expected equipment and operating times are provided in Table 7. The noise sources are assumed to be located at the centre of the development site. The prediction methodology in BS5228 has been used to calculate the noise level over a typical day for each of the main construction stages.

The closest noise sensitive receptors are the residential dwellings immediately bordering the site on the north and south boundaries, with the existing Johnstown Estate Hotel to the west. It has been assumed that the construction periods for the restaurant, removal of existing basement staircase, new entrance to and reception area to the gym and the hotel extension will run side by side therefore the cumulative impact of both have been assessed ie worst case.

Table 7: Proposed construction equipment, noise levels and duration.

Construction Phase	Item of Plant (BS 5228-1:2009+A1:2014 Ref)	Noise Level (L _{Aeq} at 10m dB(A))	On Time of 10 hr day
Site Setup	Digger	77	4 hours
	Carpentry tools	78	6 hours
	Skill saw	84	6 hours
Substructure	Excavators	77	2 Hours
	Con saws	84	3 Hours
	Drills	89	3 Hours
	Dumper 7t	81	4 Hours
	Cement Mixer	75	4 Hours
	Lorry Idling	80	2 Hours
	Telescopic Handler	71	4 Hours
	Concrete Pump	78	3 Hours

Construction Phase	Item of Plant (BS 5228-1:2009+A1:2014 Ref)	Noise Level (L _{Aeq} at 10m dB(A))	On Time of 10 hr day
Superstructure	Drills	89	2 Hours
	Power tools	70	3 Hours
	Impact steel	69	2 Hours
	Hammer	69	1 Hour
	Dumper 7t	81	3 Hours
	Cement Mixer	75	2 Hours
	Lorry Idling	80	2 Hours
	Telescopic Handler	71	5 Hours
External finishes	Hand Tools	70	5 hours
	Power Tools	70	2 hours
Internal finishes	n/a	n/a	n/a

Table 8 summarises the predicted construction noise levels at the noise sensitive locations. Examination of the results indicate the construction noise without mitigation is predicted to exceed the noise limits during all stages of the development with the exception of external and internal finishes stages.

Table 8: Predicted noise levels **without** mitigation for each stage for the hotel extension construction phase.

Location	Noise Limit	Predicted noise level (construction noise + ambient) with <u>no</u> mitigation L _{Aeq} , dB			
		Site Set Up	Substructure	Superstructure	External finishes
NSL1 (Existing Houses)	65	77	83	81	66
NSL2 (Existing Houses)	65	77	83	81	66
NSL3 (Northeasten Guestrooms)	65	72	79	77	62
NSL3 (Northwestern Guestrooms)	65	61	68	66	50

Table 9: Predicted noise levels **without** mitigation for each stage for the restaurant construction phase.

Location	Noise Limit	Predicted noise level (construction noise + ambient) with <u>no</u> mitigation L _{Aeq} , dB			
		Site Set Up	Substructure	Superstructure	External finishes
NSL1 (Existing Houses)	65	70	76	74	60
NSL2 (Existing Houses)	65	69	75	73	59
NSL3 (Northeasten Guestrooms)	65	74	80	78	63
NSL3 (Northwestern Guestrooms)	65	64	70	68	52

Table 10: Predicted noise levels **without** mitigation for each stage for both construction phases (Restaurant and Hotel).

Location	Noise Limit	Predicted noise level (construction noise + ambient) with <u>no</u> mitigation L _{Aeq} , dB			
		Site Set Up	Substructure	Superstructure	External finishes
NSL1 (Existing Houses)	65	78	84	82	67
NSL2 (Existing Houses)	65	78	84	82	67
NSL3 (Northeasten Guestrooms)	65	76	83	81	66
NSL3 (Northwestern Guestrooms)	65	66	72	70	54

The calculations set out above are based on assumed site construction works and a combination of the plant operating at the same time i.e. worst-case scenario.

Table 11 Attenuation required based on the construction noise predictions for the hotel extension construction phase.

Location	Noise Limit	Noise reduction required at each stage of works to meet criteria (dBA)			
		Site Set Up	Substructure	Superstructure	External finishes
NSL1 (Existing Houses)	65	12	18	16	1
NSL2 (Existing Houses)	65	12	18	16	1
NSL3 (Northeasten Guestrooms)	65	8	14	11	0
NSL3 (Northwestern Guestrooms)	65	0	3	1	0

Table 12 Attenuation required based on the construction noise predictions for the restaurant construction phase.

