# ENVIRONMENTAL NOISE SURVEY

**FOR**

**GROODY DEVELOPMENTS LIMITED**

**AT**

**WHITEBOX STUDENT CAMPUS DEVELOPMENT**
**GROODY ROAD**
**NEWCASTLE**
**CASTLETROY**
**LIMERICK**

**Prepared for**
Groody Developments Limited

**Prepared by:**
Traynor Environmental Ltd

**Reference Number:**
24.310 TE

**Date of Issue:**
30th January 2025

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| **Authorised By:** |  <br>*Nevin Traynor BSc. Env, H.Dip I.T, Cert SHWW, Certified Env Noise Assessor*<br>*Environmental Consultant* |

| Rev No | Status | Date | Writer | Reviewer |
|---|---|---|---|---|
| 1. | Draft Report | 04th October 2024 | Killian Bannon | Nevin Traynor |
| 2. | Final Report | 30th January 2025 | Killian Bannon | Nevin Traynor |

This report refers, within the limitations stated, to the condition of the site at the time of the report. No warranty is given as to the possibility of future changes in the condition of the site. The report as presented is based on the information sources as detailed in this report, and hence maybe subject to review in the future if more information is obtained or scientific understanding changes.

CONTENTS

## 1.0 INTRODUCTION

### 1.1 Terms of Reference

Traynor Environmental Ltd has been commissioned to carry out a study in relation to the potential noise impacts incident to the proposed development on behalf of Groody Developments Limited.

Planning Permission is currently being sought by Groody Developments Limited for the Whitebox Student Campus Development at Groody at Groody Road, Newcastle, Castletroy, Limerick. The development location is immediately adjacent to the Groody Road to the east and R445 to the north. An Acoustic Design Statement be prepared in respect of the proposed development.

Traynor Environmental Ltd was commissioned to conduct an assessment of the expected inward noise impact due to traffic noise emissions in respect of this development in an Acoustic Design Statement (ADS) in accordance with the guidance document Professional Practise Guidance on Planning & Noise 2017 (ProPG).

The following document details the results of an ambient noise monitoring survey conducted on development lands, sets out appropriate criteria in respect of inward noise impact, provides a detailed account of our assessment and lists the mitigation recommendations that were determined as being required in order to ensure the proposed development's noise impacts are minimised in accordance with the established criteria limits.

## 2.0 PROPOSED DEVELOPMENT ELEMENTS & LAYOUT

The subject site is located on the western side of Limerick City at Groody Road, Newcastle, Castletroy Limerick, partially located beside University of Limerick. The subject site is located approximately 3km west of Limerick City Centre. The site's location in the context of Limerick City is illustrated in Figure 1 below. The lands to the south and east of the subject site are characterised by greenfield land which is zoned for Groody Valley. The lands to the east of the site are characterised by existing residential development including Curragh Birin and a local centre. The lands to the north of the site are characterised by greenfield land. There are existing public transport facilities in the area including the 304, 304A and 310 bus routes operated by Transport for Ireland. The nearest bus stop that serves these routes is located approximately 200m east of the site and at the east boundary of the site.

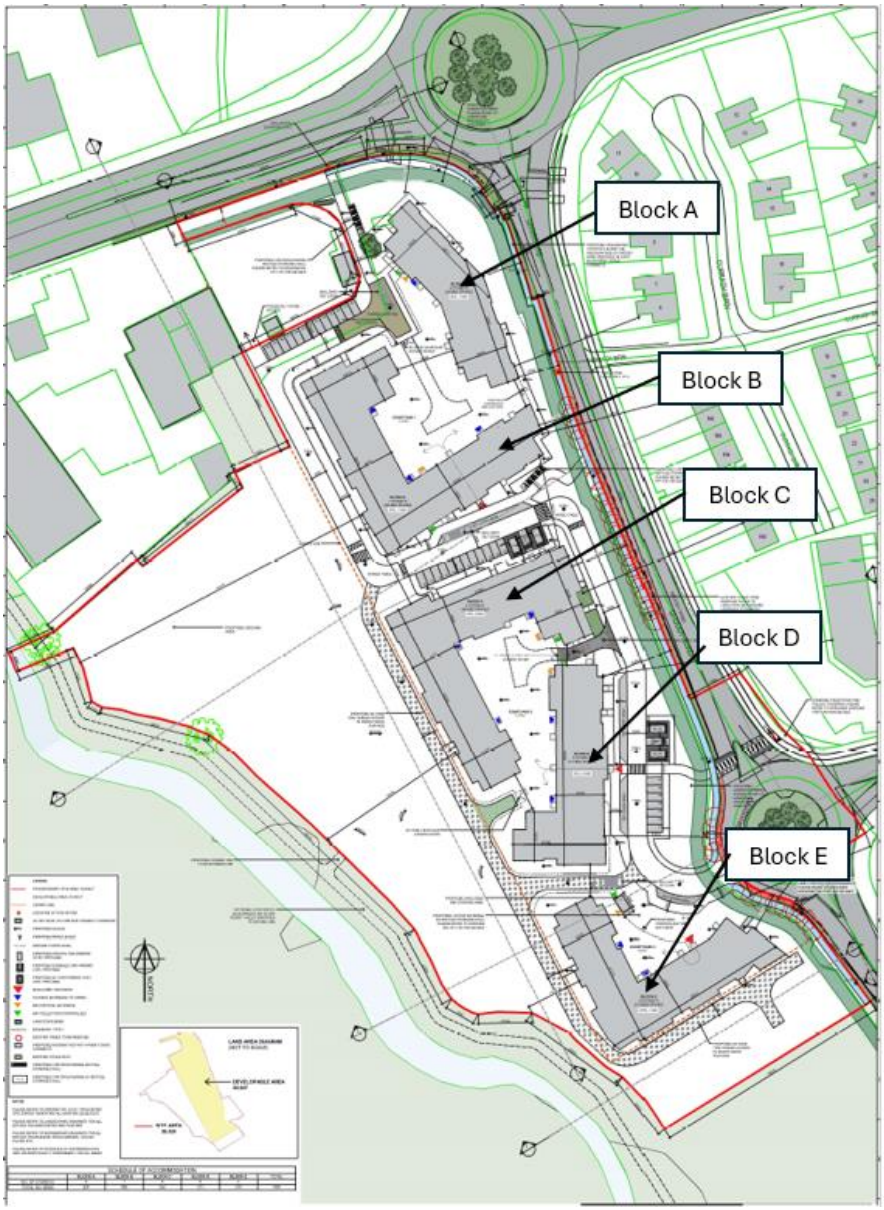
**Figure 1: Indicative site context map.** ***(Source: Google Maps)***


Groody Developments Limited seeks planning permission for the development of a Purpose-Built Student Accommodation (PBSA) scheme on land fronting the Groody Road and Dublin Road, Castletroy, in the townland of Newcastle, Limerick for a period of seven years.

The development consisting of 196 no. Bed Clusters, is distributed across 5 no. separate blocks, ranging in height from 5 - 8 storeys, with a total of 1,400 no. student bedspaces to be delivered in two phases of development including: (i) Block A comprising 8 storeys providing for (a) 28 no. bed clusters and 224 no. bedspaces; (b) Student library; (c) Student union; (d) Plant room; (e) Bin store; (f) Bicycle store; (ii) Block B comprising 7 storeys providing for (a) 52 no. bed clusters and 400 no. bedspaces; (b) Reception & Office; (c) Post room; (d) Laundry room; (e) Student canteen; (f) Maintenance store; (g) Plant room; (h) ESB sub station & switch room; (i) Bin Storage; (j) and Bicycle store; (iii) Block C comprising 6 storeys providing for (a) 51 no. bed clusters and 355 no. bedspaces; (b) Student Gym; (c) Maintenance store; (d) Plant room; (e) ESB sub station & switch room; (f) Bin Storage; (g) and Bicycle store; (iv) Block D comprising 6 storeys providing for (a) 32 no. bed clusters and 211 no. bedspaces; (b) Reception & Office; (c) Post room; (d) Laundry room; (e) Student canteen; (f) Student supply retail unit

(60m2); (g) Plant room; (h) Maintenance store; (i) Bin Storage; and (k) Bicycle Storage; (v) Block E comprising 5 storeys providing for (a) 33 no. bed clusters and 210 no. bedspaces; (b) Reception & Office; (c) Laundry room; (d) Maintenance store; (e) Bicycle store; and (f) Plant room; and (vi) ancillary site development works including car and bicycle parking provision; boundary treatments; roof plant; public lighting; water supply; foul and surface water drainage infrastructure; signage; and a temporary construction access to facilitate Phase 2. Vehicular access to the site will be from the Groody Road with pedestrian access to the Dublin Road. Extensive landscaping proposals, including (a) landscaped courtyards; (b) pedestrian and cycle connections from the Groody Road to the Groody Green Wedge; (c) natural landscaping and public walkways within the Groody Green Wedge; and (d) a Wetland area adjacent to the Groody River are also proposed. Planning permission is also sought for use of the accommodation, outside of student term time, for short-term letting purposes.

**Figure 2: Proposed Site Layout**



## 3.0 NOISE MONITORING SURVEY

An environmental noise monitoring survey was conducted in order to quantify the level of traffic noise emissions from the boundary roads at the proposed development site. The survey was conducted in general accordance with ISO 1996-2: 2017: Acoustics - Description, measurement and assessment of environmental noise.

Specific details are set out in the following sections.

### 3.1 Measurement Locations

Given that the R445 and Groody Rd are the primary noise source that was identified in the vicinity of the proposed development site

Specific details are set out below. The Noise Monitoring Locations (N) is shown in Figure 3 below.

**Figure 3. Monitoring Locations**


### 3.2 Survey Periods

A long-term noise meter was set to monitor the noise levels continuously at N1 from 19th March 2024 – 21st March 2024. The weather conditions were dry and calm throughout. Short term noise levels were recorded at N2 – N5 on the 19th – 20th March 2024.

The meteorological conditions that were observed at Shannon Airport on the days of the survey period are detailed in Table 1 below.

**Table 1: Meteorological Conditions During the Noise Surveys**

| Date | Time Period | Wind | Temperature (°C) | Precipitation (mm) |
|---|---|---|---|---|
| | | Avg. Speed (m/s) | | |
| 19th March 2024 | Daytime | 2 | 8 – 13 | 3.8 |
| | Night Time | 3 | 8- 9 | 1.5 |
| 20th March 2024 | Daytime | 4 | 7-12 | none |
| | Night Time | 3 | 5-9 | 0.1 |
| 21st March 2024 | Daytime | 6 | 9-12 | 4.1 |
| | Night Time | 4 | 6-8 | 0.2 |

### 3.3 Personal and Instrumentation

The monitoring and analysis of the data was conducted by Nevin Traynor of Traynor Environmental deemed to be a "competent person" as per criteria outlined by the EPA. The monitoring programme, data and report was carried out by Nevin Traynor who is certified as been competent in Environmental Noise Measurement by the Institute of Acoustics (IOA) with over 15 years' experience in Environmental and Acoustic Consultancy.

Nevin Traynor of Traynor Environmental installed and removed the equipment. Class 1 Larson Davis Sound Level Meters were used and were calibrated prior to measurements. The sensitivity was checked afterwards for any significant drift; none was found. Weather conditions were good in terms of Noise Monitoring conditions.

The measurements were conducted using three Class 1 Larson Davis Sound Level Meters. Microphones were fitted with a 90mm windshield and were check calibrated both before and after the survey using a Cirrus Acoustic Calibrator.

The calibration certificates for the sound level meter and calibrator are provided in Appendix A of this document.

### 3.4 Procedure

Measurements were conducted continuously over the full extent of the survey period. The sound level meter was set to average over periods that were 30 minutes in duration and record audio continuously. The results were saved to the instrument memory for later download and analysis.

### 3.5 Measurement Parameters

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

- $L_{Aeq}$: is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.
- $L_{A90}$: is the sound level that exceeded 90% of the sample period. It is typically used as a descriptor for background noise.
- $L_{A10}$: is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

- $L_{AFMax}$: is the maximum sound pressure level recorded during the sample period.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing.

All sound levels in this report are expressed in terms of decibels (dB) relative to 2x10-5 Pa.

### 3.6 Monitoring Results

#### 3.6.1 Long Term Survey Results (N1)

The noise data was analysed and complied into average values for Day (07:00- 23:00) and Night (23:00-07:00) periods which are used in the Good Acoustic Design of the development. The full set of results are shown in Appendix C. The $L_{den}$ value is used to assess the Noise Action Plan criteria. The results are given in Table 2 below.

**Table 2: Summary of unattended noise monitoring results**

| Location | $LA_{eq}$ (dB) | $LAF_{90}$ (dB) | $LAF_{10}$ (dB) | $LAF_{max}$ (dB) | Period |
|---|---|---|---|---|---|
| N1 | 55 | 51 | 56 | 73 | Daytime |
| | 48 | 42 | 51 | 65 | Night Time |
| | 59 | 54 | 60 | - | Day-Evening-Night |

The dominated noise was by road traffic on the R445 & Groody Road.

Measured data suggest that $LAF_{max}$ levels did exceed 60 dB at the site during night-time hours. As demonstrated through recorded noise levels at NML1. $LAF_{max}$ levels are not likely to approach 80 dB for all onsite areas of the proposed development within 10 m of the existing roads once constructed. Mitigation measures in section 7.0 are required for this development with regard to potential sleep disturbance.

#### 3.6.2 Short Term Survey Results

Four short term measurement locations were selected as shown in figure 3 and the tables below. These were completed along with the long-term monitoring points.

**Table 3: Baseline Noise Survey at Location No.2**

| Monitoring Location | Period | $L_{Aeq}$dB | $L_{A10}$dB | $L_{A90}$dB | $L_{Amax}$dB |
|---|---|---|---|---|---|
| Location No.2 (Day 19th March 2024) | 09:00 - 09:30 | 54 | 55 | 51 | 71 |
| | 09:30 - 10:00 | 54 | 55 | 51 | 70 |
| | 10:00 - 10:30 | 53 | 54 | 50 | 69 |
| | 10:30 – 11:00 | 54 | 55 | 53 | 70 |
| | 11:00 – 11:30 | 52 | 53 | 49 | 70 |
| | 11:30 – 12:00 | 53 | 54 | 50 | 71 |
| | **Average** | **53** | **54** | **51** | **70** |
| Location No.2 (Night 19th March 2024) | 23:00 – 23:30 | 51 | 52 | 48 | 68 |
| | 23:30 – 00:00 | 50 | 51 | 47 | 67 |
| | **Average** | **51** | **52** | **48** | **68** |

**Table 4: Baseline Noise Survey at Location No.3**

| Monitoring Location | Period | $L_{Aeq}$dB | $L_{A10}$dB | $L_{A90}$dB | $L_{Amax}$dB |
|---|---|---|---|---|---|
| Location No.3 (Day 19th March 2024) | 09:00 - 09:30 | 54 | 55 | 51 | 70 |
| | 09:30 - 10:00 | 53 | 54 | 50 | 70 |
| | 10:00 - 10:30 | 53 | 54 | 50 | 69 |
| | 10:30 – 11:00 | 54 | 55 | 51 | 69 |
| | 11:00 – 11:30 | 52 | 53 | 50 | 69 |
| | 11:30 – 12:00 | 52 | 53 | 49 | 70 |
| | **Average** | **53** | **54** | **50** | **70** |
| Location No.3 (Night 19th March 2024) | 23:00 – 23:30 | 52 | 53 | 50 | 69 |
| | 23:30 – 00:00 | 51 | 52 | 48 | 68 |
| | **Average** | **52** | **53** | **49** | **69** |

**Table 5: Baseline Noise Survey at Location No.4**

| Monitoring Location | Period | $L_{Aeq}$dB | $L_{A10}$dB | $L_{A90}$dB | $L_{Amax}$dB |
|---|---|---|---|---|---|
| Location No.4 (Day 19th March 2024) | 14:00 – 14:30 | 50 | 52 | 48 | 60 |
| | 14:30 - 15:00 | 48 | 50 | 46 | 61 |
| | 15:00 - 15:30 | 48 | 51 | 49 | 62 |
| | 15:30 – 16:00 | 48 | 50 | 50 | 64 |
| | 16:00 – 16:30 | 49 | 51 | 47 | 63 |
| | 16:30 – 17:00 | 49 | 51 | 48 | 62 |
| | **Average** | **49** | **51** | **48** | **62** |
| Location No.4 (Night 19-20th March 2024) | 02:30 – 03:00 | 38 | 40 | 36 | 59 |
| | 03:00 – 03:30 | 40 | 42 | 38 | 59 |
| | **Average** | **39** | **41** | **37** | **59** |

**Table 6: Baseline Noise Survey at Location No.5**

| Monitoring Location | Period | $L_{Aeq}$dB | $L_{A10}$dB | $L_{A90}$dB | $L_{Amax}$dB |
|---|---|---|---|---|---|
| Location No.5 (Day 19th March 2024) | 14:00 – 14:30 | 49 | 51 | 47 | 61 |
| | 14:30 - 15:00 | 48 | 50 | 46 | 63 |
| | 15:00 - 15:30 | 49 | 51 | 47 | 63 |
| | 15:30 – 16:00 | 50 | 52 | 48 | 62 |
| | 16:00 – 16:30 | 49 | 51 | 47 | 60 |
| | 16:30 – 17:00 | 48 | 50 | 46 | 61 |
| | **Average** | **48** | **51** | **47** | **62** |
| Location No.5 (Night 19-20th March 2024) | 02:30 – 03:00 | 37 | 39 | 35 | 58 |
| | 03:00 – 03:30 | 37 | 39 | 35 | 59 |
| | **Average** | **37** | **39** | **35** | **59** |

**Table 7: Baseline Noise Survey (Daytime Summary)**

| Monitoring Location | $L_{Aeq}$dB | $L_{A10}$dB | $L_{A90}$dB | $L_{Amax}$dB |
|---|---|---|---|---|
| Location No.2 | 53 | 54 | 51 | 70 |
| Location No.3 | 53 | 54 | 50 | 70 |
| Location No.4 | 49 | 51 | 48 | 62 |
| Location No.5 | 48 | 51 | 47 | 62 |

**Table 8: Baseline Noise Survey (Night time Summary)**

| Monitoring Location | $L_{Aeq}$dB | $L_{A10}$dB | $L_{A90}$dB | $L_{Amax}$dB |
|---|---|---|---|---|
| Location No.2 | 51 | 52 | 48 | 68 |
| Location No.3 | 52 | 53 | 49 | 69 |
| Location No.4 | 39 | 41 | 37 | 59 |
| Location No.5 | 37 | 39 | 35 | 59 |

The noise climate at the site is dominated by road traffic noise from the R445 and Groody Rd adjacent to the north and east site boundary. During the survey traffic flow on the R445 and Groody Rd was noted as being continuous during the daytime and frequent at night.

