ENVIRONMENTAL NOISE SURVEY

FOR

A

LARGE SCALE RESIDENTIAL DEVELOPMENT

AT

PARKMORE INDUSTRIAL ESTATE

LONG MILE ROAD

ROBINHOOD

DUBLIN 12

Prepared for

Watfore Limited

Prepared by:

Traynor Environmental Ltd

Reference Number:

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1.	Draft	28th August 2024	Killian Bannon	Nevin Traynor
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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

Traynor Environmental Ltd has been commissioned to carry out a study in relation to the potential noise impacts incident to the proposed large-scale development at Parkmore Industrial Estate, Long Mile Road, Robinhood, Dublin 12 on behalf of Watfore Limited.

The development will comprise a Large-Scale Residential Development (LRD) on a site at Parkmore Industrial Estate, Long Mile Rd, Robinhood, Dublin, 12. The proposed development will comprise the demolition of existing industrial units, and construction of a mixed use, residential-led development within 4 no. blocks ranging in height from 06 to 10 storeys over semi-basement. The development will comprise the following: 436 no. apartments (studios; 1 beds; 2 beds and 3 beds) with commercial/employment units, creche, café and library. Provision of car, cycle and motorbike parking. Vehicular accesses from Parkmore estate road and additional pedestrian/cyclist accesses from the Long Mile Road and Robinhood Road. Upgrade works to the estate road and surrounding road network. All associated site development works and services provision, open spaces, ESB substations, plant areas, waste management areas, landscaping and boundary treatments.

Included within this report is an assessment of the impact of inward noise across the development site as per the guidance provided in the ProPG: Planning & Noise document. Furthermore, the report assesses the outward noise impact of the construction and operational phases of the development.

Figure 1 & 2 presents the site location of the proposed development.

Figure 1: Site Location Map.

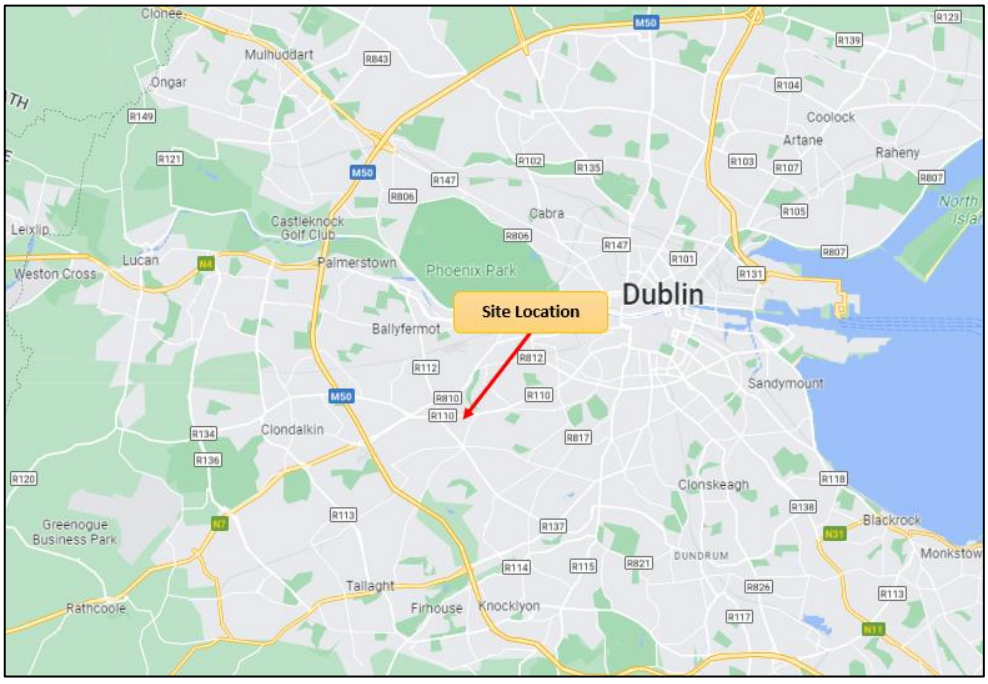
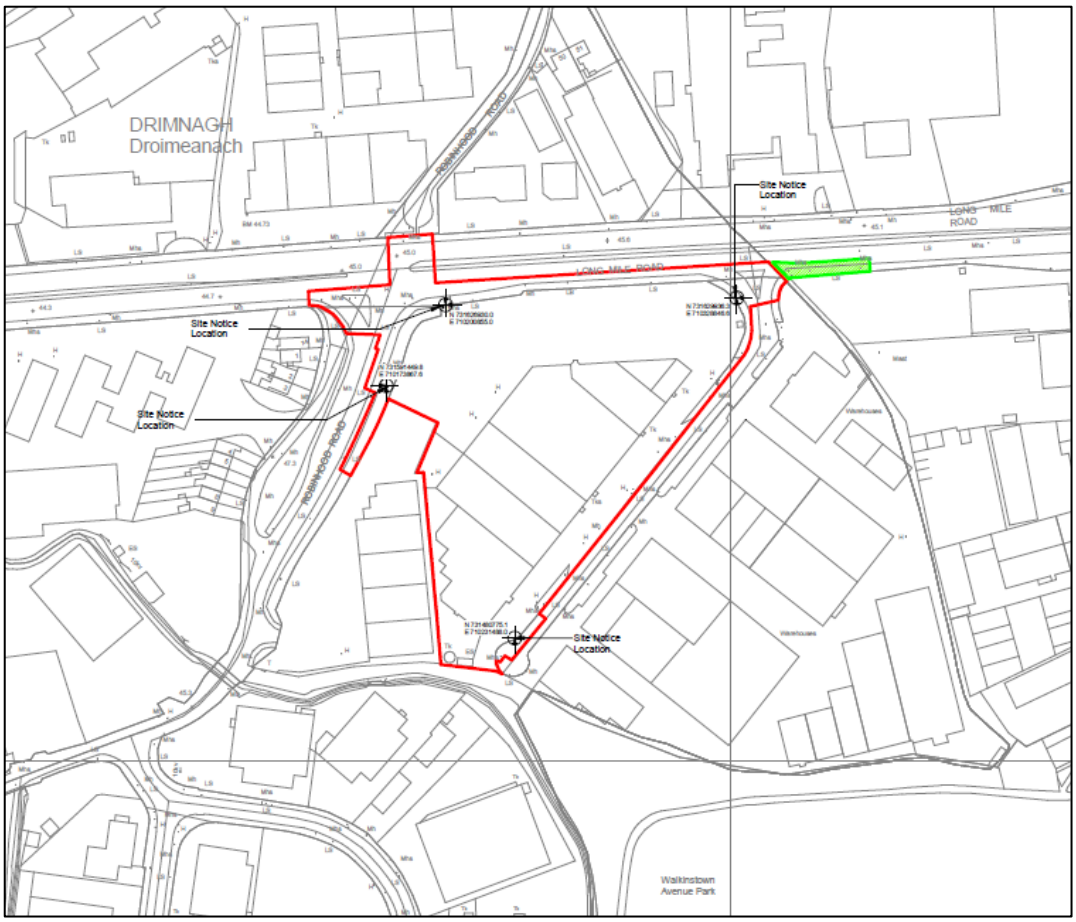