Location	Noise Limit	Noise reduction required at each stage of works to meet criteria (dBA)			
		Site Set Up	Substructure	Superstructure	External finishes
NSL1 (Existing Houses)	65	5	11	9	0
NSL2 (Existing Houses)	65	4	10	8	0
NSL3 (Northeasten Guestrooms)	65	9	15	13	0
NSL3 (Northwestern Guestrooms)	65	0	5	3	0

Table 13 Attenuation required based on the construction noise predictions for both construction phases (Restaurant and Hotel).

Location	Noise Limit	Noise reduction required at each stage of works to meet criteria (dBA)			
		Site Set Up	Substructure	Superstructure	External finishes
NSL1 (Existing Houses)	65	13	19	17	2
NSL2 (Existing Houses)	65	13	19	17	2
NSL3 (Northeasten Guestrooms)	65	11	18	16	1

Location	Noise Limit	Noise reduction required at each stage of works to meet criteria (dBA)			
		Site Set Up	Substructure	Superstructure	External finishes
NSL3 (Northwestern Guestrooms)	65	1	7	5	0

Noise mitigation measures will be required at all stages of construction. A combination of the mitigation measures outlined in section 5.2 should be used to reduce the levels of construction noise by the values listed in the Tables above.

5.2 Noise Mitigation Recommendations

Best practice control measures for noise from construction sites are found within BS 5228 (2009 +A1 2014) part 1. Construction noise impacts are expected to vary during the construction phase of the project, this impact will depend on the distance between the construction activities and noise sensitive receptor. The contractor will ensure that all best practice noise and control methods will be used, to ensure any negative noise impacts at off-site noise sensitive locations are minimised.

The best practice measures set out in BS 5228 (2009) Part 1 includes guidance on several aspects of construction site mitigation measures, this includes the:

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

As the proposed restaurant will be constructed off of the existing leisure centre, there is a risk for construction noise impact to various parts of the existing hotel. Based on the guestroom locations on the existing hotel there is some degree of screening provided to the guestrooms, particularly as the construction of the restaurant is limited to a single storey. As the operators of the hotel have control over both the construction noise and the guest experience it will be controlled via management of noisy works.

5.2.1 General Recommendations

This section of the report sets out noise mitigation options and detailed comment on each one specifically for this site.

Selection of Plant and Equipment

The noise impact of all plant and equipment should be assessed prior to selection of the plant for the project. Where an item of plant is identified as noisy with the potential to cause a negative noise impact it should be reviewed to check if there is an alternative quieter version of the same plant to undertake the same construction task.

Noise Control at Source

Where replacing a noisy item of plant is not viable or practical, consideration should be given to control that noise at source. This includes modifying the piece of plant or equipment to generate less noise, using dampening to control vibration induced noise or rattling. Example best practice mitigation measures to be considered are as follows:

- All plant and equipment to be switched off when idling.
- The use of white noise reversing alarms.
- Restriction on the dropping and loading of materials to less sensitive hours.

- The use of local screening for noisy activities or works with hand tools
- Not dropping materials onto hard surfaces and using rubber mats etc for the dropping of materials.
- Ensure all plant and equipment is well maintained and cleaned, all lubrication should be in line with manufacturers guidelines.

Screening

Screening when used correctly can be an effective method of reducing the construction noise impact on the NSL's. The use of site hoarding and careful selection of areas for noise works, using buildings on the site, site offices and the building being constructed to screen noise from the works.

Local screening of noisy works with the use of temporary acoustic barriers, examples are provided below:

- <https://ventac.com/acoustic-products/noisebreak-acoustic-barrier/>
- <https://echobarrier.com/>



Figure 6: Temporary Construction Noise Barrier © Ventac

Public Engagement

It is recommended that a public liaison officer should be put forward by the contractor to liaise with the local residents on matters relating to noise. Residents should be informed of any noise works scheduled where there is the potential to generate high levels of construction noise or if specialist works etc need to be conducted out of the working hours. This person should also be the point of contact for all complaints and be responsible for reviewing the noise monitoring results and exceedances.