## 4.0 ACOUSTIC DESIGN STATEMENT CRITERIA

### 4.1 External Noise Level Criteria

Guideline criteria for external noise levels in the proposed development courtyard areas can be found in both the BS 8233 Guidance on Sound Insulation and Noise Reduction for Buildings and ProPG: Planning & Noise (Professional Guidance on Planning & Noise for New Residential Developments) guidance documents. Both documents state that ambient noise levels in external residential areas should ideally not be above 50 - 55dB LAeq,16hr.

This criteria range is reiterated in ProPG 2017 in 3(ii):
*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.*

Although exceedances of both BS 8233 and ProPG 2017 criteria are naturally not desirable, all of the associated guidance documents recognize that their stated guideline values are not achievable in all instances and that external noise levels in excess of this criteria would not be prohibitive provided additional considerations are made in relation to the development.

From BS 8233:
*It is 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.*

*In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55dB LAeq,T or less might not be possible at the outer edge of these areas but should be achievable in some areas of the space.*

From ProPG documents:
*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.*
*Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:*
*A relatively quiet facade (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 large open balcony in a different, protected, location); and/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, publicly 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).*

Given the above guidance, the following general approach was developed as the development's external noise level strategy in order to provide an acceptable external ambient noise environment:

- The 50 - 55dB(A) LAeq,16hr criteria will be designed for in all courtyard areas where it is practically possible to be achieved.
- A relatively quiet, private external amenity space will be incorporated into the development (in accordance with both ProPG and Limerick County Council's specific request that 'a private outdoor amenity space should be available for residents expected to be exposed to road noise levels above 55dB Lden').
- The façade design of all development buildings will incorporate superior sound insulation glazing / façade elements to achieve a quiet internal acoustic environment that will comply with criteria applicable to low level residential bedroom environments.

### 4.2 Internal Noise Level Criteria

In setting appropriate target internal noise levels, the ProPG 2017 again refers to BS 8233. The BS 8233 recommended noise limits for indoor ambient noise levels in residential dwellings are summarised in Table 9 below.

**Table 9: Summary of recommended internal noise levels from BS 8233 (2014)**

| Activity | Location | Day<br>07:00 to 23:00hrs dB $L_{Aeq}$,16hour | Night<br>23:00 to 07:00hrsdB $L_{Aeq}$,8hour |
|---|---|---|---|
| Resting | Living room | 35 | - |
| Dining | Dining room/area | 40 | - |
| Sleeping (daytime resting) | Bedroom | 35 | 30 |

In order to demonstrate ADS compliance with the ProPG 2017 and BS 8233 internal noise level criteria, the glazing and external façade elements must be designed to ensure that the maximum levels in the above table are achieved throughout the proposed development residential blocks.

## 5.0 NOISE MODELLING RESULTS

In order to assess the expected degree of roadway noise emissions across the full extent of the proposed development site's facades and external areas, a Predictor Environmental Noise Modelling & Mapping acoustic software model was developed based on architectural drawings and geographical information received the Architects. Once the geographical and architectural aspects of the modelling were completed, the model was 'calibrated' based on the results of the noise monitoring surveys in order to ensure an accurate representation of the traffic noise level emissions was obtained.

The Predictor model was then used to assess the noise emissions from the roads across the subject site for each of the quantities of interest (i.e. $L_{den}$ & $L_{night}$,). The results of these modelling assessments are plotted and discussed in the following sections.

### 5.1 Noise Limits at Noise Sensitive Locations

To help illustrate the noise propagation across the site, colour noise maps for day, night-time and Lden periods presented in Figure below. The R445 and Groody Road to the north and east boundary of the site is the dominant noise on the proposed site. The assessment has review details of the road noise and has included it within the models. A 2.5m high soil berms is to be installed between the site and roads with is included within the proposed models. The external roof plant with acoustic louvres is also included with in proposed model (see section 7.3).

**Figure 4. Noise for Existing Daytime Period**

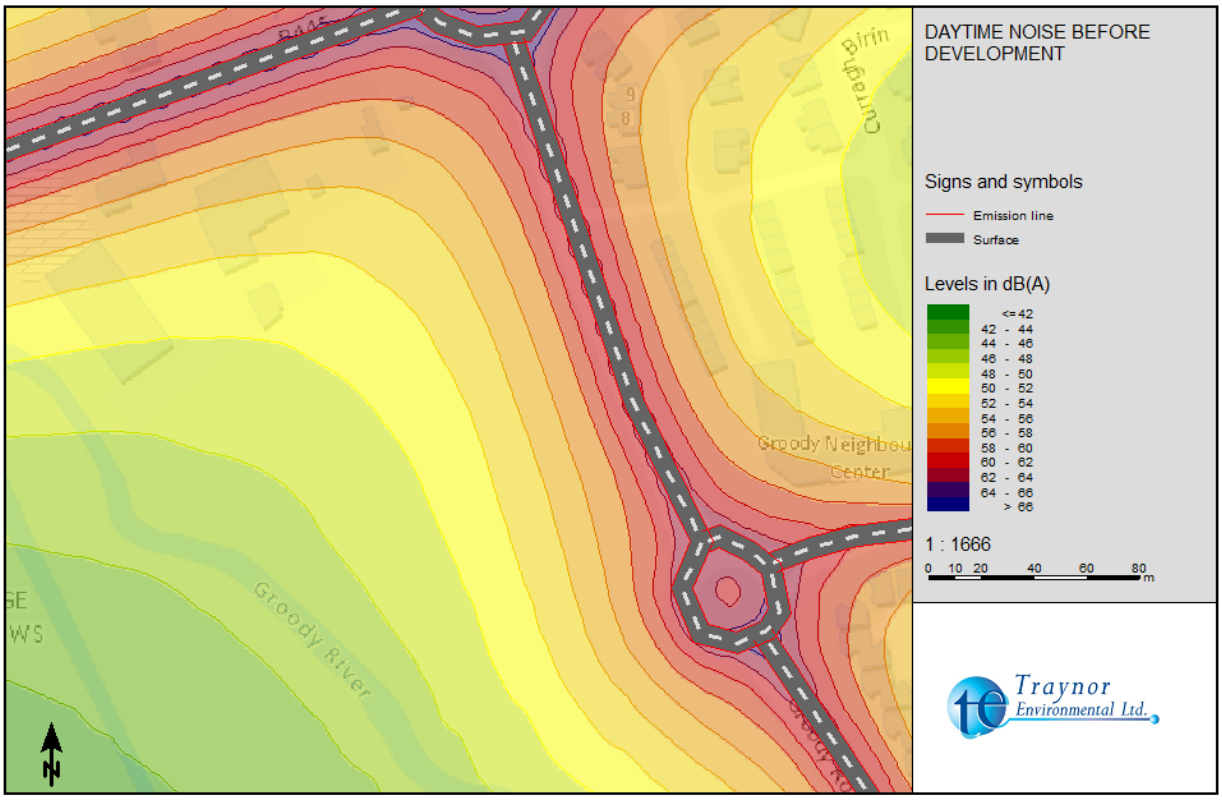


**Figure 5. Noise for Existing Night Time Period**

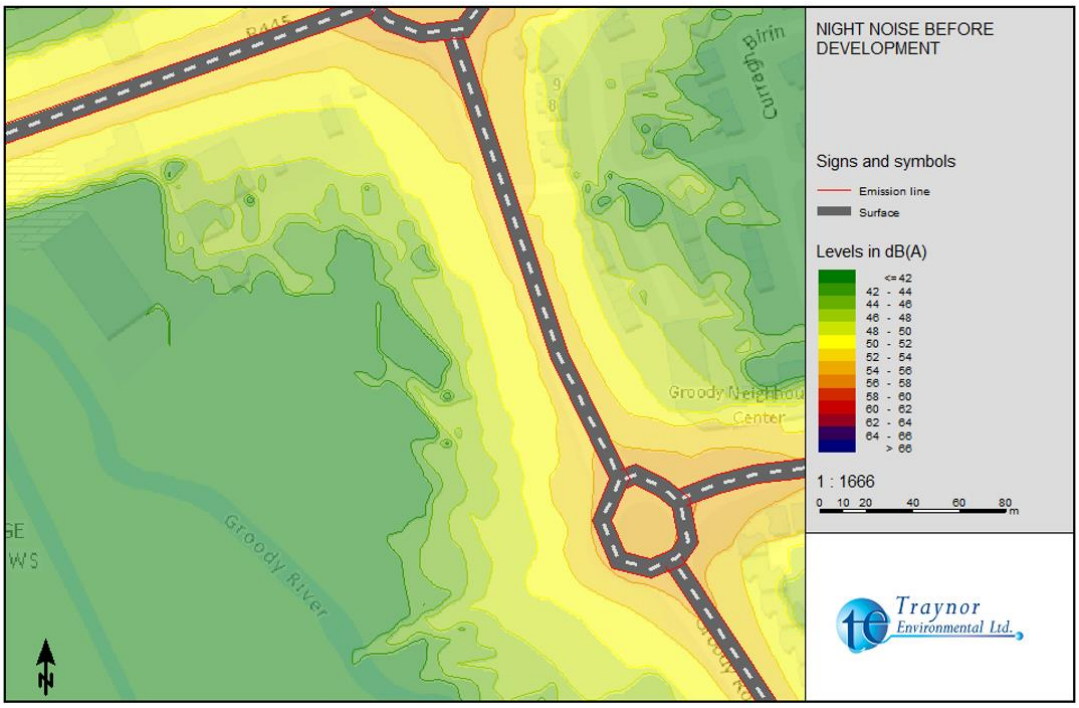



**Figure 6. Noise for Proposed Day-Time Period with Development Built**

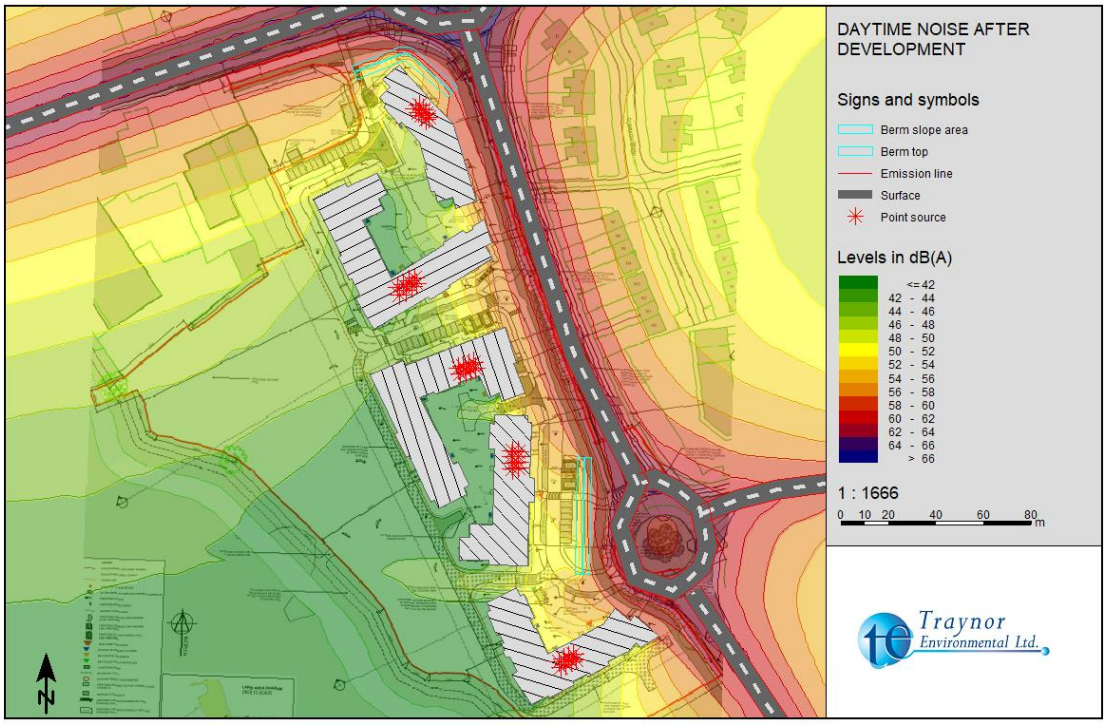


**Figure 7. Noise For Proposed Night Period with Development Built**

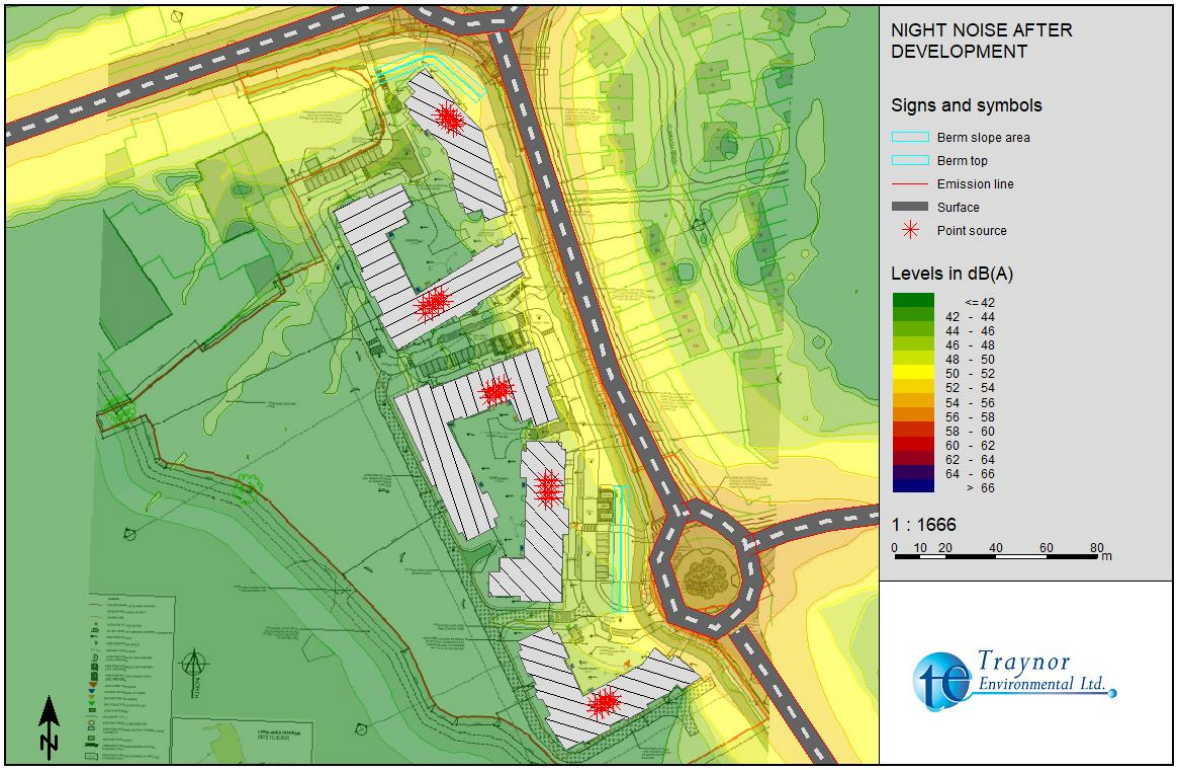
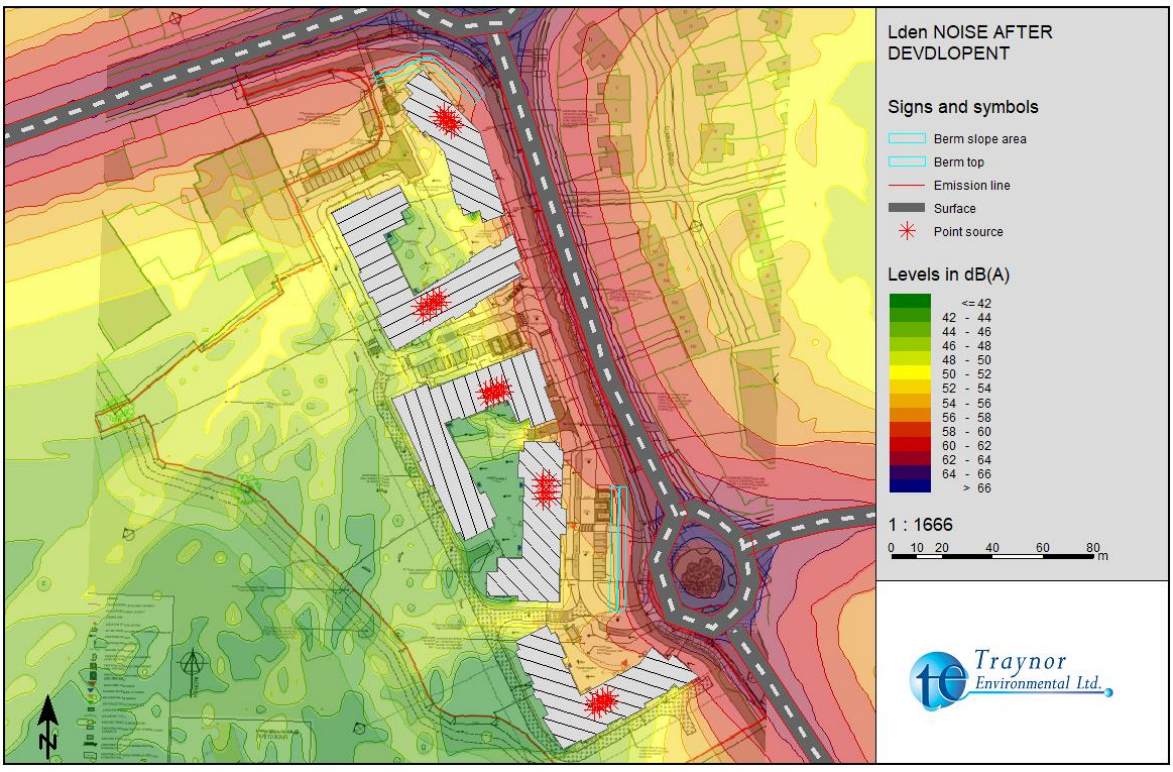