Figure 2: Proposed Site Location with Red Line Boundary



In the first instance it is considered appropriate to review relevant noise and vibration criteria being adopted for the assessment and to present a discussion of the site in the context of the existing noise and vibration environment.

1.2 Statement of Competence

In accordance with Article 5(3)(a) of the EU Directive, by appointing Traynor Environmental, the applicant has ensured that this report has been prepared by "Competent experts".

In accordance with Environmental Protection Agency (EPA) guidance "All competent persons must possess a combination of technical knowledge, experience, and skills, and must be able to demonstrate both practical and theoretical competence and should participate in continual professional development. Competence may be demonstrated through reference to an appropriate qualification and/or professional membership of a recognised acoustic organisation (e.g. the Institute of Acoustics) and/or appropriate experience".

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 25 years' experience in Environmental and Acoustic Consultancy.

2.0 DESIGN CRITERIA

2.1 Inward Noise Assessment

2.1.1 Dublin Agglomeration Environmental Noise Action Plan (NAP) 2024 - 2028

The Environmental Noise Action Plan states the following in terms of the proposed noise control measures to be adopted when considering developments which introduce people to noise:

"***7.5.1 ProPG: Planning & Noise - New Residential Development***

ProPG was published in May 2017 by the Acoustics and Noise Consultants (ANC), Chartered Institute of Environmental Health and UK Institute of Acoustics (IOA). Its primary goal is to aid in planning to deliver sustainable development by promoting good health and well-being in relation to noise. It encourages the use of good acoustic design process in and around proposed new residential development, having regard to national policy.

Any issues related to noise should be given consideration at the earliest stages of the development process to facilitate streamlined decision making in planning. ProPG follows a systematic, proportionate, risk based, two-stage, approach. Stage One is an Initial Site Noise Risk Assessment which should be conducted to establish the level of risk from noise, not including any mitigation measures. There are four noise risk categories (negligible, low, medium and high). The outcome of this assessment should not directly inform a decision, rather to allow for the consideration of good acoustic design. Stage Two is a full noise assessment including four recommended key elements:

- *Element 1 - demonstrating a "Good Acoustic Design Process" avoiding "unreasonable" and preventing "unacceptable" acoustic conditions.*
- *Element 2 - observing "Internal Noise Level Guidelines".*
- *Element 3 - undertaking an "External Amenity Area Noise Assessment".*
- *Element 4 - consideration of "Other Relevant Issues".*

To support proposals for a development an Acoustic Design Statements should be produced which will aid recommendations formulated by the decision maker".

2.1.2 British Standard BS 8233 (2014)

The standard, BS 8233 (2014) Guidelines for Sound Insulation and Noise Reduction for Buildings, sets out recommended internal noise levels for several different building types from external noise sources such as transport noise. The guidance is primarily for use by designers and hence BS 8233 may be used as the basis for an appropriate schedule of noise control measures. The recommended internal noise levels for residential developments are set out below.

Table 1: Summary of recommended internal noise levels from BS 8233 (2014)

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

The document also notes that where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.
In relation to noise levels in external amenity areas, BS 8233 provides the following guidance:

> *"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB L_{Aeq}, T, with an upper guideline value of 55 dB L_{Aeq}, T which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited".*

2.1.3 WHO COMMUNITY NOISE (1999)

The World Health Organization (WHO) document Guidelines for Community Noise (1999) provides the following design criteria and guidelines in relation to noise:

> *"The effects of noise in dwellings, typically, are sleep disturbance, annoyance, and speech interference. For bedrooms, the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30dB L_{Aeq} for continuous noise and 45dB LA_{max} for single sound events. Lower noise levels may be disturbing depending on the nature of the noise source. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35dB L_{Aeq}".*

2.1.4 ProPG: Planning & Noise

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

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

- Stage 1 - Comprises a high-level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels; and,

- Stage 2 – Involves a full detailed appraisal of the proposed development covering four "key elements" that include:

    - Element 1 - Good Acoustic Design Process.
    - Element 2 - Noise Level Guidelines.
    - Element 3 - External Amenity Area Noise Assessment
    - Element 4 - Other Relevant Issues