Construction Noise Monitoring

Construction noise monitoring will be undertaken at periodic sample periods on the boundary with the nearest noise sensitive receptors.

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

5.2.2 Site Specific Recommendations

Table 14 below outlines the recommended site-specific noise mitigation measures based on the attenuation required in Table 11.

Table 14: Attenuation required based on the construction noise predictions.

Construction Stage	Recommended Noise Mitigation Measure
Site Setup	<p>Erect a minimum 2.4m high site hoarding that blocks the line of sight between noise source and receiver.</p> <p>Example construction for the site hoarding would be as follows:</p> <ul style="list-style-type: none"> A 2.4m high and 9mm plywood (4.5 kg/m²). Barrier must be solid and not contain gaps at the bottom or between adjacent panels <p>Local screening using the examples provided in General Recommendations section 5.2.1 are required around hand tools in addition to hoarding.</p> <p>An absorptive lining should be considered for screening around hand tools will need to have an absorptive lining to avoid reflections increasing noise at other receivers.</p> <p>On this project 3 NSL's have been identified it is recommended that a noise monitor should be placed on the boundary with each of nearest noise sensitive locations closest to the works i.e. NSL's 1-2 are the most appropriate locations.</p>
Demolition	<p>Consider low noise plant and equipment.</p> <p>Plan site works and liaise with the noise sensitive receptors.</p> <p>Site hoarding will be used to block the line of sight. Also, local screening around concrete breaker, dump truck loading, hand-held breakers and drills where practical.</p> <p>Noise monitoring as above</p>
Substructure	<p>Site hoarding to block line of sight. Local screening around noisy plant and equipment.</p> <p>Noise monitoring as above</p>
Superstructure	<p>Local screening around saws/hammers where possible. Use external new building to screen noise from works where possible.</p> <p>Noise monitoring as above</p>
External finishes	<p>Local screening around hand tools.</p> <p>Noise monitoring as above</p>

6 Operational Noise Impact

The operational noise sources from the development includes noise from plant and equipment on the hotel extension and the single storey restaurant, use of the ground level amenity space and traffic movements from cars parking.

This section includes an assessment of the operational noise impacts for noise from plant and equipment on the hotel extension and the single storey restaurant extension, use of the ground level amenity space and car parking. The plant and equipment for the project has not been determined at this time. Indicative noise levels have been provided by the M&E Consultant for use in this planning stage report. As part of the building design an acoustic consultant should be engaged to review the plant noise emissions from the development to ensure that the upper noise limits outlined in this report are achieved.

Following the survey a model of the development using SoundPLAN 9.0 modelling software was developed to establish the noise levels from 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 acoustic model for the development has been developed based on the baseline noise survey and the proposed site location and predicted noise sources. As the site has potential to create noise impact at both day and nighttime, a worst-case scenario has been developed for both predicting the noise impact at the nearest noise sensitive locations.