**Figure 8. Noise for Proposed $L_{den}$ period with Development Built**



## 5.2 Predictor Model Table Results

**Table 10 (A) : Predictor Noise Modelling Results Summary**

| Block | Façade | Floor | Day time $LA_{eq}$, 16hr | Night Time $LA_{eq}$, 8hr | $L_{den}$ |
|---|---|---|---|---|---|
| A | North | Ground | 56 | 50 | 58 |
| | | 1st | 61 | 53 | 63 |
| | | 2nd | 62 | 53 | 63 |
| | | 3rd | 62 | 54 | 64 |
| | | 4th | 62 | 54 | 64 |
| | | 5th | 62 | 54 | 64 |
| | | 6th | 62 | 54 | 63 |
| | | 7th | 62 | 54 | 63 |
| | East | Ground | 57 | 51 | 60 |
| | | 1st | 60 | 53 | 62 |
| | | 2nd | 61 | 54 | 63 |
| | | 3rd | 61 | 54 | 63 |
| | | 4th | 61 | 54 | 63 |
| | | 5th | 61 | 54 | 63 |
| | | 6th | 61 | 54 | 63 |
| | | 7th | 61 | 54 | 63 |
| | South | Ground | 54 | 49 | 57 |
| | | 1st | 56 | 49 | 58 |
| | | 2nd | 56 | 50 | 59 |
| | | 3rd | 56 | 50 | 59 |
| | | 4th | 56 | 50 | 59 |
| | | 5th | 56 | 50 | 59 |
| | | 6th | 56 | 50 | 58 |
| | | 7th | 56 | 50 | 58 |
| | West | Ground | 49 | 46 | 53 |
| | | 1st | 51 | 47 | 55 |
| | | 2nd | 52 | 47 | 56 |
| | | 3rd | 52 | 48 | 56 |
| | | 4th | 53 | 48 | 56 |
| | | 5th | 53 | 48 | 56 |
| | | 6th | 53 | 48 | 56 |
| | | 7th | 54 | 48 | 57 |
| B | North | Ground | 52 | 47 | 55 |
| | | 1st | 53 | 48 | 56 |
| | | 2nd | 55 | 49 | 57 |

| | | | | | |
|---|---|---|---|---|---|
| | | 3rd | 55 | 49 | 58 |
| | | 4th | 55 | 50 | 58 |
| | | 5th | 56 | 50 | 58 |
| | | 6th | 56 | 50 | 58 |
| | East | Ground | 58 | 51 | 60 |
| | | 1st | 60 | 52 | 61 |
| | | 2nd | 60 | 52 | 61 |
| | | 3rd | 60 | 52 | 61 |
| | | 4th | 60 | 52 | 61 |
| | | 5th | 60 | 52 | 61 |
| | | 6th | 60 | 52 | 61 |
| | South | Ground | 50 | 39 | 50 |
| | | 1st | 51 | 40 | 52 |
| | | 2nd | 52 | 40 | 52 |
| | | 3rd | 52 | 41 | 53 |
| | | 4th | 53 | 41 | 53 |
| | | 5th | 53 | 42 | 54 |
| | | 6th | 53 | 42 | 54 |
| | West | Ground | 44 | 42 | 49 |
| | | 1st | 47 | 44 | 51 |
| | | 2nd | 48 | 45 | 52 |
| | | 3rd | 48 | 45 | 53 |
| | | 4th | 49 | 45 | 53 |
| | | 5th | 49 | 43 | 52 |
| | | 6th | 49 | 43 | 52 |
| C | North | Ground | 50 | 39 | 50 |
| | | 1st | 51 | 40 | 52 |
| | | 2nd | 52 | 40 | 52 |
| | | 3rd | 52 | 41 | 53 |
| | | 4th | 53 | 41 | 53 |
| | | 5th | 53 | 42 | 54 |
| | East | Ground | 59 | 52 | 61 |
| | | 1st | 61 | 53 | 62 |
| | | 2nd | 61 | 53 | 63 |
| | | 3rd | 62 | 53 | 63 |
| | | 4th | 62 | 53 | 63 |
| | | 5th | 61 | 54 | 63 |
| | South | Ground | 31 | 26 | 34 |
| | | 1st | 32 | 26 | 34 |
| | | 2nd | 33 | 26 | 35 |
| | | 3rd | 34 | 27 | 36 |
| | | 4th | 35 | 28 | 37 |

| | | | | | |
|---|---|---|---|---|---|
| | | 5th | 37 | 29 | 39 |
| | West | Ground | 41 | 38 | 45 |
| | | 1st | 43 | 39 | 46 |
| | | 2nd | 43 | 39 | 47 |
| | | 3rd | 44 | 40 | 48 |
| | | 4th | 45 | 40 | 48 |
| | | 5th | 45 | 40 | 48 |
| D | North | Ground | 53 | 48 | 56 |
| | | 1st | 55 | 49 | 57 |
| | | 2nd | 55 | 49 | 58 |
| | | 3rd | 56 | 50 | 58 |
| | | 4th | 56 | 50 | 58 |
| | | 5th | 56 | 50 | 58 |
| | East | Ground | 52 | 48 | 56 |
| | | 1st | 56 | 51 | 59 |
| | | 2nd | 58 | 52 | 60 |
| | | 3rd | 59 | 52 | 61 |
| | | 4th | 59 | 53 | 61 |
| | | 5th | 59 | 52 | 61 |
| | South | Ground | 47 | 43 | 50 |
| | | 1st | 49 | 44 | 52 |
| | | 2nd | 50 | 45 | 53 |
| | | 3rd | 50 | 45 | 53 |
| | | 4th | 51 | 46 | 54 |
| | | 5th | 51 | 46 | 54 |
| | West | Ground | 34 | 35 | 44 |
| | | 1st | 34 | 35 | 43 |
| | | 2nd | 35 | 35 | 42 |
| | | 3rd | 36 | 35 | 41 |
| | | 4th | 37 | 36 | 41 |
| | | 5th | 39 | 37 | 41 |
| E | North | Ground | 45 | 42 | 50 |
| | | 1st | 47 | 44 | 52 |
| | | 2nd | 50 | 46 | 53 |
| | | 3rd | 51 | 47 | 54 |
| | | 4th | 52 | 47 | 55 |
| | East | Ground | 61 | 54 | 63 |
| | | 1st | 62 | 54 | 64 |
| | | 2nd | 63 | 55 | 64 |
| | | 3rd | 63 | 55 | 64 |
| | | 4th | 63 | 55 | 64 |
| | South | Ground | 61 | 54 | 63 |

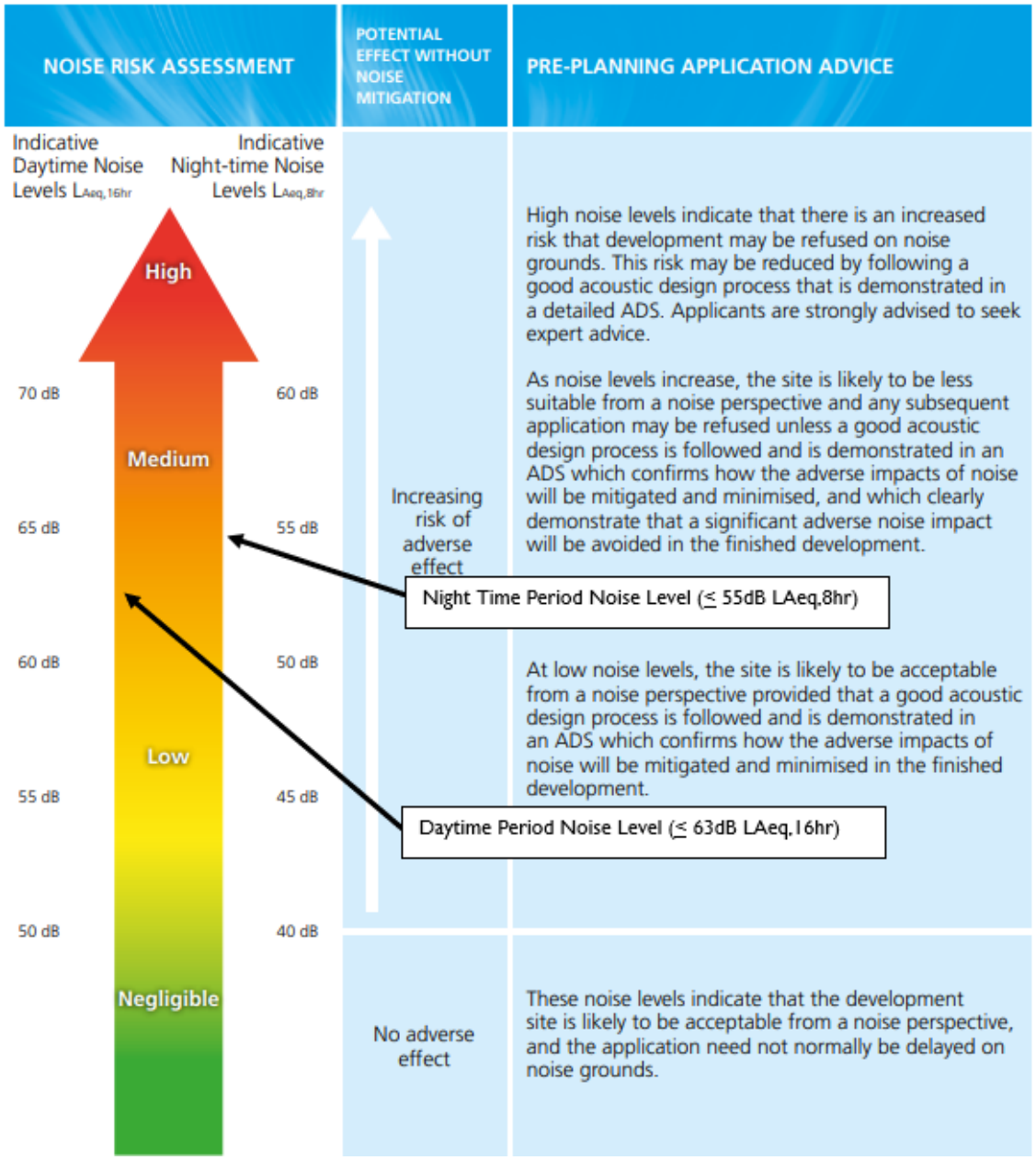
| | | | | | |
|---|---|---|---|---|---|
| | | 1st | 62 | 54 | 64 |
| | | 2nd | 63 | 55 | 64 |
| | | 3rd | 63 | 55 | 64 |
| | | 4th | 63 | 55 | 64 |
| | West | Ground | 39 | 34 | 42 |
| | | 1st | 41 | 34 | 43 |
| | | 2nd | 42 | 34 | 43 |
| | | 3rd | 42 | 35 | 44 |
| | | 4th | 43 | 35 | 45 |

## 6.0 INITIAL SITE NOISE RISK ASSESSMENT (ADS STAGE 1)

In order to provide a preliminary indication of the likely risk of adverse effects from external noise prior to consideration for provision of noise mitigation, a comparison is carried out between the average noise levels measured during the daytime and night time periods against noise risk assessment indicators detailed in the ProPG 2017.

The results of this comparison are detailed in Figure 9 below.

**Figure 9: ProPG 2017 - Stage 1 Initial Noise Risk Assessment for Proposed Development**




The specific magnitude ranges for each of the development block floors are listed in Table 10 on the following page.

**Table 10 (B) : ADS Stage 1 Magnitude Summary**

| Block | Facade | Floor | ADS Stage 1 Magnitude |
|---|---|---|---|
| A | North | Ground | Low |
| | | 1st | Low |
| | | 2nd | Medium |
| | | 3rd | Medium |
| | | 4th | Medium |
| | | 5th | Medium |
| | | 6th | Medium |
| | | 7th | Medium |
| | East | Ground | Medium |
| | | 1st | Medium |
| | | 2nd | Medium |
| | | 3rd | Medium |
| | | 4th | Medium |
| | | 5th | Medium |
| | | 6th | Medium |
| | | 7th | Medium |
| | South | Ground | Low |
| | | 1st | Low |
| | | 2nd | Medium |
| | | 3rd | Medium |
| | | 4th | Medium |
| | | 5th | Medium |
| | | 6th | Medium |
| | | 7th | Medium |
| | West | Ground | Low |
| | | 1st | Low |
| | | 2nd | Low |
| | | 3rd | Low |
| | | 4th | Low |
| | | 5th | Low |
| | | 6th | Low |
| | | 7th | Low |
| B | North | Ground | Low |
| | | 1st | Low |
| | | 2nd | Low |
| | | 3rd | Low |
| | | 4th | Low |
| | | 5th | Low |

| | | | |
|---|---|---|---|
| | | 6th | Low |
| | East | Ground | Low |
| | | 1st | Medium |
| | | 2nd | Medium |
| | | 3rd | Medium |
| | | 4th | Medium |
| | | 5th | Medium |
| | | 6th | Medium |
| | South | Ground | Low |
| | | 1st | Low |
| | | 2nd | Low |
| | | 3rd | Low |
| | | 4th | Low |
| | | 5th | Low |
| | | 6th | Low |
| | West | Ground | Negligible |
| | | 1st | Negligible |
| | | 2nd | Negligible |
| | | 3rd | Negligible |
| | | 4th | Negligible |
| | | 5th | Negligible |
| | | 6th | Negligible |
| C | North | Ground | Low |
| | | 1st | Low |
| | | 2nd | Low |
| | | 3rd | Low |
| | | 4th | Low |
| | | 5th | Low |
| | East | Ground | Low |
| | | 1st | Medium |
| | | 2nd | Medium |
| | | 3rd | Medium |
| | | 4th | Medium |
| | | 5th | Medium |
| | South | Ground | Negligible |
| | | 1st | Negligible |
| | | 2nd | Negligible |
| | | 3rd | Negligible |
| | | 4th | Negligible |
| | | 5th | Negligible |
| | West | Ground | Negligible |
| | | 1st | Negligible |

| | | | |
|---|---|---|---|
| | | 2nd | Negligible |
| | | 3rd | Low |
| | | 4th | Low |
| | | 5th | Low |
| D | North | Ground | Low |
| | | 1st | Low |
| | | 2nd | Low |
| | | 3rd | Medium |
| | | 4th | Medium |
| | | 5th | Medium |
| | East | Ground | Medium |
| | | 1st | Medium |
| | | 2nd | Medium |
| | | 3rd | Medium |
| | | 4th | Medium |
| | | 5th | Medium |
| | South | Ground | Low |
| | | 1st | Low |
| | | 2nd | Medium |
| | | 3rd | Medium |
| | | 4th | Medium |
| | | 5th | Medium |
| | West | Ground | Negligible |
| | | 1st | Negligible |
| | | 2nd | Negligible |
| | | 3rd | Negligible |
| | | 4th | Negligible |
| | | 5th | Negligible |
| E | North | Ground | Low |
| | | 1st | Low |
| | | 2nd | Medium |
| | | 3rd | Medium |
| | | 4th | Medium |
| | East | Ground | Medium |
| | | 1st | Medium |
| | | 2nd | Medium |
| | | 3rd | Medium |
| | | 4th | Medium |
| | South | Ground | Medium |
| | | 1st | Medium |
| | | 2nd | Medium |
| | | 3rd | Medium |

| | | | |
|---|---|---|---|
| | | 4th | Medium |
| | West | Ground | Negligible |
| | | 1st | Low |
| | | 2nd | Low |
| | | 3rd | Low |
| | | 4th | Low |

Overall, the noise level ranges of ≤ 63dB LAeq,16hr for daytime periods and ≤ 55dB LAeq,8hr for night time periods would mostly lie in the 'Negligible' and 'Low' magnitude ranges. Ambient noise levels in these ranges indicate that the site is 'likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and demonstrated'. Given that the noise levels were exclusively controlled by road traffic noise which is fairly constant and at a reasonable level across all time periods, only a minimal degree of mitigation measures should be required for most of the development facades in order for the ADS to confirm an acceptable level of noise levels across the entire development.