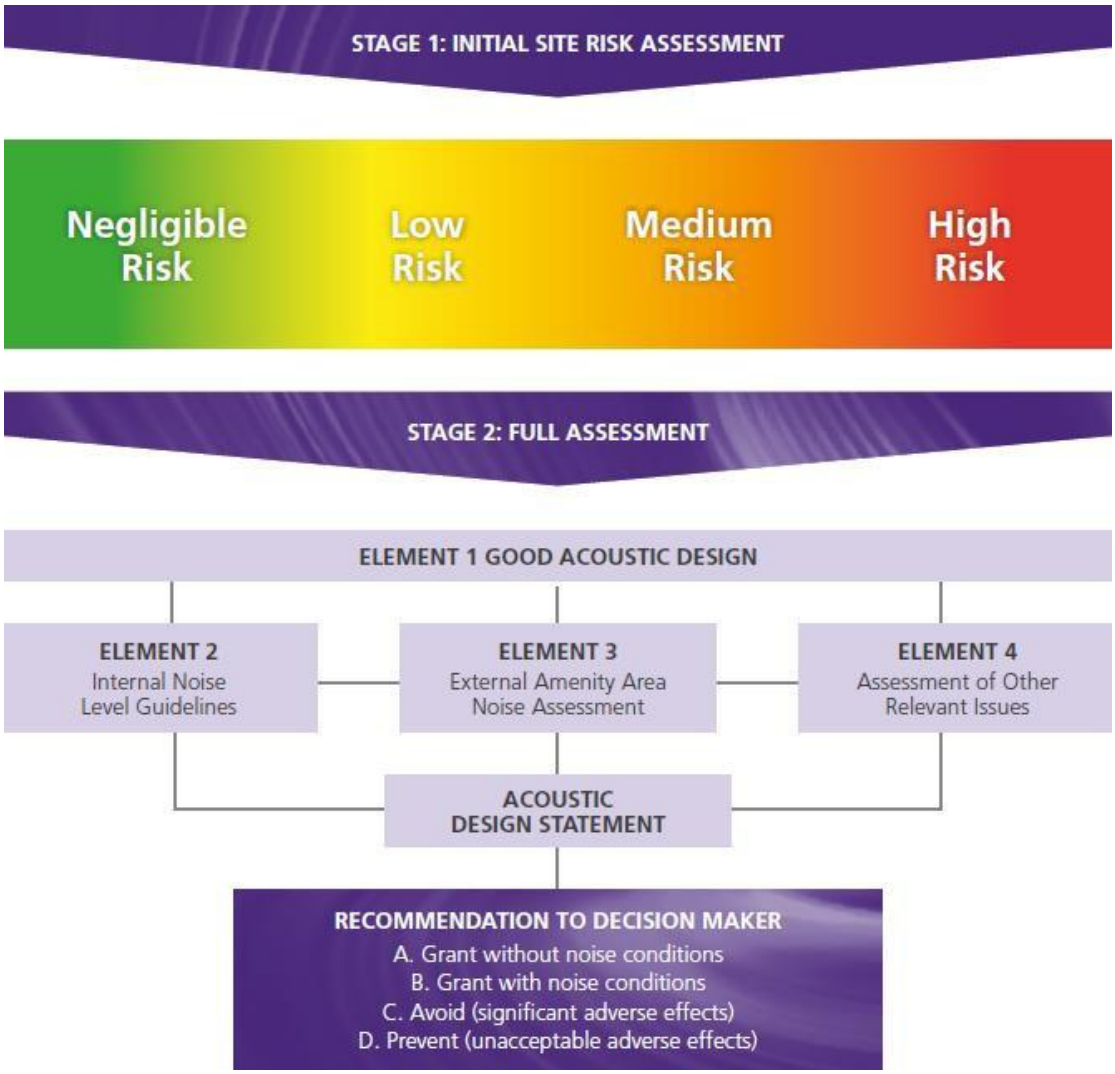
A key component of the evaluation process is the preparation and delivery of an Acoustic Design Statement (ADS) which is intended for submission to the planning authority. This document is intended to clearly outline the methodology and findings of the Stage 1 and Stage 2 assessments, so as the planning authority can make an informed decision on the permission. ProPG outlines the following possible recommendations in relation to the findings of the ADS:

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

Section 3.0 of the ProPG provides a more detailed guide on decision making to aid local authority planners on how to interpret the findings of an accompanying Acoustic Design Statement (ADS).

A summary of the ProPG approach is illustrated in Figure 3.

Figure 3: ProPG Approach (Source: ProPG)



2.1.5 Verification from EPA Strategic Noise Mapping

The background noise and the predevelopment noise model have been verified using the EPA strategic noise mapping. The results of the monitoring were compared against the noise levels expected under the EPA strategic noise round 4 road and rail - Lden mapping.

Figure 4: EPA Strategic Noise Mapping Noise Round 4 Road - Lden Maps at the site (Site marked at X)