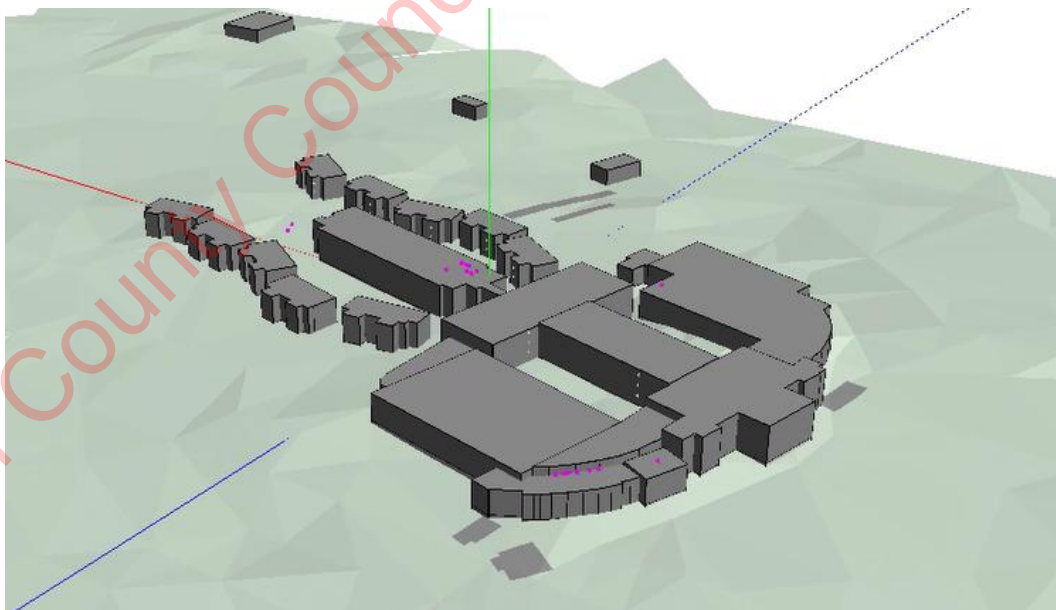


Figure 7: Screenshot from the model showing the operational noise assessment.

6.1 Assessment of Operational Noise Impact

This section outlines the operational noise impact from the plant and equipment, amenity space usage and the car park movements.

Plant Noise

This section outlines the plant noise spectrums used in the assessment. Plant is located on the roof of the proposed hotel extension on the western side of the extension, and additional plant is located on the roof of the proposed restaurant extension to the northwest of the existing Johnstown Estate Hotel. Noise spectrum data has been provided by Preston MEP Consulting for both proposed and existing plant and equipment for use in this assessment. Similar or approved mechanical plant is suitable for this development. Plant noise should be reviewed by an acoustic consultant at design stage to ensure noise levels remain within criteria outlined in this report.

Table 15: Plant sound power spectrums.

Description	Source Sound Power Level L_w (dB) at Octave Band Centre Frequency, Hz								Overall Sound Power Value L_w dBA
	63	125	250	500	1000	2000	4000	8000	
Hotel Plant and Equipment									
Heat Pump	76	76	74	72	70	67	64	59	75
VRF Condenser (Heating)	67	69	69	69	66	57	47	43	70
VRF Condenser (Night Mode)	59	61	62	61	58	50	38	35	62
AHU Breakout	54	57	53	52	48	43	38	20	53
AHU Supply Outlet	63	65	67	68	64	60	56	52	69
AHU Return Outlet	63	66	69	69	66	62	57	54	71
Restaurant Plant and Equipment									
AHU Supply Outlet	76	72	74	78	78	74	68	62	81
AHU Return Outlet	77	73	76	79	80	76	69	62	83
AHU Breakout	67	64	60	62	62	56	50	29	65
VRF Condenser (Heating)	67	69	70	69	66	58	46	43	70
VRF Condenser (Night Mode)	59	61	62	61	58	50	38	35	62
DX Condenser	72	74	70	65	62	60	62	52	69

Description	Source Sound Power Level L_w (dB) at Octave Band Centre Frequency, Hz								Overall Sound Power Value L_w (dBA)
	63	125	250	500	1000	2000	4000	8000	
Existing Bar Plant and Equipment									
Bar AHU (UATYA40) ⁽²⁾	85	82	83	77	81	80	79	65	87
Measured Existing Plant and Equipment									
Existing Roof Level Plant ⁽¹⁾	77	77	79	81	77	75	77	70	84
External Measurement of Basement Level Plant Room ⁽¹⁾	85	81	68	63	65	57	52	42	70

- 1) Existing plant sources measured during attended noise survey, converted to sound power for use in the noise model.
 2) Sound power levels and operational times provided by PMEPP Consulting for use in this report, for the existing bar AHU only. Operational from 08:00hrs-00:00hrs daily.

6.1.1 Daytime Scenario

As the new development has the potential to generate noise with different characteristics for both the day and nighttime, a model has been undertaken for both the day and nighttime operations of the proposed development.

The daytime situation assumes the following noise sources:

- 3 carpark movements per hour per parking space during daytime hours of 07:00-23:00.
- Use of the ground level external amenity spaces during the hours of 16:00-23:00.
- Occupancy in amenity spaces assessed based on guidelines outlined in AAAC Licensed Premises Guidelines - 1 in 3 are talking at once with normal voices, as per Table 16 below with an occupancy of 12 persons.
- Assumed plant operating 100% of the time for both the proposed hotel extension and the new restaurant.
- Existing plant measured at ground and roof level of The Johnstown Hotel assumed to be operational 100% of the time, with the exception of the existing Bar AHU located at roof level – Operating from 08:00hrs-00:00hrs daily, based on discussions with design team.