There were some results (on facades that face the Groody road and R445) that were in the 'Medium' magnitude range which confirms that traffic noise will need to be appropriate addressed at these locations and that upgraded mitigation measures will be required to ensure that internal noise levels comply with the established criteria.

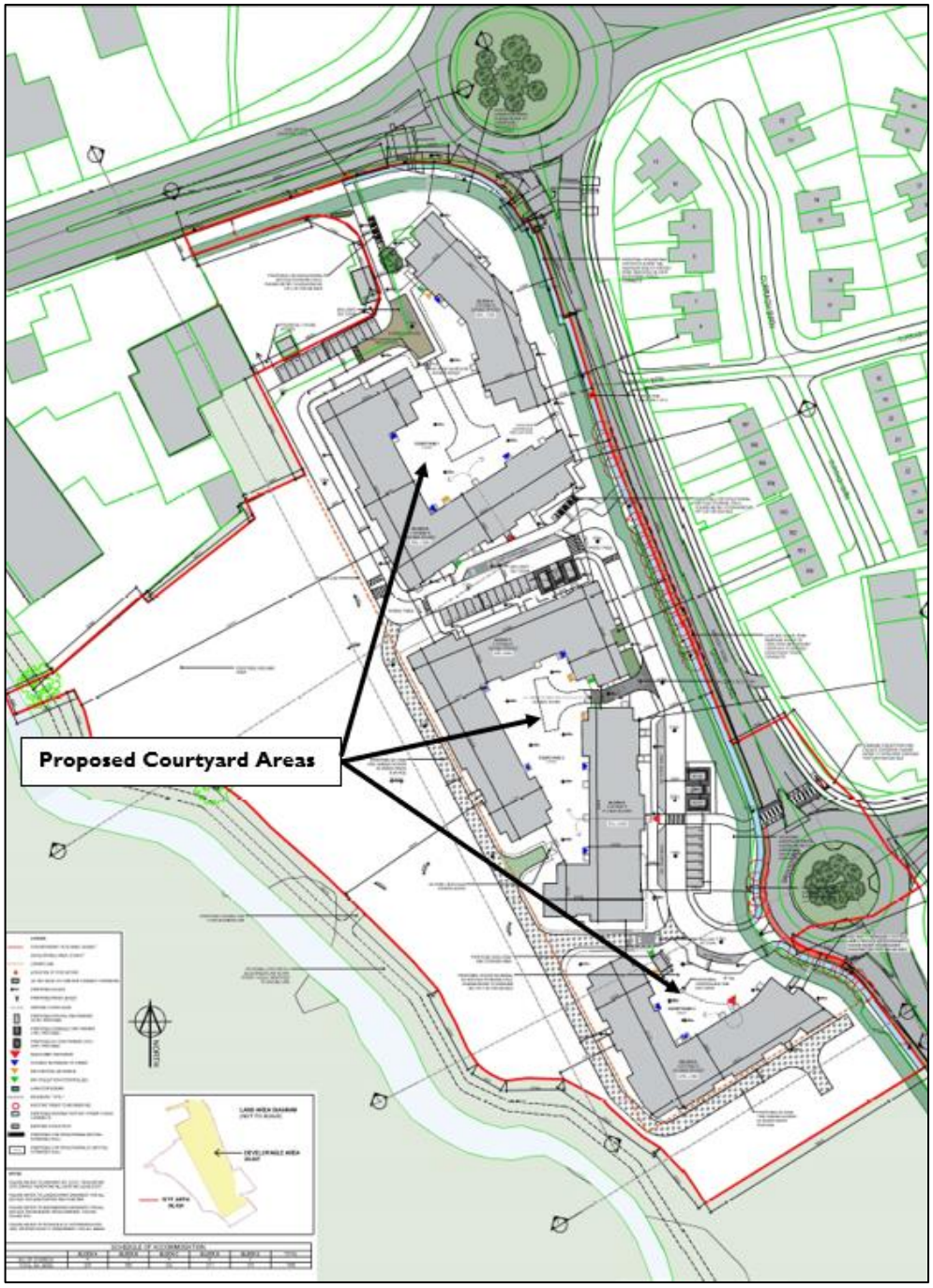
The mitigation measures that were determined as being required in this instance are discussed in detail in the following ADS Stage 2 sections.

## 7.0 EXTERNAL AREA ACOUSTIC DESIGN ASSESSMENT (ADS STAGE 2)

### 7.1 Private Amenity Areas

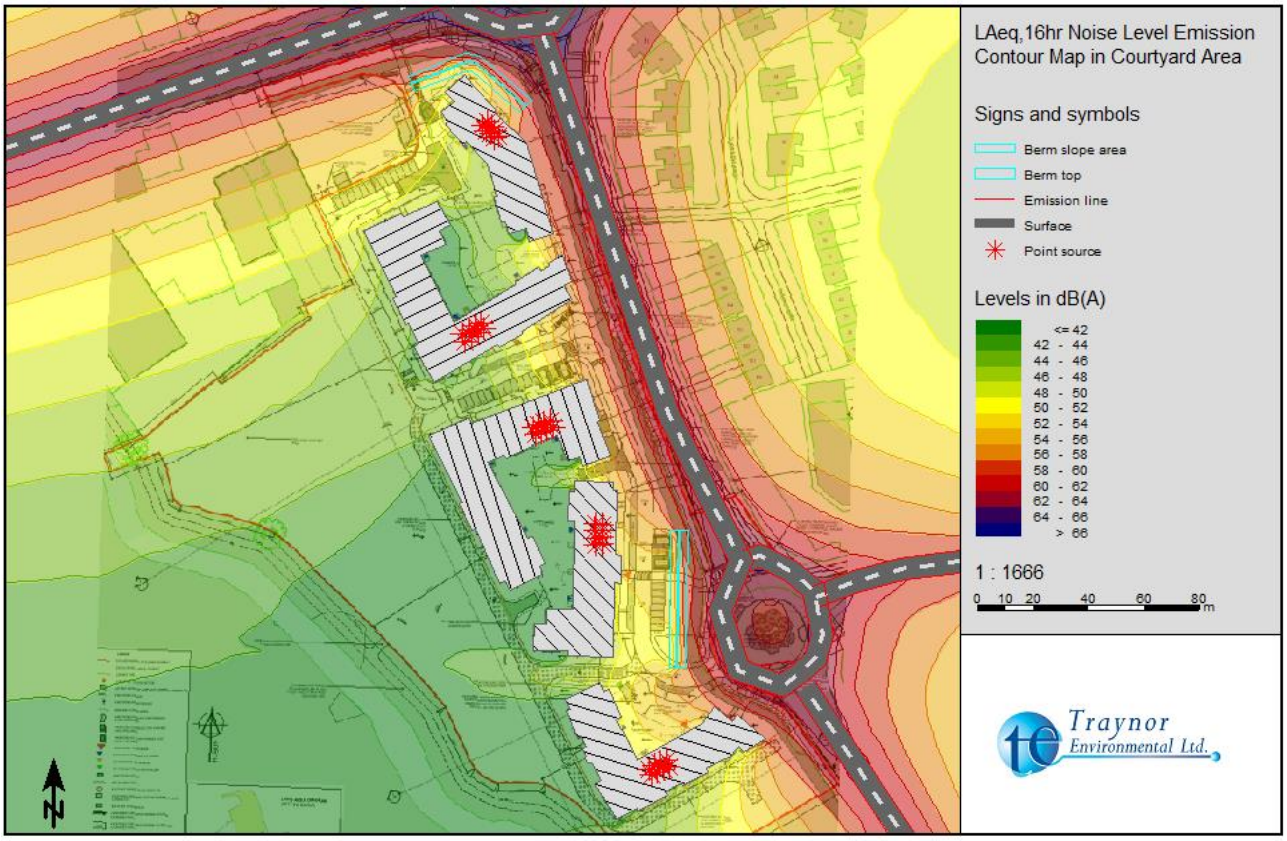
There are Courtyard areas planned for the proposed development. This area are located near the centre of the development and are appropriately shielded from all adjacent roadways by the proposed development residential blocks.

**Figure 10 : Proposed Courtyard Amenity Spaces Location**



A Predictor modelling results noise contour map showing the LAeq,16hr noise emissions in the vicinity of the Courtyard areas is provided in Figure 11 below.

**Figure 11 : LAeq,16hr Noise Level Emission Contour Map in Courtyard Area**




As can be seen in Figure 10, the LAeq,16hr noise levels in the courtyard areas are estimated as being in the range summarised in Table below.

**Figure 12. Proposed Development Courtyard Area Locations**

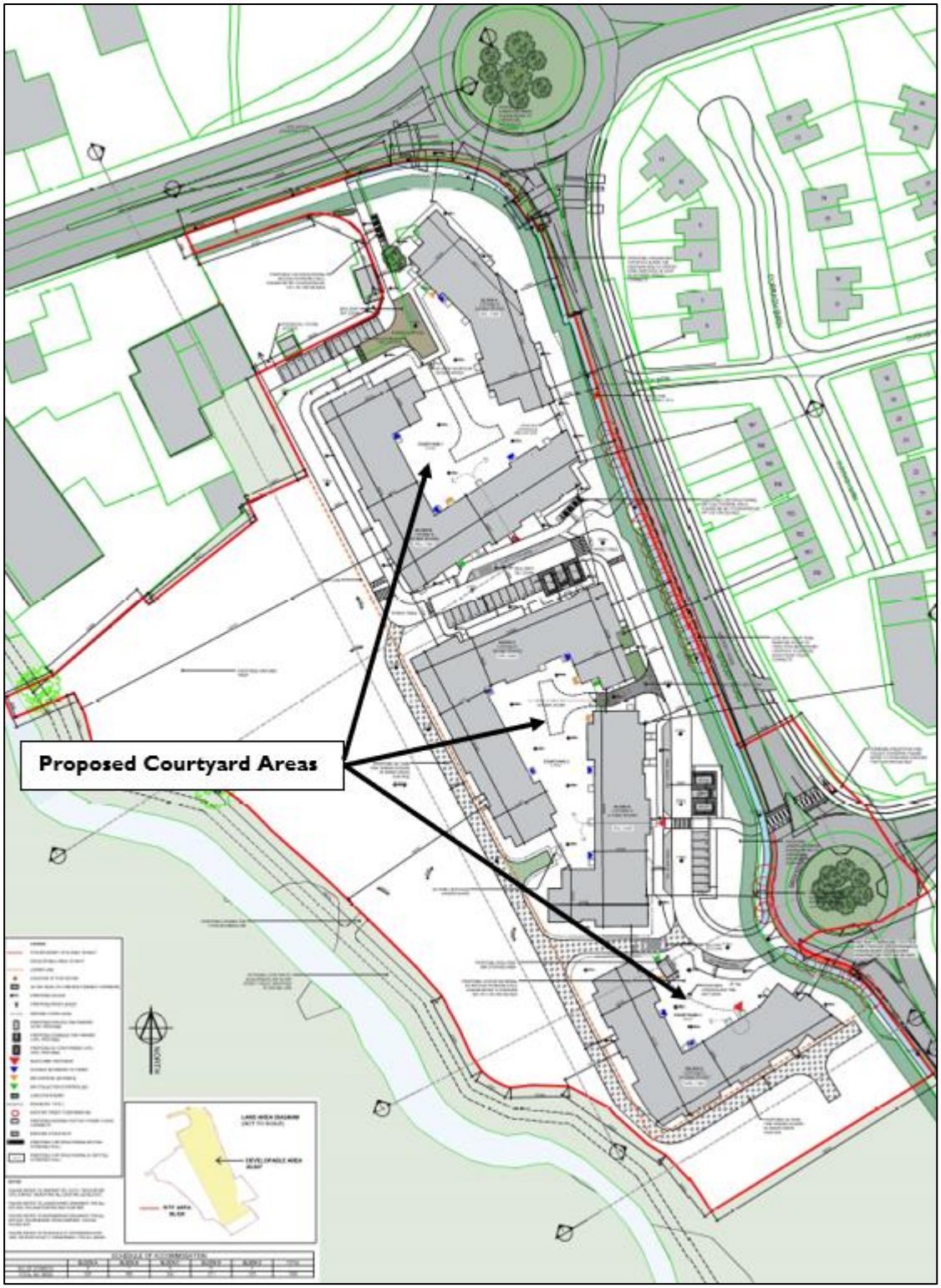


**Table 11 : Courtyard Areas Predicted Noise Level Ranges**

| Location | dB LAeq,16hr |
|---|---|
| Courtyard Areas | 43 - 53 |

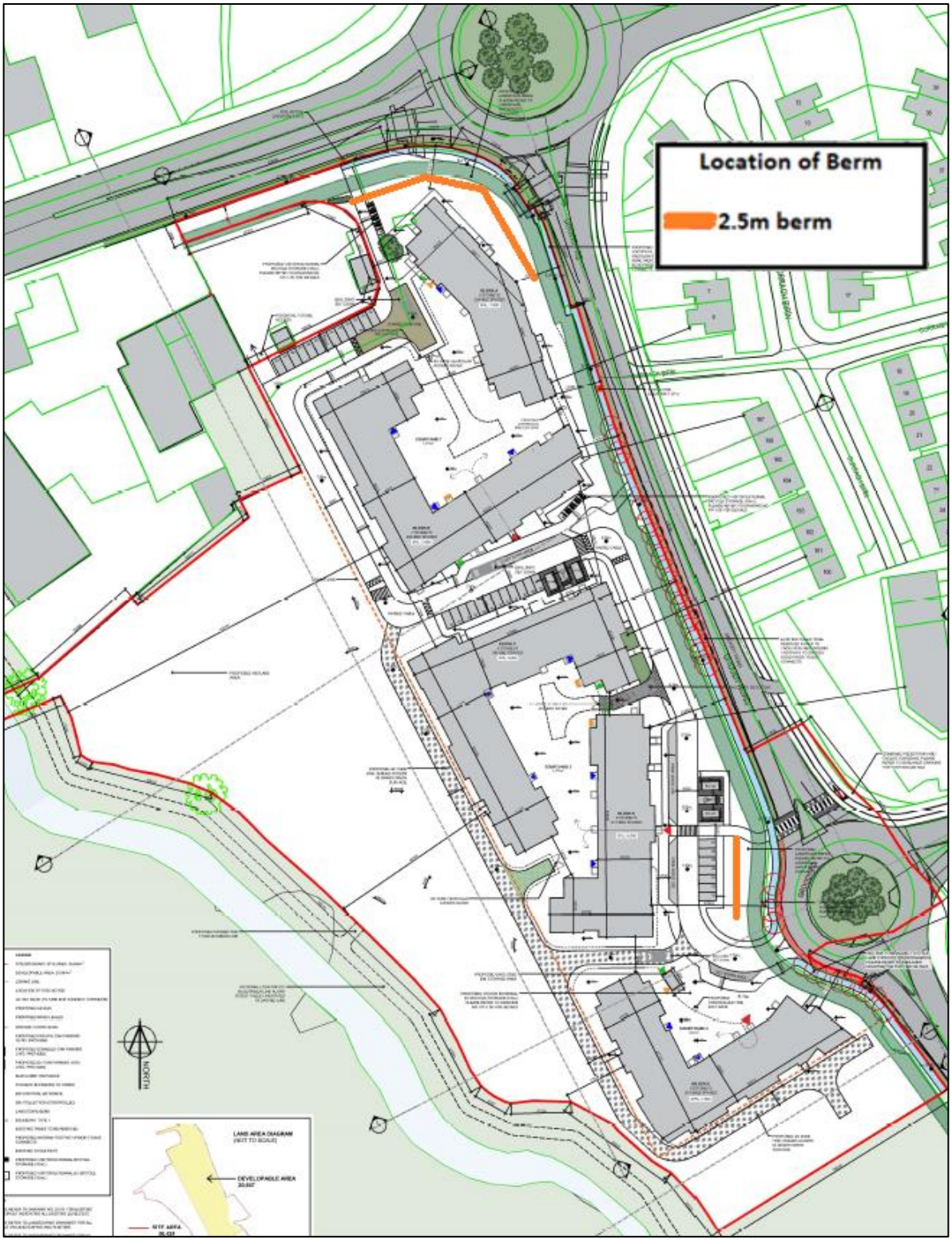
The predicted Courtyard Areas noise level range of 43 - 53dB dB LAeq,16hr is below the ProPG 2017 recommended maximum criteria range of 50 - 55dB LAeq,16hr and would therefore be considered acceptable in this instance.
It should also be noted that the majority of the proposed development ground level external areas is ≤ 55dB LAeq,16hr and would therefore be consistent with the ProPG 2017 criteria. Only the areas immediately next to the Groody road and R445 road would be above this level.
No further mitigation measures would therefore be required in respect of the proposed development's private amenity areas.