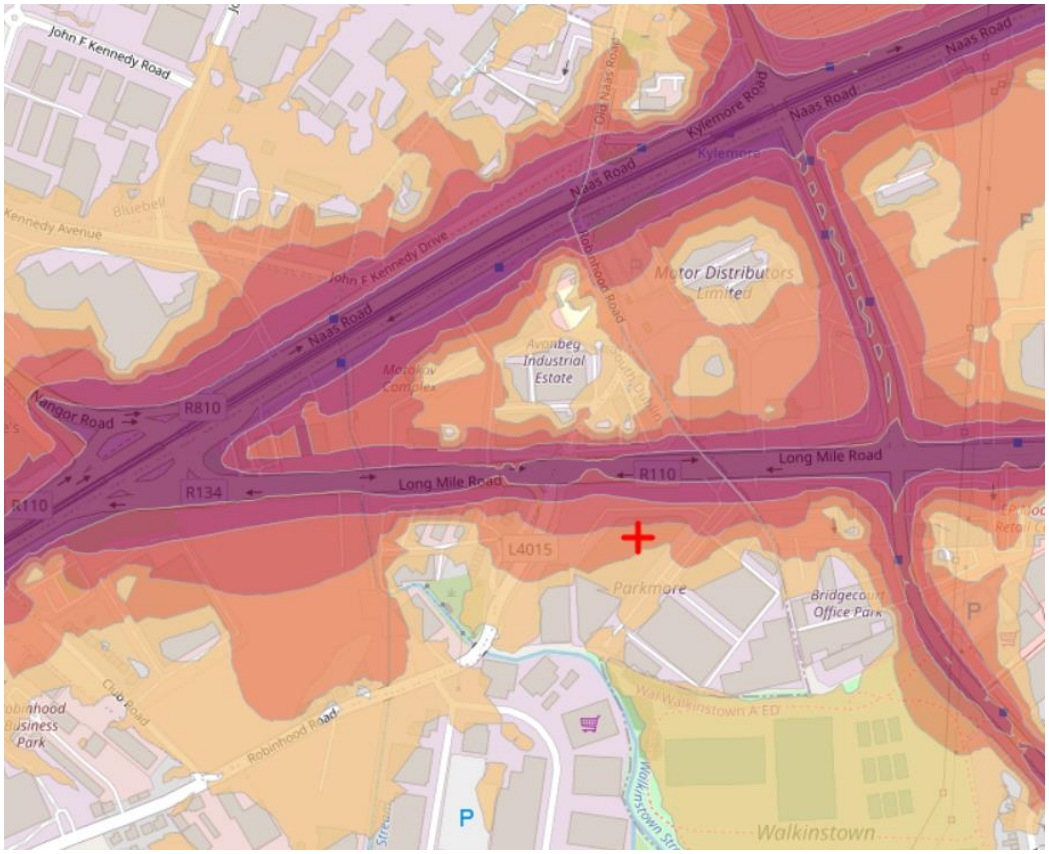
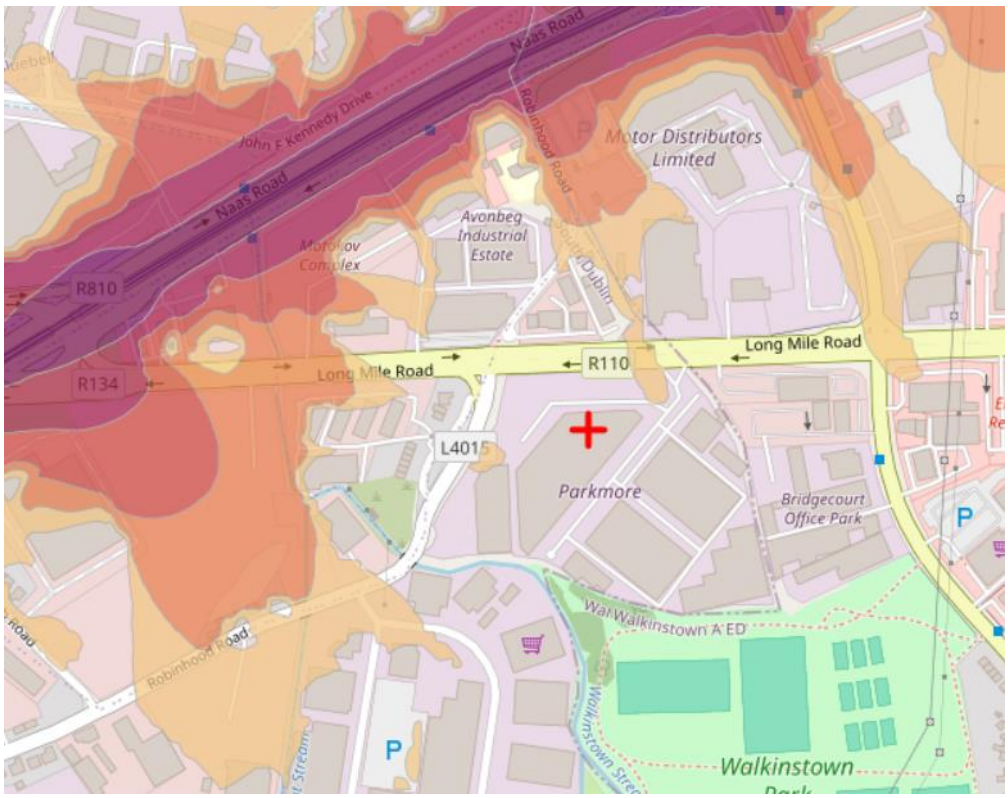


Figure 5: EPA Strategic Noise Mapping Noise Round 4 Rail - L_{den} Maps at the site (Site marked at X)



2.2 Outward Noise Assessment – Construction Phase

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. In lieu of statutory guidance an assessment of significance has been undertaken as per BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise.

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

BS 5228-1:2009+A1:2014 sets out guidance on permissible noise levels relative to the existing noise environment. Table 2 sets out the values which, when exceeded, signify a potential significant effect at the facades of residential receptors.

Table 2: Example threshold of potential 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

[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

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

Comparison of the proposed plans with the surrounding area indicates that the closest area where significant works are to take place from the nearest residential properties with the remainder of works taking place across the site at varying distances.

In order to assess the worst-case scenario to the residential receptors, construction noise levels have been predicted. The calculations also assume that the equipment will operate for 66% of the 12-hour working day (i.e., 8 hours) and that a standard site hoarding, typically 2.4m height, will be erected around the perimeter of the construction site for the duration of works.

2.3 Outward Noise Assessment – Operational Phase

2.3.1 Vehicular Traffic

In order to assist with the interpretation of the noise associated with vehicular traffic on existing public roads, Table 3 offers guidance as to the likely impact associated with any particular change in traffic noise level due to the proposed development (Source DMRB, 2011).

Table 3: Likely Impact Associated with Change in Traffic Noise Level

Change in Sound Level (dB L_{A10})	Subjective Reaction	Magnitude of Impact
0	Inaudible	No Change
0.1 – 2.9	Barely Perceptible	Negligible
3 – 4.9	Perceptible	Minor
5 – 9.9	Up to a doubling of loudness	Moderate
10+	Doubling of loudness and above	Major

2.3.2 Plant Noise Emissions

British Standard 4142: 2014: Methods for Rating and Assessing Industrial and Commercial Sound is the industry standard method for analysing building services plant noise emissions to residential receptors.

BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

For an appropriate BS 4142 assessment it is necessary to compare the measured external background noise level (i.e., the LA_{90}, T level measured in the absence of plant items) to the rating level (LAr, T) of the various plant items, when operational. Where noise emissions are found to be tonal, impulsive in nature or irregular enough to attract attention, BS 4142 also advises that a penalty be applied to the specific level to arrive at the rating level.

The subjective method for applying a penalty for tonal noise characteristics outlined in BS 4142 recommends the application of a 2 dB penalty for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

The following definitions as discussed in BS 4142 as summarised below

"*Ambient noise level, $L_{Ae, T}$*"	is the noise level produced by all sources including the sources of concern, i.e., the residual noise level plus the specific noise of mechanical plant, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
"*Residual noise level, $L_{Ae, T}$*"	is the noise level produced by all sources excluding the sources of concern, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
"Specific noise level, $L_{Aeq, T}$"	is the sound level associated with the sources of

	concern, i.e., noise emissions solely from the mechanical plant, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
"Rating level, $L_{ar,T}$"	is the specific sound level plus any adjustments for the characteristic features of the sound (e.g., tonal, impulsive, or irregular components);
"Background noise level, $L_{A90,T}$"	is the sound pressure level of the residual noise that is exceeded for 90% of the time period T.

If the rated plant noise level is +10 dB or more above the pre-existing background noise level, then this indicates that complaints are likely to occur and that there will be a significant adverse impact. A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.
Please refer to Section 6.1 of this document for details in relation to the recommended plant noise criteria for the development.