Table 16: AAAC Patron sound power levels for the outdoor communal space.

Description	Source Sound Power Level L_w (dB) at Octave Band Centre Frequency, Hz							Overall Sound Power Value L_w dBA
	125	250	500	1000	2000	4000	8000	
1 male talker with normal voice	55	64	66	60	56	52	47	66

Noise Impact (BS 4142 Assessment) for Daytime Hours

The noise impact at the nearest noise sensitive location (NSL1-NSL3) has been assessed in accordance with BS 4142. The predicted noise from the development is worst case at NSL3 due to its proximity to the development. Residual and background sound levels are based on attended measurement results. The BS4142 at NSL3 is outlined in Table 17 below however all locations have been assessed and are predicted to comply with the BS4142 criteria.

Table 17: BS4142 Assessment for daytime period

Results		Relevant BS 4142 Clause	Commentary
Predicted specific sound level (daytime)	$L_{Aeq(60min)} = 40dB$	7.3.6	As the new development is not yet existing, the noise levels have been predicted using SoundPlan 9.0 modelling software. Worst case specific sound predicted at NSL3 as this is closest to the proposed development.
Residual sound level (daytime)	$L_{Aeq(60min)} = 55dB$	7.3.2	The residual sound level was dominated by road traffic noise. Background location A2 assessed as this is representative for worst case receptor (NSL3).
Background sound level (daytime)	$L_{A90(60min)} = 52dB$	8.1.2 8.4	The L_{A90} sound level was measured at the noise sensitive location with the source absent.
Assessment made during the daytime, so the reference time interval is 1 hour		7.2	
Specific sound level as predicted	$L_{Aeq(60min)} = 28dB$	7.3.6	The specific sound has been predicted by calculation alone as the new development was not existing at the time.
Acoustic feature correction	+0dB	9.2 9.3.2	It is not anticipated that the specific sound will have any impulsive, tonal or intermittent characteristics.
Rating level	$(40 + 0) dB = 40dB$	9.2	
Background sound level	$L_{A90(60min)} = 52dB$	8	
Excess of rating over background sound level	$(40 - 52) dB = -12dB$	11	Assessment indicates that no adverse impact is likely on the noise sensitive locations as the specific sound is 12dB below the background noise levels and is lower than the residual sound. Context has also been considered.
Uncertainty of the assessment	Not significant	10	The specific sound is a worst-case prediction as the assessment assumes plant operating 100% of the time, multiple carpark movements every hour, groups of persons occupying the amenity space during evening hours and one in three speaking with normal voice.

Based on the review of the noise sources and the BS 4142 assessment it is predicted that the noise emanating from the proposed development will not have any adverse impact on the surrounding noise sensitive locations.

Consideration of Tonality and Impulsivity

An assessment for tonality and impulsivity was conducted to evaluate noise emissions from the proposed development. Findings indicate that the noise emissions are significantly lower than both the background and residual noise levels in the area. Consequently, the emissions are unlikely to produce tonal or impulsive characteristics that will have an impact at the noise sensitive receptors.

EPA NG4

NG4 recommends a daytime criterion of (07:00hrs – 19:00hrs) 55dB $L_{Aeq,T}$, the predicted noise emissions from the development are 40 dBA at NSL3, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved. Table 18 below outlines the predicted noise impact at each noise sensitive location, the project criteria and compliance with the project criteria.

Table 18: Predicted noise levels at each noise sensitive location.

Location	Distance To the Hotel Extension	Distance To the Restaurant Extension	EPA NG4 Daytime Criteria $L_{Aeq,T}$ dBA	Predicted Noise Level from Proposed Development $L_{Aeq,T}$ dBA	Compliance
NSL1 (Existing Houses)	20	100	55	36	Compliant
NSL2 (Existing Houses)	20	125	55	36	Compliant
NSL3 (Northeastern Guestrooms)	50	40	55	40	Compliant
NSL3 (Northwestern Guestrooms)	65	40	55	40	Compliant

EPA NG4 Evening Time

NG4 recommends an evening-time criterion of (19:00hrs – 23:00hrs) 50dB $L_{Aeq,T}$, the predicted noise emissions from the development are 40 dBA at NSL3, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved. Table 18 below outlines the predicted noise impact at each noise sensitive location, the project criteria and compliance with the project criteria.