### 7.2 External Area Noise Recommended Mitigation Measures

Based on our assessment, an additional noise mitigation measure that was deemed as being required in respect of external area noise levels in this instance is a 2.5m high soil berms to be installed between the site and roads. The 2.5m high soil berms will provide sufficient shielding of the development's external areas.

The R445 and Groody Road to the north and east boundary of the site is the dominant noise on the proposed site. The assessment has review details of the road noise and has included it within the models.

**Figure 13. 2.5m High Soil Berms**



### 7.3 External Mechanical Services Plant Screening

It is expected that the principal items of building and mechanical services plant will be associated with the proposed development. They will be designed and located so that there is no negative impact on sensitive receivers within the development itself. The services plant will be designed/attenuated to meet the relevant plant noise criteria for day and night-time periods at nearby sensitive receivers.

According to CSD Engineering Limited Services Planning Stage mechanical plant servicing each block will be located on the ground floor and on the roof of each block. The plantroom is proposed to be located at ground level of with external access to cater for maintenance access. In general, all wall constructions, i.e., block work or concrete, offer a high degree of sound insulation. Therefore, noise escape via the wall construction will be minimal. The calculated internal noise levels across the building façade have assumed a minimum sound reduction index of 45dB Rw for this construction.

There are no significant sources of vibration associated with the operational phase are expected. The external mechanical services plant on the roof have been model in the proposed daytime and night time model of the development with the mitigation measures.

The base model has included the provision of a 18dB reduction acoustic louvres to the perimeter of the external mechanical services plant. The acoustic louvres will be lined on the internal plant side with an absorbent facing to reduce reverberant noise build up in this space. The 18dB reduction acoustic louvres are shown in appendix D.

## 8.0 INTERNAL AREA ACOUSTIC DESIGN ASSESSMENT (ADS STAGE 2)

It was determined during our external noise level assessment that external noise levels will be in the range of 34 - 63dB(A) LAeq,16hr during daytime periods and 28 - 55dB LAeq,8hr during night time periods at the various development apartment block building facades once constructed. These noise levels are considered in developing the required mitigation for each external façade element in the following sections.

### 8.1 External Façade / Roof Constructions

The required minimum external wall and roof construction sound insulation performance requirements for each development block were determined based on the predicted noise level ranges and are summarised in Table 12 below.

**Table 12. External Roof / Façade Minimum Sound Insulation Performance Specifications**

| Block | Roof | Facade | Daytime LAeq, 16hr |
|---|---|---|---|
| **A** | 45 dB Rw | All | 50 dB Rw |
| **B** | 45 dB Rw | All | 50 dB Rw |
| **C** | 45 dB Rw | All | 50 dB Rw |
| **D** | 45 dB Rw | All | 50 dB Rw |
| **E** | 45 dB Rw | All | 50 dB Rw |

The proposed external wall construction should provide a sound insulation performance in the range of 57 - 59dB Rw and would therefore be sufficient to reduce external noise levels to well below the established internal noise level criteria within each development block.

The proposed roof construction should provide a minimum sound insulation performance in the range of 59 - 60dB Rw and would therefore be sufficient to reduce external noise levels to well below the established internal noise level criteria within each development block.

### 8.2 External Glazing Constructions

Given that there will be a range of external noise levels on the various facades of the proposed development blocks due to both their distance and orientation to the adjacent roadways, it would therefore be considered prudent to provide a different range of noise reduction specifications for the glazing elements on each façade. Based on the predicted external noise levels predicted at each block façade with the development in place, two recommended minimum glazing specifications were deemed as being required in this instance. These specifications are summarised in Table below.

**Table 13. Development Building Glazing Sound Insulation Performance Requirements, SRI (dB)**

| Glazing Type | Octave Band Centre Frequency (Hz) | | | | | | dB Rw | Indicative Glazing Configuration |
|---|---|---|---|---|---|---|---|---|
| | 125 | 250 | 500 | 1k | 2k | 4k | | |
| **1** | 20 | 22 | 30 | 38 | 35 | 35 | 32 | 6mm glass - 12mm air space - 8mm glass |
| **2** | 27 | 29 | 36 | 41 | 42 | 42 | 40 | 6mm glass - 12mm air space - 10mm laminate glass |

**Table 14. External Glazing Minimum Specifications**

| Block | Facade | External Glazing Minimum Specification |
|---|---|---|
| A | North | 2 |
| | East | 2 |
| | South | 2 |
| | West | 1 |
| B | North | 1 |
| | East | 2 |
| | South | 1 |
| | West | 1 |
| C | North | 1 |
| | East | 2 |
| | South | 1 |
| | West | 1 |
| D | North | 2 |
| | East | 2 |
| | South | 2 |
| | West | 1 |
| E | North | 2 |
| | East | 2 |
| | South | 2 |
| | West | 1 |

It should be noted that the performance values detailed in Table 14 are the basis of the assessment and that the configurations detailed are merely typical examples which can be expected to afford these performance values. Alternative products with an equivalent or better performance would also provide sufficient sound insulation ; however, glazing thicknesses of individual panes should not be similar to each other in order to avoid unwanted resonance dips that occur in the critical traffic noise frequency range.

For operable windows, the proposed framing design will need to be acoustically reviewed during the design stage and acoustic treatment may be required. At a minimum, operable windows would need to incorporate compressible gasket seals to the full perimeter of the frame and any sliding windows will need to be installed in a rebated frame and sealed so that no gaps exist around the perimeter when closed.

Acoustic test data should be obtained from the façade supplier to confirm that all primary window and external door constructions to be supplied perform to the required acoustic specification as given above. If acoustical performance data is not available for any of the specific systems, then it must be provided in accordance with the following details :

- The performance requirements shall be obtained from laboratory measurements obtained in accordance with ISO 140-3 : 1995 "Measurement of sound insulation in buildings and of building elements" and weighted in accordance with ISO 717-1: 1997 "Acoustics - Rating of sound insulation in buildings and of building elements - Part 1 : Airborne sound insulation".

- Laboratory measurements shall be obtained from an independent acoustic test laboratory accredited by a recognized body and shall be a fully representative part of the system including associated framing / support systems / seals.

- Ratings / measurements obtained in accordance with other equivalent standards may be permitted but should be submitted to the client representative for approval.

- The Trade Contractor shall provide Tender test certificates demonstrating compliance with the specified acoustic performance for the products offered. Failing this, the Trade Contractor shall allow for the expense of such necessary testing as demonstrating compliance with the specification. The tests shall be carried out at an independent acoustic test laboratory approved by a recognized acoustic institution.

### 8.3 Trickle Vents

In addition to provision of appropriate glazing provisions, it is also important that the sound insulation performance of the trickle vents do not significantly compromise the integrity of the window performance. Provision should therefore be made for provision of acoustic trickle vents in development block façades that achieve the minimum sound reduction values listed in Table 15 below based on the façade's corresponding glazing specification.

**Table 15: Trickle Vent Minimum Sound Insulation Performance Specifications**

| Glazing Specification | Minimum Trickle Vent Sound Insulation Performance in Open Position (dB Dn,e,w) |
|---|---|
| 1 | 25dB |
| 2 | 30dB |

Acoustic test data should be obtained from the façade supplier to confirm that all constructions supplied perform to the required acoustic specifications as given above. If acoustical performance data is not available for any of the specific systems, then it must be provided in accordance with the details provided in Section 8.2.

### 8.4 Partially Opened Window Assessment

It should be emphasised from the outset of this section that BS 8233 internal ambient noise criteria is not meant to be prohibitive for residential developments if it is not achieved for an open window condition. Exceedance of the criteria during open window conditions is actually the very purpose for the specification of upgraded glazing constructions, façade constructions and acoustic trickle vents. If the BS 8233 criteria cannot be achieved with an open window condition, mitigation measures and / or mechanical ventilation is then provided to ensure that the dwelling / apartment has both ample ventilation and appropriate internal ambient noise levels.

Notwithstanding the above, an analysis was conducted of the predicted night time noise levels (worst case condition when residents are sleeping) in accordance with specific Limerick County Council instruction.

For the purposes of this assessment, it is necessary to estimate internal noise levels based on the predicted external façade night time period noise levels (summarised in Table 9). This is done by factoring in a degree of noise reduction afforded by an open window. BS 8233 recommends a correction of 15dB for an open window. However, an additional attenuation of between 1 - 10dB is obtained for a partially opened window (depending on how 'partially' it is opened). For the sake of this

assessment, we will apply an average additional attenuation of 5dB and, therefore, a total overall attenuation of 20dB for a partially opened window in this instance.

Applying this 20dB partially opened window attenuation reduction to the predicted external façade night time period noise levels summarised in Table 10 results in the following estimated internal noise levels (refer to Table below).

**Table 16. Within BS 8233 Criteria Range**

| Block | Facade | Predicted External Night Time Noise Level (dB LAeq, 8hr) | Predicted Internal Night Time Noise Level (dB LAeq, 8hr) | Within BS 8233 Criteria Range |
|---|---|---|---|---|
| A | North | 50-54 | 30-34 | Marginal |
| | East | 51-54 | 31-34 | × |
| | South | 49-50 | 29-30 | ✓ |
| | West | 46-48 | 26-28 | ✓ |
| B | North | 47-50 | 27-30 | ✓ |
| | East | 51-52 | 31-32 | Marginal |
| | South | 39-42 | 19-22 | ✓ |
| | West | 42-45 | 22-25 | ✓ |
| C | North | 39-42 | 19-22 | ✓ |
| | East | 52-54 | 32-34 | × |
| | South | 26-29 | 6-9 | ✓ |
| | West | 38-40 | 18-20 | ✓ |
| D | North | 48-50 | 28-30 | ✓ |
| | East | 48-53 | 28-33 | Marginal |
| | South | 43-46 | 23-26 | ✓ |
| | West | 35-37 | 15-17 | ✓ |
| E | North | 42-47 | 22-27 | ✓ |
| | East | 54-55 | 34-35 | × |
| | South | 54-55 | 34-35 | × |
| | West | 34-35 | 14-15 | ✓ |

As can be seen from the results in Table above, the predicted internal noise levels during a partially opened window condition would comply with the BS 8233 internal criteria in almost all development block locations. There are a few areas on the Block A,C,E east and south façades that exceed the 30dB LAeq,8hr BS 8233 criterion by 5dB; This 1 - 6dB(A) excess would not be considered significant as discussed previously in this section, acoustic trickle vent recommendations detailed in Section 8.3 are provided to ensure that the development apartments can be properly ventilated whilst still ensuring that BS 8233 noise levels are achieved internally.

In the event that further mitigation measures are deemed as being required by the council in respect of this open window condition, the most prudent and effective option would be to just provide non-operable windows and introduce supplemental mechanical ventilation in apartments at façade in question. However, in our experience, the ability to open a window as much or as little as desired (even in the event of slight noise level exceedances) is far more preferable by residential occupants / tenants than not being able to open a window at all when external noise ingress is slightly above a criteria limit.

## 9.0 SUMMARY OF PROPOSED DEVELOPMENT NOISE IMPACT

### 9.1 Summary Of Proposed Development Noise Impact

In accordance with the ProPG 2017 and BS 8233 guidance documents, a suitable approach was adopted in order to ensure an acceptable external ambient noise environment could be achieved. This approach is summarised as follows :

- The 50 - 55dB LAeq,16hr criteria will be designed for in Courtyard areas where it is practically possible to be achieved.
- A relatively quiet, Courtyard amenity areas will be incorporated into the development (in accordance with both ProPG and Limerick County Council's request that 'a private outdoor amenity space should be available for residents expected to be exposed to road noise levels above 55dB Lden').
- The façade design of all development buildings will incorporate superior sound insulation glazing / façade elements to achieve a quiet internal acoustic environment that will comply with criteria applicable to low level residential bedroom environments.

Following a computer modelling assessment, the following mitigation measures were identified as being required in order to reduce external noise levels accordingly :

- A 2.5m high soil berms to be installed between the site and roads
- A 18dB reduction acoustic louvres to the perimeter of the external mechanical services plant.

Provided the above mitigation measures are incorporated into the development's architectural design, the development should be compliant with the external area noise requirements detailed within the ProPG 2017 and BS 8233 guidance documents and the magnitude of the inward noise impact from the adjacent roadways on development external areas would therefore be considered negligible.

### 9.2 Internal Areas - Noise Impact Summary

Appropriate guidance for internal noise levels within residential spaces was taken from BS 8233 (2014) : Guidance on Sound Insulation and Noise Reduction for Buildings as summarised in the table 9.

Given the requirements in the above table together with the predicted external noise levels with the development in place, the following mitigation measures were developed for both dwelling and apartment blocks :

- Provision of minimum 50dB Rw external walls (refer to Table 12).
- Provision of minimum 45dB Rw roof constructions (refer to Table 12).
- Provision of glazing with minimum acoustic performance specifications (refer to Tables 13 & 14).
- Provision of acoustic trickle vents (refer to Table 15).

Assuming the above developed mitigation measures are appropriately incorporated into the development design, the development is expected to be fully compliant with the internal area noise requirements contained within the ProPG 2017 and BS 8233 guidance documents and the magnitude of the inward noise impact from the adjacent roadways on development internal areas would therefore be considered negligible.

## 10.0 CONSTRUCTION NOISE

### 10.1 Construction Phase - Assessment Criteria (Noise)

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. To set appropriate construction noise limits for the development site, reference has been made to BS 5228 - 1:2009 +A1 2014 Code of practice for noise and vibration control on construction and open sites - Noise. This provides basic information on the prediction and measurement of noise from construction sites and operations such as mines and quarries. It also includes a large database of source noise levels for commonly used equipment and activities on construction sites. The standard provides guidance on the 'threshold of significant effect' in respect of noise impact at dwellings. One suggested method for determining threshold noise levels is known as the 'ABC method'. This involves measuring existing ambient noise levels at noise sensitive locations and categorising them A, B or C accordingly, with the relevant threshold level derived from the category as set out in Table 17.

**Table 17: BS 5228 – Example of significant effect at dwellings**

| Assessment Category and Threshold Value Period ($L_{Aeq}$) | Threshold Value (dB) | | |
|---|---|---|---|
| | Category A | Category B | Category C |
| Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00) | 65 | 70 | 75 |
| Evenings and weekends [D] | 55 | 60 | 65 |
| Night-time (23:00 to 07:00hrs) | 45 | 50 | 55 |
| **NOTE 1** A significant effect has been deemed to occur if the total LAeq noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level. **NOTE 2** If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total lAeq noise level for the period increases by more than 3 dB due to construction activity. **NOTE 3** Applied to residential receptors only. | | | |
| [A] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values. | | | |
| [B] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values. | | | |
| [C] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values. | | | |
| [D] 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays | | | |

In general, the noise impact due to the construction phase will be from the specific items of plant used, the duration and phasing of the construction methods, the time of day that each plant will be used and their location. At this stage of the planning for the proposed development however, a definitive construction plan is not yet formalised. Typically, a worse-case scenario is adopted whereby the plant associated for each phase e.g., site perpetrations, demolition, piling, general construction etc, is assumed to operate simultaneously. This can then inform the construction management plan and be refined as required.

### 10.2 Construction Phase -Assessment Criteria (Vibration)

BS 5228-2:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites: - Part 2: Vibration, outlines several calculation methods for predicting vibration from construction works on open sites.

The standard references other guidance to set acceptable levels for:

- Disturbance:
  BS 6472-1 (2008) Guide to evaluation of Human Exposure to Vibration in Buildings, and.
- Damage
  BS 7385-2 (1993) Evaluation and Measurement for Vibration in Buildings.

#### 10.2.1 Disturbance

BS 6472 requires that the estimated vibration dose value (EVDV) parameter be determined for the 16-hour daytime and 8-hour night-time periods. For vibration associated with construction sites however it is considered more appropriate to provide guidance in terms of the PPV, since this parameter is likely to be more routinely measured based upon the more usual concern over potential building damage. Furthermore, since many of the empirical vibration predictors yield a result in terms of PPV, it is necessary to understand what the consequences might be of any predicted levels in terms of human perception and disturbance. Some guidance is given in Table 18.

**Table 18: Guidance on effects of vibration levels**

| Vibration Level | Effects |
|---|---|
| **0.14 mm/s** | Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration. |
| **0.3 mm/s** | Vibration might be just perceptible in residential environments. It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents. |
| **1.0 mm/s** | Vibration is likely to be intolerable for any more than a very brief exposure to this level. |
| **10 mm/s** | Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration. |

#### 10.2.2 Building Damage

The response of a building to ground-borne vibration is affected by the type of foundation, underlying ground conditions, the building construction, and the state of repair of the building.
BS 7385 provides guidance on vibration measurement, data analysis and reporting as well as building classification and guide values for building damage.
Limits for transient vibration, above which cosmetic damage could occur, are given in Table 19.