3.0 PROPG STAGE 1 – NOISE RISK ASSESSMENT

3.1 Methodology

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium, or high risk based on the pre-existing noise environment.

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

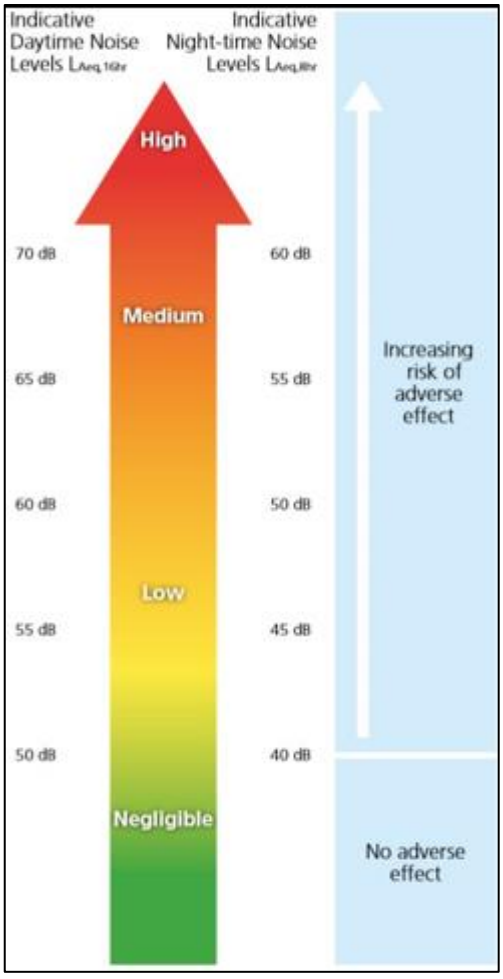
Paragraph 2.9 of ProPG states that,

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

In this instance a computer noise model of the development site has been developed to predict the noise levels across the entire site in order to investigate the initial noise risk. The noise model will use the measured noise levels during the survey, discussed in Section 3.2, to validate the model. Furthermore, the model allows the site to be assessed considering the changes in topography that are required to allow development. This is to comply with the requirements of paragraph 2.8 of ProPG which states,

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

Figure 6: ProPG Noise Risk Assessment



The ProPG advocates a risk-based approach to noise with a two-stage sequential approach, which is:

- *Stage 1 – an initial noise risk assessment of the proposed development site; and*
- *Stage 2 – a systematic consideration of four key elements –*
  Element 1 – demonstrating a 'Good Acoustic Design Process.
  Element 2 – observing internal 'Noise Level Guidelines'.
  Element 3 – undertaking an 'External Amenity Area Noise Assessment' and
  Element 4 – consideration of 'Other Relevant Issues'
- *The ProPG approach is underpinned by the preparation and delivery of an 'Acoustic Design Statement (ADS), whereby the higher the risk the site, the more detailed the ADS. The ADS should address the following issues:*
- *Present the initial site noise risk assessment, including the pre-development acoustic conditions prior to development.*
- *Describe the external noise levels that occur across the site both before and after mitigation measures. The external post mitigation noise assessment should use an informed judgement of typical worst-case conditions.*
- *Demonstrate how good acoustic design is integrated into the overall design and how the proposed acoustic design responds to specific circumstances of the site.*

- *Confirm how the internal noise level guidelines will be achieved, including full details of the design measures, and building envelope specifications.*
- *A detailed assessment of the potential impact on occupants should be undertaken where individual noise events are expected to exceed 45 dB L_{AFmax} more than 10 times a night inside bedrooms.*
- *Priority should be given to enable the use of openable windows where practical across the development. Where this is not practical to achieve the internal noise level guidelines with windows open, then full details of the proposed ventilation and thermal comfort arrangements must be provided.*
- *Present the findings of the external amenity area noise assessment.*
- *Present findings of the assessment of other relevant issues.*
- *Confirm for a low-risk site, however adverse impacts of noise will be mitigated and minimised.*
- *Confirm for a medium or high noise risk site how adverse impacts of noise will be mitigated and minimised and clearly demonstrate that a significant adverse noise impact has been avoided.*

3.2 Environmental Noise Survey

Environmental noise surveys have been conducted in order to quantify noise emissions across the existing site. The external survey was conducted in general accordance with ISO1996-2:2017 Acoustics - Description, Measurement and Assessment of Environmental Noise -- Determination of Environmental Noise Levels. Specific details are set out in the following sections.

3.2.1 Methodology

An unattended environmental noise survey was conducted at the site from the 08th -09th of August 2024 by Traynor Environmental Ltd in order to quantify the existing noise environment. Additional attended 'spot' measurements were undertaken on the 08th - 09th of August 2024. The approximate noise measurement locations were selected at the proposed site as shown in Figure 7.

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice and no drift was observed.

Measurements were taken in general accordance with BS 7445-1:2003 The Description and Measurement of Environ-mental Noise: Guide to quantities and procedures. Weather conditions during the survey period were observed as being dry with no showers. Anemometer readings confirmed that wind speeds were less than 2.2 – 3.5 m/s at all times during the surveys.

3.2.2 Measurement Parameters

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

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

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

L_{AFMin} is the minimum sound pressure level recorded during the sample period.

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_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for back-ground noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to 2x10-5 Pa.

3.3 Survey Period

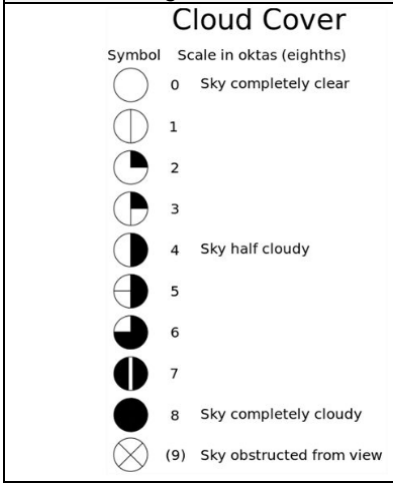
Noise levels were logged over 30-minute periods at each location,

Table 4: Instrumentation Details.