6.1.2 Night-time Scenario

The proposed development has potential to generate noise impact at nighttime.

The nighttime situation assumes the following noise sources:

- 1 carpark movements per hour per parking space during nighttime hours of 23:00-07:00
- Use of the ground level external amenity spaces during the hours of 23:00-01:00.
- Occupancy in amenity spaces assessed based on guidelines outlined in AAAC Licensed Premises Guidelines - 1 in 3 are talking at once with normal voices, as per Table 16 above with an occupancy of 12 persons.
- Assumed plant operating 100% of the time for both the proposed hotel extension and the new restaurant.
- Existing plant measured at ground and roof level of The Johnstown Hotel assumed to be operational 100% of the time, with the exception of the existing Bar AHU located at roof level – Operating from 08:00hrs-00:00hrs daily, based on discussions with design team.

BS4142 Nighttime Assessment

The noise impact at the nearest noise sensitive location (NSL1-NSL3) has been assessed in accordance with BS 4142. The predicted noise from the development is worst case at NSL3 due to its proximity to the development, car parking and communal area. Residual and Background sound levels are based on the averaged attended measurement results. The BS4142 at NSL3 is outlined in Table 19 below however all locations have been assessed and are predicted to comply with the BS4142 criteria.

Table 19: BS4142 Assessment for nighttime period

Results		Relevant BS 4142 Clause	Commentary
Predicted specific sound level (nighttime)	$L_{Aeq(15min)} = 39dB$	7.3.6	As the new development is not yet existing, the noise levels have been predicted using SoundPlan 9.0 modelling software. Worst case specific sound predicted at NSL3 as this is closest to the proposed development.
Residual sound level (nighttime)	$L_{Aeq(15min)} = 54dB$	7.3.2	The residual sound level was dominated by road traffic noise on the nearby roads. Background location L1 assessed as this is representative for worst case receptor (NSL3).
Background sound level (nighttime)	$L_{A90(15min)} = 44dB$	8.1.2 8.4	The L_{A90} sound level was measured at the noise sensitive location with the source absent.
Assessment made during the daytime, so the reference time interval is 15 minutes		7.2	
Specific sound level as predicted	$L_{Aeq(15min)} = 39dB$	7.3.6	The specific sound has been predicted by calculation alone as the new development was not existing at the time of the survey.
Acoustic feature correction	+0dB	9.2 9.3.2	It is not anticipated that the specific sound will have any impulsive, tonal or intermittent characteristics.
Rating level	$(39 + 0) dB = 39dB$	9.2	
Background sound level	$L_{A90(15min)} = 44dB$	8	
Excess of rating over background sound level	$(39 - 44) dB = -5dB$	11	Assessment indicates that no adverse impact is likely on the noise sensitive locations at nighttime as the specific sound is 5dB below the background levels and is lower than the residual sound. Context has also been considered.
Uncertainty of the assessment	Not significant	10	The specific sound is a worst-case prediction as the assessment assumes plant operating 100% of the time, multiple carpark movements every hour, groups of persons occupying the amenity space during

Results	Relevant BS 4142 Clause	Commentary
		evening hours and one in three speaking with normal voice.

Based on the review of the noise sources and the BS 4142 assessment it is predicted that the noise emanating from the proposed development will not have any adverse impact on the surrounding noise sensitive locations.

Consideration of Tonality and Impulsivity

An assessment for tonality and impulsivity was conducted to evaluate noise emissions from the proposed development. Findings indicate that the noise emissions are significantly lower than both the background and residual noise levels in the area. Consequently, the emissions are unlikely to produce tonal or impulsive characteristics that will have an impact at the noise sensitive receptors.

EPA NG4

NG4 recommends a night-time criterion of (23:00hrs – 07:00hrs) 45dB $L_{Aeq,T}$, the predicted noise emissions from the development are 39dBA at NSL3, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved. Table 20 below outlines the predicted noise impact at each noise sensitive location, the project criteria and compliance with the project criteria.

Table 20: Predicted noise levels at each noise sensitive location.