**Table 19: Transient Vibration guide Values for Cosmetic Damage**

| Type of Building | Peak component particle velocity in frequency range of predominant pulse | |
|---|---|---|
| | 4Hz to 15Hz | 15Hz and above |
| **Reinforced or framed structures**<br><br>**Industrial and heavy commercial buildings** | 50 mm/s at 4Hz and above | 50 mm/s at 4Hz and above |
| **Unreinforced or light framed Structures**<br><br>**Residential or light commercial buildings** | 15 mm/s at 4Hz[1] increasing to 20 mm/sat 15Hz | 20 mm/s at 15Hz increasing to 50 mm/s at 40Hz and above |

NOTE 1 Values referred to are at the base of the building.

[1]*At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.*

Minor structural damage may occur at levels around twice the above limits and major damage can occur at levels around four times the above limits.

Both standards note that important buildings that are difficult to repair might require special consideration on a case-by-case basis but building of historical importance should not (unless it is structurally unsound) be assumed to be more sensitive. If a building is in a very unstable state, then it will tend to be more vulnerable to the possibility of damage arising from vibration or any other ground borne disturbance.

It should be noted that there is a major difference between the sensitivity of people in feeling vibration and the onset of vibration which caused building damage. Vibration in relation to construction sites therefore may result in short- term disturbance but rarely cause even cosmetic damage. For some construction sites e.g., during piling or rock-braking and with dwellings nearby, vibration monitoring at these locations may be prudent.

### 10.3 Noise Limits at Noise Sensitive Locations

Following a review of the baseline noise survey results in Table 2,7,8 and the criteria detailed in Table 17, the day-time noise limit at the NSL for construction noise are set out in Table 20.

**Table 20: Defined Construction Noise threshold.**

| Survey Location | Ambient Noise Level Rounded to Nearest 5dB LAeq | BS 5228-1 Category | Construction Noise Threshold Value (LAeq, T) |
|---|---|---|---|
| N1 | 55dB | A | 65dB |
| N2 | 55dB | A | 65dB |
| N3 | 55dB | A | 65dB |
| N4 | 50dB | A | 65dB |
| N5 | 50dB | A | 65dB |

### 10.4 Construction Plan & Site Noise Limits

BS 5228 outlines plant items and associated noise levels that are anticipated for various stages of a typical construction programme, the noise levels of which are generally given at a distance of 10m from the item of plant. Using a typical construction

programme, the maximum noise level criterion at 10m from the construction site has been calculated as: 80dBA. Not all plant will operate simultaneously, and further guidance is given on the calculation of Activity LAeq (F.2.2 Method for activity LAeq) which has been calculated as: -26dB.

**Table 21: Predicted Noise Level at 10m from Construction Plant during Construction Phase**

| Activity – Construction Phase | Item of Plant (BS5228 Ref) | Qty | Total Noise Level @ 10m |
|---|---|---|---|
| **Site Preparation (Stage 1)** | Wheeled Loader – 52kW (D3.3) | 1 | 74 |
| | Tracked Loader – 56kW (D3.17) | 1 | 85 |
| | Dozer – 239kW (D3.27) | 1 | 81 |
| | Grader – 168kW (D3.75) | 1 | 84 |
| | Tipper Lorry – 75kW (D3.112) | 1 | 85 |
| | Activity Correction: | | -26 |
| | Total: | | 64 |
| | **65dB Limit Exceeded?** | | **No** |
| | | | |
| **General Construction (Stage 2)** | Dump Truck – 29t (C2.30) | 1 | 79 |
| | Tracked excavator – 22t (C2.21) | 1 | 71 |
| | Compressor (D7.08) | 1 | 70 |
| | Telescopic Handler – 4t (C4.54) | 1 | 79 |
| | Diesel Generator | 1 | 61 |
| | Activity Correction: | | -26 |
| | Total: | | 57 |
| | **65dB Limit Exceeded?** | | **No** |
| | | | |
| **Roadworks/Landscaping (Stage 3)** | Asphalt Paver & Tipping Lorry – 112kw (C5.30) | 1 | 75 |
| | Electric Water Pump – 15 KW (C5.20) | 1 | 68 |
| | Vibratory Roller – 89kW (C5.20) | 1 | 75 |
| | Activity Correction: | | -26 |
| | Total: | | 52 |
| | **65dB Limit Exceeded?** | | **No** |
| dB re. $2x10^{-5}$Pa | | | |

### 10.4.1 Discussion

The assessment of the typical construction plan indicates that the criteria will be met at almost all of the nearby existing residential locations. However, the criterion may not be met for short periods of time during the site preparation stage at the residential properties immediately adjacent to the site. Section 10.7 below sets out measures to mitigate the impact.
Therefore, any impact is expected to be negative, moderate, and short-term.

## 10.5 Construction Phase – Vibration

BS 5228-2:2009 Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration provides empirical vibration levels from various activities. Without a detailed construction plan it is prudent to assess the likely vibration levels at the nearby dwellings from this most severe test as all other sources of vibration will be below this level.

The vibration limits are set out in Table 18 for Disturbance and Table 19 for Cosmetic Damage are 0.14mm/s ("just perceptible in the most sensitive situations") and 15mm/s respectively.

### 10.5.1 Discussion

A review of the predicted vibration levels from the typical construction programme set out above indicates that the resultant vibration levels at noise sensitive locations are expected to be well below a level that would cause disturbance to building occupants and there is also no risk of building damage. The associated impact with these activities is considered to be neutral and imperceptible.

## 10.6 Construction Phase - Traffic Noise

The noise levels associated with mobile plant items such as concrete mixer trucks, loaders etc. operational on site have been included as part of the construction noise assessment and calculated noise levels in Table 22. Consideration should also be given to the addition of construction traffic along the site access routes. Access to the development site for construction traffic will be via the Groody Road to the east of the proposed development.

It is possible to calculate the noise levels associated with the passing vehicle using the following formula.

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

Where: $L_{Aeq,T}$ = is the equivalent continuous sound level over the time period Tin seconds.

$L_{AX}$ = is the "A-weighted" Sound Exposure Level of the event considered(dB).

N = is the number of events over the course of time period T.

$r_1$= is the distance at which LAX is expressed.

$r_2$= is the distance to the assessment location

A calculation distance of 5m from the road has been used to assess noise levels at the closest buildings along the construction routes. The mean value of Sound Exposure Level for truck moving at low to moderate speeds (i.e. 15 to 45km/hr) is of the order of 82dB $L_{ax}$ at a distance of 5 metres from the vehicle. This figure is based on a series of measurements conducted under controlled conditions. Construction vehicles are predicted in the table below for peak hours associated with each key stage of the construction phase. Table 22 below summarises the calculated noise level associated with passing haul vehicles during each phase, assuming the peak hour flows per day.

**Table 22: Predicted Noise Level at 10m from Construction Plant**

| Construction Phase | No. of Trucks/peak hour | Calculated Noise at edge of road (5m),dB $L_{Aeq,\ 1hr}$ |
|---|---|---|
| Site Preparation (Stage 1) | 2 | 51 |
| General Construction (Stage 2) | 4 | 56 |
| Roadworks/Landscaping (Stage 3) | 2 | 51 |

The calculated noise levels associated with the various stages of construction are in the range of 51 to 56dB $L_{Aeq,1hr}$. The calculated noise levels are below the construction noise criterion of 65dB. In addition, it should be noted that, in order to assess a worst- case scenario, a large proportion of the daily vehicle numbers have been assumed to arrive/depart over an hour-long period.

### 10.6.1 Discussion

The existing daytime noise environment is dominated by road traffic and the noise generated by construction traffic is not expected to change the character of the existing noise environment significantly. Therefore, any impact is expected to be neutral and imperceptible.

## 10.7 Ameliorative, Remedial or Reductive Measures

The impact assessment conducted for the construction activity during the construction phase has highlighted that the predicted construction noise levels are within the adopted criterion for almost all NSLs. However, the following mitigation measures may be considered during certain construction activities in order to further reduce the noise and vibration impact to nearby noise sensitive areas.

As part of these mitigation measures it is recommended that the Contractor should compile a Noise and Vibration Management Plan (NVMP) which will deal specifically with management processes and strategic mitigation measures to remove or reduce significant noise and vibration impacts, and cumulative noise and vibration impacts from the construction works. The Plan will also define noise and vibration monitoring and reporting. The NVMP will also include method statements for each phase of the works, the associated specific measures to minimise noise and vibration in so far as is reasonably practicable for the specific works covered by each plan and a detailed appraisal of the resultant construction noise and vibration generated.

The contractor will provide proactive community relations and will notify the public and vibration sensitive premises before the commencement of any works forecast to generate appreciable levels of noise or vibration, explaining the nature and duration of the works.
The contractor will distribute information circulars informing people of the progress of the work and any likely periods of significant noise and vibration.

8S5228 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- selection of quiet plant.
- control of noise sources.
- screening.
- hours of work.
- liaison with the public, and.
- monitoring.

Noise control measures that will be considered include the selection of quiet plant, enclosures, and screens around noise sources, limiting the hours of work and carrying out noise/vibration monitoring as required. A suitable site hoarding would protect the residents immediately adjacent to the construction site.

## 11.0 CONCLUSION

- The site is located adjacent to the R445 and Groody Road. The potential noise impact of this has been fully considered in the report.

- The noise impact of the construction and operational phases of the proposed development has also been assessed.

- During the construction phase noise is predicted while works are taking place in proximity to the nearest Noise Sensitive locations. Mitigation measures have been recommended.

- A noise monitoring survey has been conducted during the school term that contains a full set of noise monitoring results. The results include the Time Run Duration, $L_{AeqT}$ (1 hour), $LA_{eqT}$ (15min), $L_{AFmax}$, $L_{AF10}$, $L_{AF90}$, calculated $L_{den}$ noise levels and measured $L_{night}$ noise levels.

- The $L_{den}$ at 1.50 metres above ground level at the facades of the proposed building and in the useability outdoor public open spaces have been calculated.

- The calculated $L_{den}$ and measured $L_{night}$ values at the façades of the proposed development at levels not less than 1.5 metres above each of the respective floor levels has also been calculated within the models.

- The predicted internal noise levels are within the British Standards BS 8233:2014. Traynor Environmental was also assessed with regard to opening windows at night and the impact on internal ambient noise levels.

- The proposed development complies fully with the British Standard BS 8233:2014 Guidelines for Sound Insulation and Noise Reduction for Buildings, World Health Organisation's (WHO) Guidelines for Community Noise (1999), Limerick Noise Action Plan 2024-2028 and ProPG: Planning and Noise – Professional Practice Guidance on Planning & Noise – New Residential Development – May 2017.

- With the proposed mitigation measures, the noise levels at the nearest facades to the R445 and Groody Road will have acceptable noise levels.

**ENVIRONMENTAL NOISE ASSESSMENT**
**WHITEBOX LTD AT**
**CASTLETROY, LIMERICK, CO. LIMERICK**
**COMPLETED**
**BY**
**TRAYNOR ENVIRONMENTAL LTD**

# APPENDIX A – NOISE METER CALIBRATION CERTIFICATES OF CALIBRATION

MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
Billingham TS23 1LG,
England
Telephone: 01642 876 410

# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of Issue:** 02 September 2022 **Certificate Number:** 37332

## Sound Level Meter

## Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

*Client:* Traynor Environmental Ltd

*Instrument Make:* Larson Davis
*Instrument Model:* 831
*Serial Number:* 0003913

| *Associated Equipment* | Make | Model | Serial number |
|---|---|---|---|
| *Preamplifier* | Larson Davis | PRM831 | 036768 |
| *Microphone* | PCB | 377B02 | 302020 |
| *Calibrator* | Cirrus | CR:515 | 44501 |
| *Calibrator supplied by* | the Client, with the SLM | | |

The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the items tested.

**Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1**

**Test results summary, detailed results are shown on subsequent pages.**

| Tests performed | Section | Results of test | Page | Comments |
|---|---|---|---|---|
| Calibration Certificate | 22 | | 1 | |
| Additional information | | | 2 | |
| Indication with Calibrator Supplied | 10 | No Limit | 3 | |
| Self-Generated Noise | 11 | No Limit | 3 | |
| Frequency and Time-weightings at 1kHz | 14 | Complies | 3 | |
| Long term stability | 15 | Complies | 3 | |
| High stability | 21 | Complies | 3 | |
| Acoustic Tests | 12 | Complies | 4 | |
| Frequency Weighting A | 13 | Complies | 5 | |
| Frequency Weighting C | 13 | Complies | 6 | |
| Frequency Weighting Z | 13 | Complies | 7 | |
| Level Linearity | 16 | Complies | 8 | |
| Level Linearity Range Control | 17 | Complies | 9 | 0 |
| Tone-burst Response | 18 | Complies | 10 | |
| Peak C sound level | 19 | Complies | 11 | |
| Overload indication | 20 | Complies | 12 | |

The instrument was within the above specification as received - no modifications were made

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013

| Additional tests performed | Reference | |
|---|---|---|
| Microphone full frequency response | 37334 | See additional certificate |
| Filter calibration, third octave or octave | 37332F | See additional certificate |
| Calibrator calibration | 37335U | See additional UKAS certificate |

MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
Billingham TS23 1LG,
England
Telephone: 01642 876 410

# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of Issue:** 02 September 2022 **Certificate Number:** 37332F

## Third Octave Band Filter

## Third-Octave Band Filter verification to BS EN 61260:1996

**Client:** Traynor Environmental Ltd

| | |
|---|---|
| *Instrument Make:* | Larson Davis |
| *Instrument Model:* | LxT1 |
| *Serial Number:* | 0003913 |

| *Associated Sound Level Meter* | | *Associated Preamplifier* | |
|---|---|---|---|
| *Instrument Make:* | Larson Davis | *Instrument Make:* | Larson Davis |
| *Instrument Model:* | LxT1 | *Instrument Model:* | PRM831 |
| *Serial Number:* | 0003913 | *Serial Number:* | 036768 |
| *Calibrated by:* | MTS Calibration | | |
| *Certificate Number:* | 37332 | | |
| *Date: of SLM calibration* | 02 August 2022 | | |
| *Date: of receipt* | 11 August 2022 | | |

The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the item(s) tested.

**Third-Octave Band Filter** **Compliance with BS EN 61260: 1996 Class 1**

**Test results summary. Detailed results are shown on subsequent pages.**

| | | Comments |
|---|---|---|
| - Tabular Data | | See Page 2 |
| - Graphic Data for 125Hz filter | Complies | See Page 3 |
| - Graphic Data for 1kHz filter | Complies | See Page 3 |
| - Graphic Data for 8kHz filter | Complies | See Page 3 |

Because each digital filter will have the same amplitude characteristic relative to its centre frequency, only three filters were measured at each of the test frequencies specified by BS EN 61260:1996 for exact base 10 distribution. The measurements made were relative to the attenuation of the 1kHz filter at 1kHz input frequency and input level 7 V. Because the measurements include a linearity contribution from the sound level meter, and could be variable with frequency, the assessment is valid only for this pairing. The sound level meter was set for "Linear" frequency response on the lowest range setting which did not give overload at any test frequency or test level. Its compliance with the standard was assessed by referring the measurements to the tolerances specified.

Agreed and reported Decision Rule:

"Complies" indicates that the instrument conforms with the relevant accuracy requirements of the testing standard AND the expanded measurement uncertainty ( k = 2 for approximately 95 % coverage probability) is no greater in magnitude than the accuracy requirements defined in BS EN 61260:1996.

**Comments**

The sound level meter and preamplifier were calibrated as a unit.
The input level used is selected to produce a sound level at 1kHz that is close to but not exceeding the maximum level on the reference range.
The centre frequency sequence of this filter set follows the exact base 10 midband frequency sequence of IEC 61260 and the measurements have been made accordingly.

| Measurement Conditions: | | | |
|---|---|---|---|
| Temperature | 23.6 | °C | ± 1 °C |
| Atmospheric Pressure | 1014.2 | mBar | ± 2 mBar |
| Relative Humidity | 55.1 | % | ± 5 % |

| Uncertainties of measurements: | | |
|---|---|---|
| Within Passband (0.89 to 1.12 of centre frequency) | 0.42 | dB |
| Outside Passband | 2.49 | dB |

**Test Equipment:**

| Equipment | Manufacturer | Model | Serial No. | Traceability Ref. | Cal. Due |
|---|---|---|---|---|---|
| Signal Generator (set 3) | HP | 33120A | US34007156 | TE 163 | Sep-22 |

# Certificate of Calibration

MTS Calibration

Certificate Number: 37334

## Measurement Microphone
## Half-Inch diameter – Free-Field, 0 degree incidence response

Client: Traynor Environmental Ltd

***Instrument Make:*** **Larson Davis**
***Instrument Model:*** **377B02**
***Serial Number:*** **302020**

Sensitivity is calculated by the Insert Voltage method. The frequency response calibration is one of three independent measurements of the pressure response of the Object Microphone obtained by the Electrostatic Actuator measurement method. Microphone Capacitance is the polarised capacitance of the test microphone measured on a capacitance bridge relative to a reference microphone.