Instrumentation Details		
Manufacturer	**Instrument**	**Calibrated by**
Larson Davis Sound Expert 831	(Serial No.3913)	Environmental Measurements, Unit 12, Tallaght Business Park, Dublin 24
Larson Davis Sound Expert LxT	(Serial No.5901)	Environmental Measurements, Unit 12, Tallaght Business Park, Dublin 24
Larson Davis Sound Expert LxT	(Serial No.5595)	Environmental Measurements, Unit 12, Tallaght Business Park, Dublin 24

3.4 Weather Conditions

Table 5: Meteorological Conditions during the Survey – 08th – 09th August 2024

Date/Time	Weather Conditions		
	Description	**At the Start of Survey**	**On Completion**
08th – 09th August 2024	Temperature	15 ℃	23 ℃
	Precipitation	Dry	Dry
	Cloud cover	5	4
	Any fog/snow/ice	No	No
	Any damp roads/wet ground	Yes	No
	Wind Speed	2.2m/s	3.5 m/s
	Wind Direction	South	South
	Any conditions that may cause temp, inversion (e.g., calm nights with no cloud)	No	No

3.5 Survey Location

Location No.1 – is located within the development to the west boundary and is near Robinhood road.

Location No.2 – is located within the development site to the north-western corner of the site boundary and is near the Robinhood Road and Long Mile Road (R110).

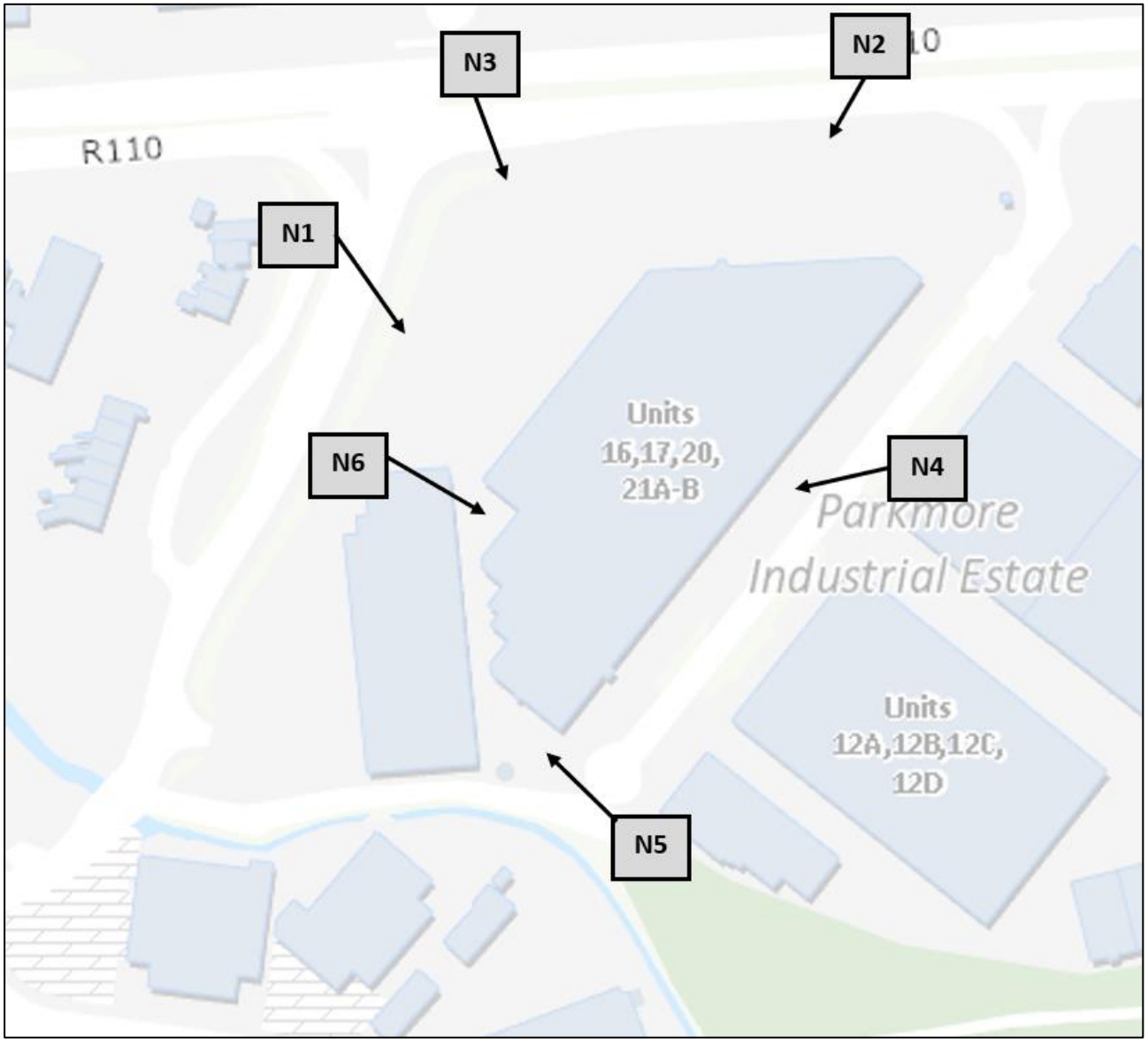
Location No.3 - is located within the development to the northern boundary of the site and is near the Long Mile Road (R110).

Location No.4 – is located within the development to the southeast boundary of the site and near the industry estate road and industrial units.

Location No.5 – is located to the southwestern corner of the site beside industrial units.

Location No.6 - is located within the development to the west boundary of the site and is near Industrial units.

Figure 7: Noise Monitoring Locations



3.6 Survey Results (Unattended Environmental Noise Survey)

Table below presents a summary of noise levels measured during the unattended environmental noise survey for both day and night-time periods from 08th to the 09th of August 2024.