Location	Distance To the Hotel Extension	Distance To the Restaurant Extension	EPA NG4 Night-time Criteria $L_{Aeq,T}$ dBA	Predicted Noise Level from Proposed Development $L_{Aeq,T}$ dBA	Compliance
NSL1 (Existing Houses)	20	100	45	34	Compliant
NSL2 (Existing Houses)	20	125	45	34	Compliant
NSL3 (Northeastern Guestrooms)	50	40	45	39	Compliant
NSL3 (Northwestern Guestrooms)	65	40	45	38	Compliant

6.1.3 Modelling Assumptions

The following assumptions were made throughout the modelling and assessment:

- Assessment based on the noise measurements undertaken on 25th of February 2025 to the 27th of February 2025.
- Assumes car parking movements as outlined above in Section 6.1
- Assumes proposed hotel and restaurant plant is operating 100% of the time.
- Assumed measured plant on site will operate 100% of the time.
- Sound power levels and operational times provided for existing Bar AHU, as outlined above.
- Model assumes a worst-case operating scenario as outlined in Section 6 above.
- Modelling based on the drawings, layouts and information provided.
- Assessment based on proposed new development only.

7 Conclusion

Wave Dynamics were engaged by Lefgem Limited as the acoustic consultants to provide an Acoustic Design Statement including an Operational Noise Assessment and construction noise assessment to assess the noise impact of the proposed hotel extension at The Johnstown Estate Hotel, Johnstown, Enfield, Co. Meath A83 V070 in response to a further information request from the planning authority.

The request for further information requests the following:

7. *The applicant shall submit the following with regard to waste management as follows;*

- f. *A Noise Assessment and Management Plan should be provided for this application for both sites' construction and operational phases. This should also include noise assessment and management from the outside plant located on the roof and any associated mitigation measures.*

This report outlines noise impact assessments conducted for the proposed development during the construction phase and the operational phase.

The proposed development includes:

- i. Construction of a three-storey extension to the rear of the existing hotel comprising 90 no. guest bedrooms with an area of plant at roof level of the extension;
- ii. Creation of opening in rear façade of the existing hotel at ground floor level with the omission of one existing guest bedroom to allow for a new single-storey connection to the proposed extension;
- iii. Modifications to the existing floor plan of the tenor suite at the ground floor level of the existing hotel to provide for a new restaurant, extend the existing kitchen, provide bathrooms and to separate the restaurant from the spa and gym;
- iv. provision of single-storey extension to the proposed restaurant at ground floor and a new entrance to the existing leisure centre;
- v. provision of extension to the basement level to the north-west corner of the existing hotel and provision of storeroom;
- vi. removal of existing external escape staircase from ground floor level to basement level and provision of a new entrance and reception area to gym;
- vii. provision of new replacement external staircase from ground floor level to basement level and alterations to existing openings and partition walls;
- viii. modifications to 6 no. car parking spaces comprising the provision of 4 no. accessible spaces to serve the restaurant and relocation of the remaining 2 no. spaces. Car parking numbers remain the same;
- ix. provision of 14 no. additional bicycle parking spaces for staff;
- x. provision of 2 no. external signs above new restaurant and gym entrances;
- xi. The development also includes all other associated engineering works, landscaping, lighting, and ancillary works necessary to facilitate the development. The subject property is within the curtilage of a Protected Structure (MH048-103).

Baseline Noise Survey

An attended and unattended noise survey was conducted for The Johnstown Estate Hotel, Johnstown, Enfield, Co. Meath A83 V070 to measure the existing noise environment. The purpose of the measurements was to quantify the existing noise environment to assess the potential noise impact of the proposed development on the surrounding noise sensitive locations. Following the baseline survey, construction noise and operational noise assessments were conducted as requested by the planning authority via a request for further information document.

Construction Noise

A construction noise assessment was conducted on the proposed development to predict the potential noise impact of the construction phase on the surrounding noise sensitive receptors. Using guidance from BS 8233 and BS 5228-1 the predicted construction noise is in exceedance of project criteria. Suitable mitigation measures have been proposed in order to reduce the noise impact on the surrounding noise sensitive receptors.

Operational Noise

An operational noise impact assessment from the noise generated in the communal amenity space, existing and proposed plant and equipment noise and car parking for both the restaurant and hotel extension. It is predicted that the development will not cause a negative noise impact on the nearby noise sensitive locations. The mechanical plant and equipment specification should be reviewed by an acoustic consultant at design stage to ensure noise levels remain in compliance with criteria outlined in this report.

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