**The frequency response, capacitance, and sensitivity of the microphone are shown graphically on Page 2**
**Uncertainties of these measurements are:**

| | |
|---|---|
| 31.5 Hz to 4kHz | 0.41 dB (k = 2.04) |
| 5kHz to 10 kHz | 0.87 dB (k = 2.17) |
| 12.5 kHz to 40 kHz | 1.81 dB (k = 2.17) |
| Sensitivity at 250Hz | 0.16 dB (k = 2.0) |

**The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k (as above) to provide a level of confidence of approximately 95%. The uncertainty evaluation has been calculated in accordance with UKAS publication M 3003 (December 1997).**

**Measurement Conditions:**

| | |
|---|---|
| **Polarisation Voltage** | **0V +/- 0.5V** |
| **Temperature** | **23.6 °C** |
| **Atmospheric Pressure** | **1016 mBar **** |
| **Relative Humidity** | **45.6 %** |

**** Note that the computer-produced Certificate shows a Pressure of 1040.6 mbar - this is in error. The above measurement is traceable**

**Test Equipment:**

| Equipment | Manufacturer | Model | Serial No. | Traceability Ref. | Cal. Due |
|---|---|---|---|---|---|
| Condenser Microphone | Larson Davis | 2541 | 7300 | TE 157 | November 2022 |
| Acoustic Calibrator 250Hz | Larson Davis | CA250 | 2807 | TE 104 | November 2023 |
| Real-Time Frequency Analyser | Larson Davis | 2900 | 0492 | TE 108 | July 2023 |
| Signal Generator | Hewlett Packard | 33120A | US36016577 | TE 111 | September 2022 |
| Digital Multimeter | Hewlett Packard | 34401A | 3146A63804 | TE 105 | September 2022 |

Date of Receipt : 11th August 2022
Date of Calibration : 17th August 2022
Date of Certificate: 17th August 2022

Authorised Signatory: .....

Tony Sherris

Page 1 of 2



**MTS Calibration Ltd**
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**The Grange Business Centre, Belasis Avenue, Billingham TS23 1LG, England**
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MTS Calibration Ltd,
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Telephone: 01642 876 410

# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of issue:** 02 September 2022 **Certificate Number:** 37321

## Sound Level Meter

## Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

*Client:* Environmental Measurements
Unit 12, Tallaght Business Centre
Whitestown Business Park
Co.Dublin 24, Ireland

*Instrument Make:* Larson Davis
*Instrument Model:* LxT1L
*Serial Number:* 0005901

| *Associated Equipment* | Make | Model | Serial number |
|---|---|---|---|
| *Preamplifier* | Larson Davis | PRMLxT1L | 055773 |
| *Microphone* | PCB | 377B02 | 325451 |
| *Calibrator* | Larson Davis | CAL200 | 9175 |
| *Calibrator supplied by* | MTS for this calibration | | |

The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the items tested.

**Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1**

**Test results summary, detailed results are shown on subsequent pages.**

| Tests performed | Section | Results of test | Page | Comments |
|---|---|---|---|---|
| Calibration Certificate | 22 | | 1 | |
| Additional information | | | 2 | |
| Indication with Calibrator Supplied | 10 | No Limit | 3 | |
| Self-Generated Noise | 11 | No Limit | 3 | |
| Frequency and Time-weightings at 1kHz | 14 | Complies | 3 | |
| Long term stability | 15 | Complies | 3 | |
| High stability | 21 | Complies | 3 | |
| Acoustic Tests | 12 | Complies | 4 | |
| Frequency Weighting A | 13 | Complies | 5 | |
| Frequency Weighting C | 13 | Complies | 6 | |
| Frequency Weighting Z | 13 | Complies | 7 | |
| Level Linearity | 16 | Complies | 8 | |
| Level Linearity Range Control | 17 | | n/a | SLM only has one range |
| Tone-burst Response | 18 | Complies | 9 | |
| Peak C sound level | 19 | Complies | 10 | |
| Overload indication | 20 | Complies | 11 | |

The instrument was within the above specification as received - no modifications were made

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013

| Additional tests performed | Reference | |
|---|---|---|
| Microphone full frequency response | 37323 | See additional certificate |
| Filter calibration, third octave or octave | 37321F | See additional certificate |

MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
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Telephone: 01642 876 410

# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of Issue:** 05 September 2022 **Certificate Number:** 37321F

## Third Octave Band Filter

### Third-Octave Band Filter verification to BS EN 61260:1996

*Client:* Traynor Enviranmental Ltd

*Instrument Make:* Larson Davis
*Instrument Model:* LxT1
*Serial Number:* 0005901

| *Associated Sound Level Meter* | | *Associated Preamplifier* | |
|---|---|---|---|
| *Instrument Make:* | Larson Davis | *Instrument Make:* | Larson Davis |
| *Instrument Model:* | LxT3 | *Instrument Model:* | PRMLxT1L |
| *Serial Number:* | 0005901 | *Serial Number:* | 055773 |
| *Calibrated by:* | MTS Calibration | | |
| *Certificate Number:* | 37321 | | |
| *Date of SLM calibration* | 02 September 2022 | | |
| *Date of receipt* | 11 August 2022 | | |

The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the item(s) tested.

**Third-Octave Band Filter** **Compliance with BS EN 61260: 1996 Class 1**

**Test results summary. Detailed results are shown on subsequent pages.**

| | | Comments |
|---|---|---|
| - Tabular Data | | See Page 2 |
| - Graphic Data for 125Hz filter | Complies | See Page 3 |
| - Graphic Data for 1kHz filter | Complies | See Page 3 |
| - Graphic Data for 8kHz filter | Complies | See Page 3 |

Because each digital filter will have the same amplitude characteristic relative to its centre frequency, only three filters were measured at each of the test frequencies specified by BS EN 61260:1996 for exact base 10 distribution. The measurements made were relative to the attenuation of the 1kHz filter at 1kHz input frequency and input level V. Because the measurements include a linearity contribution from the sound level meter, and could be variable with frequency, the assessment is valid only for this pairing. The sound level meter was set for "Linear" frequency response on the lowest range setting which did not give overload at any test frequency or test level. Its compliance with the standard was assessed by referring the measurements to the tolerances specified.

Agreed and reported Decision Rule:

"Complies" indicates that the instrument conforms with the relevant accuracy requirements of the testing standard AND the expanded measurement uncertainty ( k = 2 for approximately 95 % coverage probability) is no greater in magnitude than the accuracy requirements defined in BS EN 61260:1995.

Comments

The sound level meter and preamplifier were calibrated as a unit.
The input level used is selected to produce a sound level at 1kHz that is close to but not exceeding the maximum level on the reference range.
The centre frequency sequence of this filter set follows the exact base 10 midband frequency sequence of IEC 61260 and the measurements have been made accordingly.

| Measurement Conditions: | | | |
|---|---|---|---|
| Temperature | 22.3 | °C | ± 1 °C |
| Atmospheric Pressure | 1013.8 | mBar | ± 2 mBar |
| Relative Humidity | 58.6 | % | ± 5 % |

| Uncertainties of measurements: | | |
|---|---|---|
| Within Passband (0.88 to 1.12 of centre frequency) | 0.42 | dB |
| Outside Passband | 2.46 | dB |

**Test Equipment:**

| Equipment | Manufacturer | Model | Serial No. | Traceability Ref. | Cal. Due |
|---|---|---|---|---|---|
| Signal Generator (set 3) | HP | 33120A | US34007158 | TE 163 | Sep-22 |

# Certificate of Calibration

MTS Calibration

Certificate Number: 37323

## Measurement Microphone
## Half-Inch diameter – Free-Field, 0 degree incidence response

Client: Traynor Environmental Ltd

***Instrument Make:*** **Larson Davis**
***Instrument Model:*** **377B02**
***Serial Number:*** **325451**

Sensitivity is calculated by the Insert Voltage method. The frequency response calibration is one of three independent measurements of the pressure response of the Object Microphone obtained by the Electrostatic Actuator measurement method. Microphone Capacitance is the polarised capacitance of the test microphone measured on a capacitance bridge relative to a reference microphone.

**The frequency response, capacitance, and sensitivity of the microphone are shown graphically on Page 2**

**Uncertainties of these measurements are:**

| | |
|---|---|
| 31.5 Hz to 4kHz | 0.41 dB (k = 2.04) |
| 5kHz to 10 kHz | 0.87 dB (k = 2.17) |
| 12.5 kHz to 40 kHz | 1.81 dB (k = 2.17) |
| Sensitivity at 250Hz | 0.16 dB (k = 2.0) |

**The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k (as above) to provide a level of confidence of approximately 95%. The uncertainty evaluation has been calculated in accordance with UKAS publication M 3003 (December 1997).**

**Measurement Conditions:**

| | |
|---|---|
| Polarisation Voltage | 0V +/- 0.5V |
| Temperature | 23.7 °C |
| Atmospheric Pressure | 1016 mBar ** |
| Relative Humidity | 45.9 % |

** Note that the computer-produced Certificate shows a Pressure of 1043.5 mbar - this is in error. The above measurement is traceable

**Test Equipment:**

| Equipment | Manufacturer | Model | Serial No. | Traceability Ref. | Cal. Due |
|---|---|---|---|---|---|
| Condenser Microphone | Larson Davis | 2541 | 7300 | TE 157 | November 2022 |
| Acoustic Calibrator 250Hz | Larson Davis | CA250 | 2807 | TE 104 | November 2023 |
| Real-Time Frequency Analyser | Larson Davis | 2900 | 0492 | TE 108 | July 2023 |
| Signal Generator | Hewlett Packard | 33120A | US36016577 | TE 111 | September 2022 |
| Digital Multimeter | Hewlett Packard | 34401A | 3146A63804 | TE 105 | September 2022 |

Date of Receipt : 11th August 2022
Date of Calibration : 17th August 2022
Date of Certificate: 17th August 2022

Authorised Signatory: .....
Tony Sherris

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**MTS Calibration Ltd**
Company Registration Number: 05508525 England and Wales
**The Grange Business Centre, Belasis Avenue, Billingham TS23 1LG, England**
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MTS Calibration Ltd,
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Belasis Avenue,
Billingham TS23 1LG,
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# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of Issue:** 01 September 2022 **Certificate Number:** 37324

## Sound Level Meter

## Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

*Client:* Traynor Enviranmental Ltd

*Instrument Make:* Larson Davis
*Instrument Model:* LxT1L
*Serial Number:* 0005595

| *Associated Equipment* | Make | Model | Serial number |
|---|---|---|---|
| *Preamplifier* | Larson Davis | PRMLxT1L | 055665 |
| *Microphone* | PCB | 377B02 | 305480 |
| *Calibrator* | Larson Davis | CAL200 | 9175 |
| *Calibrator supplied by* | MTS for this calibration | | |

**The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the items tested.**

**Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1**

**Test results summary, detailed results are shown on subsequent pages.**

| Tests performed | Section | Results of test | Page | Comments |
|---|---|---|---|---|
| Calibration Certificate | 22 | | 1 | |
| Additional Information | | | 2 | |
| Indication with Calibrator Supplied | 10 | No Limit | 3 | |
| Self-Generated Noise | 11 | No Limit | 3 | |
| Frequency and Time-weightings at 1kHz | 14 | Complies | 3 | |
| Long term stability | 15 | Complies | 3 | |
| High stability | 21 | Complies | 3 | |
| Acoustic Tests | 12 | Complies | 4 | |
| Frequency Weighting A | 13 | Complies | 5 | |
| Frequency Weighting C | 13 | Complies | 6 | |
| Frequency Weighting Z | 13 | Complies | 7 | |
| Level Linearity | 16 | Complies | 8 | |
| Level Linearity Range Control | 17 | | n/a | SLM only has one range |
| Tone-burst Response | 18 | Complies | 9 | |
| Peak C sound level | 19 | Complies | 10 | |
| Overload Indication | 20 | Complies | 11 | |

**The instrument was within the above specification as received - no modifications were made**

**The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013**

| Additional tests performed | Reference | |
|---|---|---|
| Microphone full frequency response | 37326 | See additional certificate |
| Filter calibration, third octave or octave | 37324F | See additional certificate |

# Certificate of Calibration

MTS Calibration

Certificate Number: 37326

## Measurement Microphone
## Half-Inch diameter – Free-Field, 0 degree incidence response

Client: Traynor Environmental Ltd

***Instrument Make:*** **Larson Davis**
***Instrument Model:*** **377B02**
***Serial Number:*** **305480**

Sensitivity is calculated by the Insert Voltage method. The frequency response calibration is one of three independent measurements of the pressure response of the Object Microphone obtained by the Electrostatic Actuator measurement method. Microphone Capacitance is the polarised capacitance of the test microphone measured on a capacitance bridge relative to a reference microphone.

**The frequency response, capacitance, and sensitivity of the microphone are shown graphically on Page 2**
**Uncertainties of these measurements are:**

| | |
|---|---|
| 31.5 Hz to 4kHz | 0.41 dB (k = 2.04) |
| 5kHz to 10 kHz | 0.87 dB (k = 2.17) |
| 12.5 kHz to 40 kHz | 1.81 dB (k = 2.17) |
| Sensitivity at 250Hz | 0.16 dB (k = 2.0) |

**The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k (as above) to provide a level of confidence of approximately 95%. The uncertainty evaluation has been calculated in accordance with UKAS publication M 3003 (December 1997).**

**Measurement Conditions:**

| | |
|---|---|
| **Polarisation Voltage** | **0V +/- 0.5V** |
| **Temperature** | **23.6 °C** |
| **Atmospheric Pressure** | **1016 mBar **** |
| **Relative Humidity** | **45.5 %** |

**** Note that the computer-produced Certificate shows a Pressure of 1040.5 mbar - this is in error. The above measurement is traceable**

**Test Equipment:**

| Equipment | Manufacturer | Model | Serial No. | Traceability Ref. | Cal. Due |
|---|---|---|---|---|---|
| Condenser Microphone | Larson Davis | 2541 | 7300 | TE 157 | November 2022 |
| Acoustic Calibrator 250Hz | Larson Davis | CA250 | 2807 | TE 104 | November 2023 |
| Real-Time Frequency Analyser | Larson Davis | 2900 | 0492 | TE 108 | July 2023 |
| Signal Generator | Hewlett Packard | 33120A | US36016577 | TE 111 | September 2022 |
| Digital Multimeter | Hewlett Packard | 34401A | 3146A63804 | TE 105 | September 2022 |

Date of Receipt : 11th August 2022
Date of Calibration : 17th August 2022
Date of Certificate: 17th August 2022

Authorised Signatory: .....

Tony Sherris

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# CERTIFICATE OF CALIBRATION

Page 1 of 3 pages

Approved Signatory:

Tony Sherris

Issued by: MTS Calibration Ltd

Date of Issue: 02 September 2022 Certificate Number: 37324F

## Third Octave Band Filter

## Third-Octave Band Filter verification to BS EN 61260:1996

| | | | |
|---|---|---|---|
| *Client:* | Traynor Environmental Ltd | *Instrument Make:* | Larson Davis |
| | | *Instrument Model:* | LxT1 |
| | | *Serial Number:* | 0005595 |

| *Associated Sound Level Meter* | | *Associated Preamplifier* | |
|---|---|---|---|
| *Instrument Make:* | Larson Davis | *Instrument Make:* | Larson Davis |
| *Instrument Model:* | LxT1 | *Instrument Model:* | PRMLxT1L |
| *Serial Number:* | 0005595 | *Serial Number:* | 055665 |
| *Calibrated by:* | MTS Calibration | | |
| *Certificate Number:* | 37324 | | |
| *Date of SLM calibration* | 01 September 2022 | | |
| *Date of receipt* | 11 August 2022 | | |

The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the item(s) tested.

Third-Octave Band Filter Compliance with BS EN 61260: 1996 Class 1

**Test results summary. Detailed results are shown on subsequent pages.**

| | | Comments |
|---|---|---|
| - Tabular Data | | See Page 2 |
| - Graphic Data for 125Hz filter | Complies | See Page 3 |
| - Graphic Data for 1kHz filter | Complies | See Page 3 |
| - Graphic Data for 8kHz filter | Complies | See Page 3 |

Because each digital filter will have the same amplitude characteristic relative to its centre frequency, only three filters were measured at each of the test frequencies specified by BS EN 61260:1996 for exact base 10 distribution. The measurements made were relative to the attenuation of the 1kHz filter at 1kHz input frequency and input level 0.8 V. Because the measurements include a linearity contribution from the sound level meter, and could be variable with frequency, the assessment is valid only for this pairing. The sound level meter was set for "Linear" frequency response on the lowest range setting which did not give overload at any test frequency or test level. Its compliance with the standard was assessed by referring the measurements to the tolerances specified.

Agreed and reported Decision Rule:

"Complies" indicates that the instrument conforms with the relevant accuracy requirements of the testing standard AND the expanded measurement uncertainty ( k = 2 for approximately 95 % coverage probability) is no greater in magnitude than the accuracy requirements defined in BS EN 61260:1996.