Table 6 – Night-time Unattended Measured Noise Levels (N1)

Date	Time	L_{AFeq}	L_{AFmax}	L_{AF10}	L_{AF90}
08-08-2024	23:00:00	56	72	59	47
08-08-2024	23:30:00	55	69	59	46
09-08-2024	00:00:00	55	71	59	46
09-08-2024	00:30:00	54	69	59	44
09-08-2024	01:00:00	51	68	55	42
09-08-2024	01:30:00	51	65	55	42
09-08-2024	02:00:00	51	67	54	43
09-08-2024	02:30:00	52	66	56	43
09-08-2024	03:00:00	52	67	56	42
09-08-2024	03:30:00	52	65	56	44
09-08-2024	04:00:00	52	71	56	44
09-08-2024	04:30:00	53	68	57	45
09-08-2024	05:00:00	56	69	59	47
09-08-2024	05:30:00	58	68	61	51
09-08-2024	06:00:00	59	70	62	53
09-08-2024	06:30:00	60	72	63	55
Average		**54**	**69**	**58**	**46**

Table 7 -Daytime Unattended Measured Noise Levels (N)

Date	Time	L_{AFeq}	L_{AFmax}	L_{AF10}	L_{AF90}
09-08-2024	07:00:00	59	71	62	54
09-08-2024	07:30:00	60	80	62	55
09-08-2024	08:00:00	60	73	62	56
09-08-2024	08:30:00	60	70	62	56
09-08-2024	09:00:00	60	73	62	56
09-08-2024	09:30:00	60	70	62	56
09-08-2024	10:00:00	59	74	62	55
09-08-2024	10:30:00	60	75	62	56
09-08-2024	11:00:00	61	75	63	57
09-08-2024	11:30:00	62	89	63	57
09-08-2024	12:00:00	60	73	63	56
09-08-2024	12:30:00	60	72	62	56
09-08-2024	13:00:00	61	82	63	57
09-08-2024	13:30:00	61	80	63	56
09-08-2024	14:05:43	60	74	62	56
09-08-2024	14:30:00	60	75	62	57
09-08-2024	15:00:00	61	77	63	56
09-08-2024	15:30:00	61	82	62	56
09-08-2024	16:00:00	60	74	62	57
09-08-2024	16:30:00	60	75	62	56
09-08-2024	17:00:00	59	70	62	55
09-08-2024	17:30:00	61	80	62	54
09-08-2024	18:00:00	59	73	62	53
09-08-2024	18:30:00	59	74	62	51
09-08-2024	19:00:00	58	77	62	51
09-08-2024	19:30:00	59	81	63	51
09-08-2024	20:00:00	58	70	61	50
09-08-2024	20:30:00	59	84	61	50
09-08-2024	21:00:00	57	75	61	48
09-08-2024	21:30:00	57	68	60	49
09-08-2024	22:00:00	57	72	61	48
09-08-2024	22:30:00	56	77	60	45
Average		**59**	**75**	**62**	**54**

LAF_{max} values were measured at 30-minute intervals over the duration of the unattended monitoring surveys. Figures below presents the number of measured LAF_{max} events for various decibel levels during the night period.

Figure 8: LAF_{max} Monitoring Data for N1 from 08/08/2024 – 09/08/2024

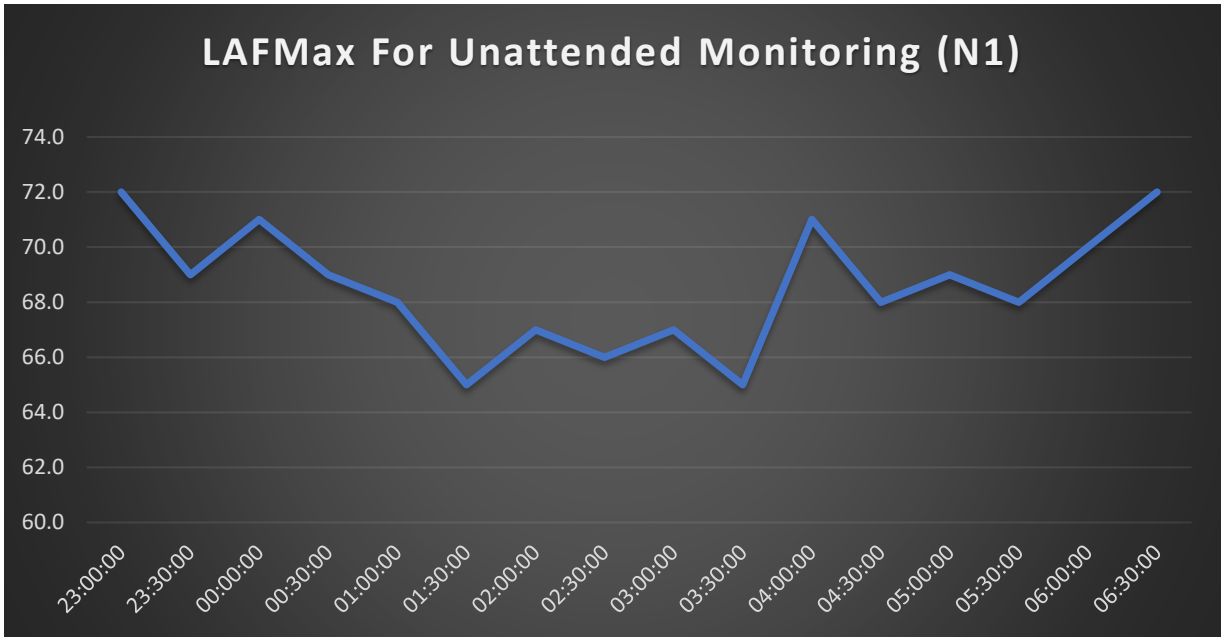
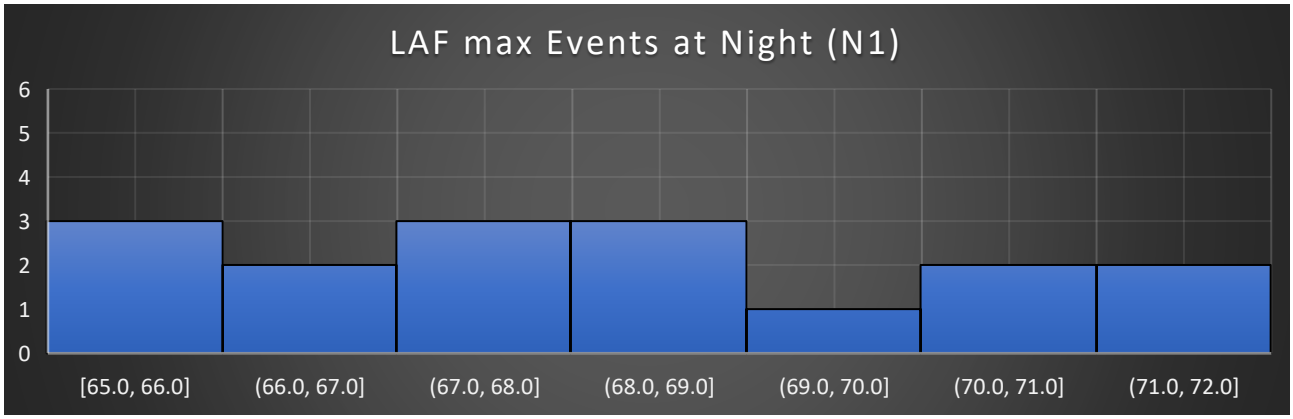


Figure 9: Distribution of the magnitude of L_{AFmax} events (N1)



As can be seen the L_{AFmax} values typically range from 65 to 72dB during the night period at points N1.