Comments

The sound level meter and preamplifier were calibrated as a unit.
The input level used is selected to produce a sound level at 1kHz that is close to but not exceeding the maximum level on the reference range.
The centre frequency sequence of this filter set follows the exact base 10 midband frequency sequence of IEC 61260 and the measurements have been made accordingly.

| Measurement Conditions: | | | |
|---|---|---|---|
| Temperature | 21.9 | °C | ± 1 °C |
| Atmospheric Pressure | 1016.0 | mBar | ± 2 mBar |
| Relative Humidity | 56.0 | % | ± 5 % |

| Uncertainties of measurements: | | |
|---|---|---|
| Within Passband (0.88 to 1.12 of centre frequency) | 0.42 | dB |
| Outside Passband | 2.40 | dB |

Test Equipment:

| Equipment | Manufacturer | Model | Serial No. | Traceability Ref. | Cal. Due |
|---|---|---|---|---|---|
| Signal Generator (set 3) | HP | 3812A | US34007158 | TE 163 | Sep-22 |

**ENVIRONMENTAL NOISE ASSESSMENT**
**WHITEBOX LTD AT**
**CASTLETROY, LIMERICK, CO. LIMERICK**
**COMPLETED**
**BY**
**TRAYNOR ENVIRONMENTAL LTD**

# APPENDIX B – COMPETENCY CERTIFICATE FROM INSTITUTE OF ACOUSTICS

Institute of Acoustics

# Certificate of Competence in Environmental Noise Measurement

This is to certify that

## Nevin Traynor

has completed a course of instruction approved by the Institute of Acoustics and designed to enable the candidate to undertake environmental noise measurements in a competent manner and has achieved a satisfactory performance in the written and practical examinations thereof and that this fact has been recorded in a Register kept by the Institute for this purpose.

Education Committee Chairman

Institute Secretary

Date 11/10/2019

Centre Maloney & Associates

Reference Number M0111

For the purposes of Credit Transfer or Professional Development this Certificate may be considered to be equivalent to 25 points on Annex

**ENVIRONMENTAL NOISE ASSESSMENT**
**WHITEBOX LTD AT**
**CASTLETROY, LIMERICK, CO. LIMERICK**
**COMPLETED**
**BY**
**TRAYNOR ENVIRONMENTAL LTD**

# APPENDIX C – FULL SET OF NOISE RESULTS FOR N1

**Daytime Noise Levels**

| Date | Time | $LAF_{eq}$ | $LAF_{max}$ | $LAF_{10}$ | $LAF_{90}$ |
|---|---|---|---|---|---|
| 19-03-2024 | 07:00:00 | 56 | 72 | 57 | 53 |
| 19-03-2024 | 07:30:00 | 55 | 67 | 56 | 53 |
| 19-03-2024 | 08:00:00 | 53 | 67 | 55 | 51 |
| 19-03-2024 | 08:30:00 | 53 | 66 | 54 | 50 |
| 19-03-2024 | 09:00:00 | 56 | 72 | 57 | 50 |
| 19-03-2024 | 09:30:00 | 56 | 74 | 55 | 50 |
| 19-03-2024 | 10:00:00 | 53 | 69 | 54 | 50 |
| 19-03-2024 | 10:30:00 | 52 | 70 | 54 | 50 |
| 19-03-2024 | 11:00:00 | 53 | 73 | 54 | 50 |
| 19-03-2024 | 11:30:00 | 52 | 68 | 53 | 49 |
| 19-03-2024 | 12:00:00 | 52 | 70 | 54 | 49 |
| 19-03-2024 | 12:30:00 | 53 | 72 | 53 | 49 |
| 19-03-2024 | 13:00:00 | 54 | 74 | 54 | 50 |
| 19-03-2024 | 13:30:00 | 56 | 73 | 56 | 51 |
| 19-03-2024 | 14:00:00 | 54 | 79 | 55 | 50 |
| 19-03-2024 | 14:30:00 | 53 | 69 | 55 | 50 |
| 19-03-2024 | 15:00:00 | 54 | 74 | 54 | 50 |
| 19-03-2024 | 15:30:00 | 54 | 73 | 55 | 51 |
| 19-03-2024 | 16:00:00 | 54 | 74 | 56 | 51 |
| 19-03-2024 | 16:30:00 | 54 | 72 | 55 | 51 |
| 19-03-2024 | 17:00:00 | 54 | 70 | 55 | 51 |
| 19-03-2024 | 17:30:00 | 54 | 71 | 56 | 51 |
| 19-03-2024 | 18:00:00 | 54 | 67 | 55 | 52 |
| 19-03-2024 | 18:30:00 | 56 | 75 | 56 | 52 |
| 19-03-2024 | 19:00:00 | 55 | 72 | 56 | 52 |
| 19-03-2024 | 19:30:00 | 53 | 70 | 54 | 50 |
| 19-03-2024 | 20:00:00 | 52 | 67 | 54 | 50 |
| 19-03-2024 | 20:30:00 | 52 | 70 | 54 | 49 |
| 19-03-2024 | 21:00:00 | 53 | 69 | 54 | 50 |
| 19-03-2024 | 21:30:00 | 51 | 62 | 53 | 49 |
| 19-03-2024 | 22:00:00 | 53 | 69 | 55 | 50 |
| 19-03-2024 | 22:30:00 | 51 | 68 | 54 | 49 |
| **Average** | | **54** | **71** | **55** | **50** |

**Night Time Noise Levels**

| Date | Time | $LAF_{eq}$ | $LAF_{max}$ | $LAF_{10}$ | $LAF_{90}$ |
|---|---|---|---|---|---|
| 19-03-2024 | 23:00:00 | 52 | 69 | 53 | 48 |
| 19-03-2024 | 23:30:00 | 52 | 67 | 54 | 49 |
| 20-03-2024 | 00:00:00 | 50 | 65 | 52 | 46 |
| 20-03-2024 | 00:30:00 | 49 | 68 | 52 | 44 |
| 20-03-2024 | 01:00:00 | 47 | 62 | 50 | 41 |
| 20-03-2024 | 01:30:00 | 47 | 62 | 50 | 40 |
| 20-03-2024 | 02:00:00 | 44 | 61 | 48 | 37 |
| 20-03-2024 | 02:30:00 | 45 | 59 | 48 | 37 |
| 20-03-2024 | 03:00:00 | 44 | 63 | 47 | 35 |
| 20-03-2024 | 03:30:00 | 45 | 60 | 48 | 38 |
| 20-03-2024 | 04:00:00 | 47 | 65 | 50 | 40 |
| 20-03-2024 | 04:30:00 | 47 | 65 | 50 | 38 |
| 20-03-2024 | 05:00:00 | 49 | 73 | 51 | 37 |
| 20-03-2024 | 05:30:00 | 49 | 68 | 52 | 42 |
| 20-03-2024 | 06:00:00 | 52 | 68 | 55 | 46 |
| 20-03-2024 | 06:30:00 | 57 | 78 | 56 | 46 |
| **Average** | | **48** | **66** | **51** | **41** |

**Daytime Noise Levels**

| Date | Time | $LAF_{eq}$ | $LAF_{max}$ | $LAF_{10}$ | $LAF_{90}$ |
|---|---|---|---|---|---|
| 20-03-2024 | 07:00:00 | 54 | 76 | 55 | 47 |
| 20-03-2024 | 07:30:00 | 56 | 74 | 57 | 51 |
| 20-03-2024 | 08:00:00 | 56 | 73 | 57 | 53 |
| 20-03-2024 | 08:30:00 | 57 | 77 | 57 | 53 |
| 20-03-2024 | 09:00:00 | 56 | 74 | 57 | 52 |
| 20-03-2024 | 09:30:00 | 55 | 72 | 56 | 52 |
| 20-03-2024 | 10:00:00 | 55 | 69 | 56 | 52 |
| 20-03-2024 | 10:30:00 | 55 | 76 | 57 | 52 |
| 20-03-2024 | 11:00:00 | 54 | 68 | 56 | 52 |
| 20-03-2024 | 11:30:00 | 54 | 75 | 56 | 52 |
| 20-03-2024 | 12:00:00 | 55 | 83 | 56 | 52 |
| 20-03-2024 | 12:30:00 | 55 | 83 | 55 | 52 |
| 20-03-2024 | 13:00:00 | 56 | 77 | 56 | 52 |
| 20-03-2024 | 13:30:00 | 54 | 69 | 56 | 51 |
| 20-03-2024 | 14:00:00 | 55 | 85 | 55 | 50 |
| 20-03-2024 | 14:30:00 | 54 | 71 | 56 | 50 |
| 20-03-2024 | 15:00:00 | 53 | 69 | 54 | 50 |
| 20-03-2024 | 15:30:00 | 54 | 81 | 55 | 51 |
| 20-03-2024 | 16:00:00 | 55 | 78 | 54 | 50 |
| 20-03-2024 | 16:30:00 | 52 | 71 | 54 | 49 |
| 20-03-2024 | 17:00:00 | 53 | 71 | 54 | 50 |
| 20-03-2024 | 17:30:00 | 58 | 80 | 57 | 50 |
| 20-03-2024 | 18:00:00 | 55 | 73 | 57 | 50 |
| 20-03-2024 | 18:30:00 | 54 | 75 | 56 | 50 |
| 20-03-2024 | 19:00:00 | 55 | 75 | 56 | 50 |
| 20-03-2024 | 19:30:00 | 56 | 73 | 59 | 51 |
| 20-03-2024 | 20:00:00 | 57 | 79 | 58 | 51 |
| 20-03-2024 | 20:30:00 | 53 | 66 | 54 | 51 |
| 20-03-2024 | 21:00:00 | 53 | 70 | 54 | 50 |
| 20-03-2024 | 21:30:00 | 53 | 63 | 55 | 51 |
| 20-03-2024 | 22:00:00 | 54 | 71 | 55 | 51 |
| 20-03-2024 | 22:30:00 | 53 | 71 | 55 | 50 |
| **Average** | | **55** | **74** | **56** | **51** |

**Night Time Noise Levels**

| Date | Time | $LAF_{eq}$ | $LAF_{max}$ | $LAF_{10}$ | $LAF_{90}$ |
|---|---|---|---|---|---|
| 20-03-2024 | 23:00:00 | 52 | 74 | 54 | 48 |
| 20-03-2024 | 23:30:00 | 52 | 74 | 54 | 48 |
| 21-03-2024 | 00:00:00 | 51 | 76 | 52 | 46 |
| 2024-03-21 | 00:30:00 | 50 | 61 | 52 | 46 |
| 2024-03-21 | 01:00:00 | 51 | 60 | 54 | 46 |
| 2024-03-21 | 01:30:00 | 45 | 58 | 48 | 40 |
| 2024-03-21 | 02:00:00 | 47 | 68 | 48 | 40 |
| 2024-03-21 | 02:30:00 | 45 | 55 | 48 | 40 |
| 2024-03-21 | 03:00:00 | 46 | 65 | 49 | 41 |
| 2024-03-21 | 03:30:00 | 45 | 55 | 49 | 39 |
| 2024-03-21 | 04:00:00 | 44 | 56 | 48 | 37 |
| 2024-03-21 | 04:30:00 | 43 | 57 | 46 | 38 |
| 2024-03-21 | 05:00:00 | 45 | 58 | 48 | 38 |
| 2024-03-21 | 05:30:00 | 47 | 64 | 50 | 40 |
| 2024-03-21 | 06:00:00 | 47 | 63 | 50 | 42 |
| 2024-03-21 | 06:30:00 | 53 | 75 | 54 | 45 |
| **Average** | | **48** | **64** | **50** | **42** |

**Average Daytime Noise Levels**

| Date | $LAF_{eq}$ | $LAF_{max}$ | $LAF_{10}$ | $LAF_{90}$ |
|---|---|---|---|---|
| 19-03-2024 | 54 | 71 | 55 | 50 |
| 20-03-2024 | 55 | 74 | 56 | 51 |
| **Average** | **55** | **73** | **56** | **51** |

**Average Night Time Noise Levels**

| | $LAF_{eq}$ | $LAF_{max}$ | $LAF_{10}$ | $LAF_{90}$ |
|---|---|---|---|---|
| 19-03-2024/20-03 -2024 | 48 | 66 | 51 | 41 |
| 20-03-2024/21-03 -2024 | 48 | 64 | 50 | 42 |
| **Average** | **48** | **65** | **51** | **42** |

**ENVIRONMENTAL NOISE ASSESSMENT**
**WHITEBOX LTD AT**
**CASTLETROY, LIMERICK, CO. LIMERICK**
**COMPLETED**
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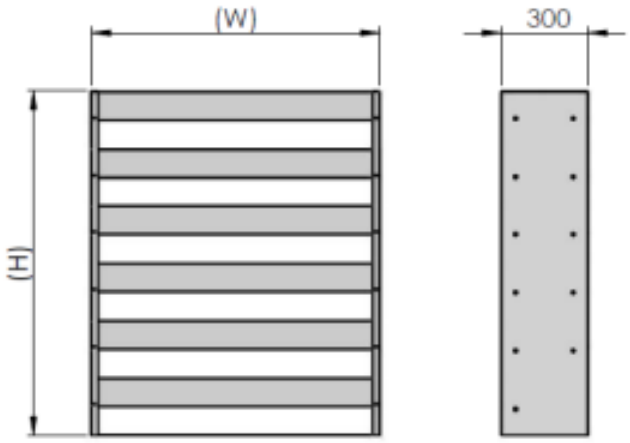
**TRAYNOR ENVIRONMENTAL LTD**

# APPENDIX D – ACOUSTIC LOUVRES

# BASL300
# Acoustic Louvre

Bespoke Acoustic Solutions

www.bas-ltd.co.uk




WIDTH **(W)** AND HEIGHT **(H)** DIMENSIONS GIVEN ON THE EQUIPMENT SCHEDULE ARE AS MANUFACTURED. ADEQUATE CLEARANCE MUST BE ALLOWED WHEN CONSTRUCTING THE BUILDERSWORK OPENING. A MINIMUM CLEARANCE OF 10 mm ALL ROUND IS RECOMMENDED. WHERE WINDPLATES ARE USED PLEASE CONSULT THE OFFICE FOR SPECIFIC RECOMMEDATIONS.
LOUVRES WILL BE SUPPLIED WITHOUT SUPPORT STEELWORK, CLEATS, BRACKETS, FIXINGS, FLASHING, MASTIC, OR OTHER SUCH ITEMS, UNLESS OTHERWISE STATED.
EXCESSIVELY LARGE OR HEAVY LOUVRES MAY BE MANUFACTURED AS MULTI MODULE SECTIONS FOR EASE OF HANDLING.
LOUVRES ARE MANUFACTURED TO STANDARD SHEET METAL TOLERANCES OF +/- 3mm.

**SPECIFICATION**
LOUVRES ARE CONSTRUCTED FROM FOLDED SHEET METAL AND HAVE A SERIES OF HORIZONTAL BLADES CONTAINED WITHIN TWO SIDE FRAMES.
THE MATERIAL OF CONSTRUCTION MAY BE PRE-GALVANISED STEEL, ALUMINIUM OR STAINLESS STEEL. LOUVRE BLADES HAVE LOWER/REAR FACES OF PERFORATED SHEET METAL, CONTAINING A FIBROUS SOUND ABSORBENT INFILL THAT IS NON-SHEDDING, NON-COMBUSTIBLE,NON-HYGROSCOPIC AND CHEMICALLY INERT. THE INFILL IS CAN BE FACED WITH GLASS CLOTH TO MINIMISE FIBRE MIGRATION.
GALVANISED BIRD SCREENS OR NYLON COATED INSECT MESH CAN BE FITED TO THE REAR OF THE LOURVE IF REQUIRED.
CASING SIDES ARE PROVIDED WITH 11mm DIA HOLES FOR FIXING ADJACENT SECTIONS TOGETHER, OR FIXING THE LOUVRE INTO THE BUILDERSWORK OPENING.
LOUVRES ARE SUPPLIED SELF FINISH AS STANDARD OR WITH AN OPTIONAL POLYESTER POWDER FINISH TO A STANDARD RAL/BS COLOUR.

**Sound Reduction Indices (SRI's) obtained from test at Salford University to BS EN ISO 10140-2 : 2010.**
**SRI is equivalent to the Transmission Loss of the Louvre.**

| Frequency Hz | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | Rw |
|---|---|---|---|---|---|---|---|---|---|
| SRI dB | 6 | 7 | 9 | 12 | 19 | 22 | 17 | 15 | 18 |
| Face Velocity m/s | 0.5 | 0.75 | 1 | 1.25 | 1.5 | 1.75 | 2.0 | 2.25 | 2.5 |
| Pressure Drop Pa | 3 | 7 | 12 | 18 | 26 | 35 | 46 | 58 | 71 |
| Weight | | | 41 kg/m2 | | | | | | |
| Visual Free Area * | | | 50% | | | | | | |
| Actual Free Area | | | 34% | | | | | | |

**Bespoke Acoustic Solutions Ltd**
**12 Shield Drive**
Wardley Industrial Estate
Worsley
Manchester
M28 2QB
Tel : 0161 804 4440

**Available Options :**
Peripheral Flanges
Birdguard / Insect Mesh
Single / Double Door sets
Rain Rejection Module
Inclined or Sloping Louvres