Table 8 – Night-time Unattended Measured Noise Levels (N2)

Date	Time	L_{AFeq}	L_{AFmax}	L_{AF10}	L_{AF90}
08-08-2024	23:00:00	70	86	75	54
08-08-2024	23:30:00	69	85	74	52
09-08-2024	00:00:00	69	87	74	52
09-08-2024	00:30:00	69	87	72	48
09-08-2024	01:00:00	66	85	69	45
09-08-2024	01:30:00	65	84	67	46
09-08-2024	02:00:00	65	82	67	47
09-08-2024	02:30:00	66	83	69	46
09-08-2024	03:00:00	66	85	67	46
09-08-2024	03:30:00	66	83	70	48
09-08-2024	04:00:00	66	85	69	49
09-08-2024	04:30:00	67	84	69	49
09-08-2024	05:00:00	68	90	72	52
09-08-2024	05:30:00	71	87	76	57
09-08-2024	06:00:00	72	92	77	58
09-08-2024	06:30:00	74	85	78	62
Average		**68**	**86**	**72**	**51**

Table 9 -Daytime Unattended Measured Noise Levels (N2)

Date	Time	L_{AFeq}	L_{AFmax}	L_{AF10}	L_{AF90}
09-08-2024	07:00:00	73	85	77	63
09-08-2024	07:30:00	73	86	77	63
09-08-2024	08:00:00	73	95	76	62
09-08-2024	08:30:00	72	85	76	62
09-08-2024	09:00:00	71	83	75	61
09-08-2024	09:30:00	72	87	75	62
09-08-2024	10:00:00	71	87	75	62
09-08-2024	10:30:00	72	83	76	62
09-08-2024	11:00:00	71	85	75	63
09-08-2024	11:30:00	73	96	75	63
09-08-2024	12:00:00	71	83	75	64
09-08-2024	12:30:00	72	85	75	63
09-08-2024	13:00:00	71	84	75	63
09-08-2024	13:30:00	71	83	75	63
09-08-2024	14:05:43	71	84	75	64
09-08-2024	14:30:00	72	88	74	63
09-08-2024	15:00:00	71	87	75	63
09-08-2024	15:30:00	71	85	75	63
09-08-2024	16:00:00	70	86	74	62
09-08-2024	16:30:00	71	85	75	63
09-08-2024	17:00:00	71	84	75	62
09-08-2024	17:30:00	71	84	75	61
09-08-2024	18:00:00	72	88	76	61
09-08-2024	18:30:00	73	89	76	60
09-08-2024	19:00:00	73	90	76	61
09-08-2024	19:30:00	74	93	78	61
09-08-2024	20:00:00	73	87	77	58
09-08-2024	20:30:00	72	86	77	59
09-08-2024	21:00:00	72	85	77	58
09-08-2024	21:30:00	72	85	76	59
09-08-2024	22:00:00	73	86	77	59
09-08-2024	22:30:00	71	84	76	56
Average		**72**	**86**	**76**	**62**

LAF_{max} values were measured at 30-minute intervals over the duration of the unattended monitoring surveys. Figures below presents the number of measured LAF_{max} events for various decibel levels during the night period.

Figure 10: LAF_{max} Monitoring Data for N2 from 08/08/2024 – 09/08/2024

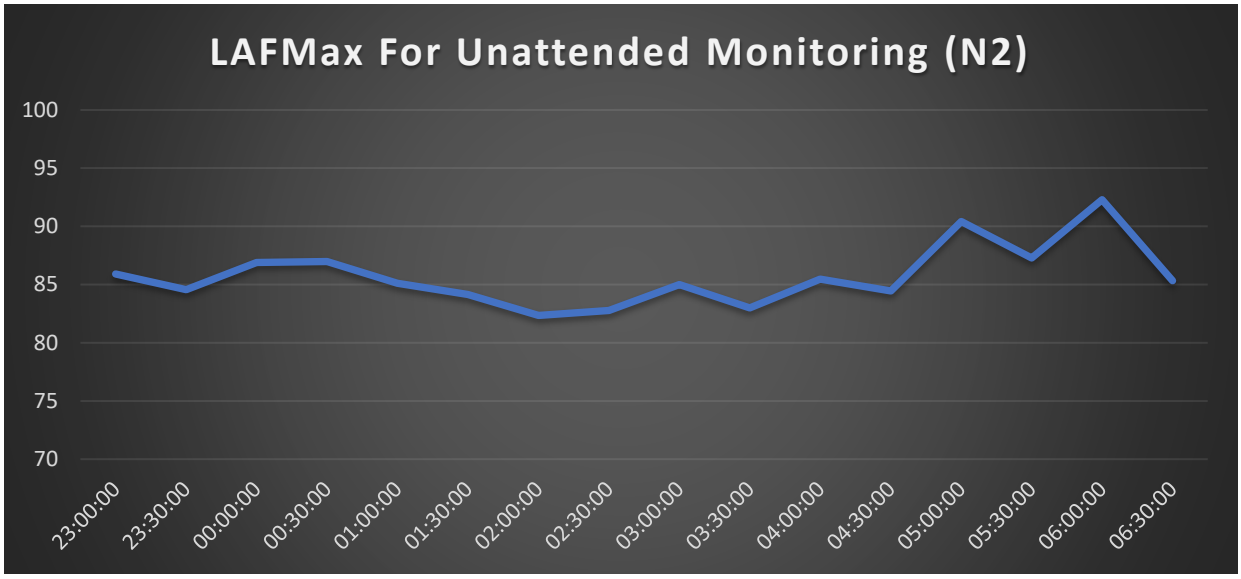
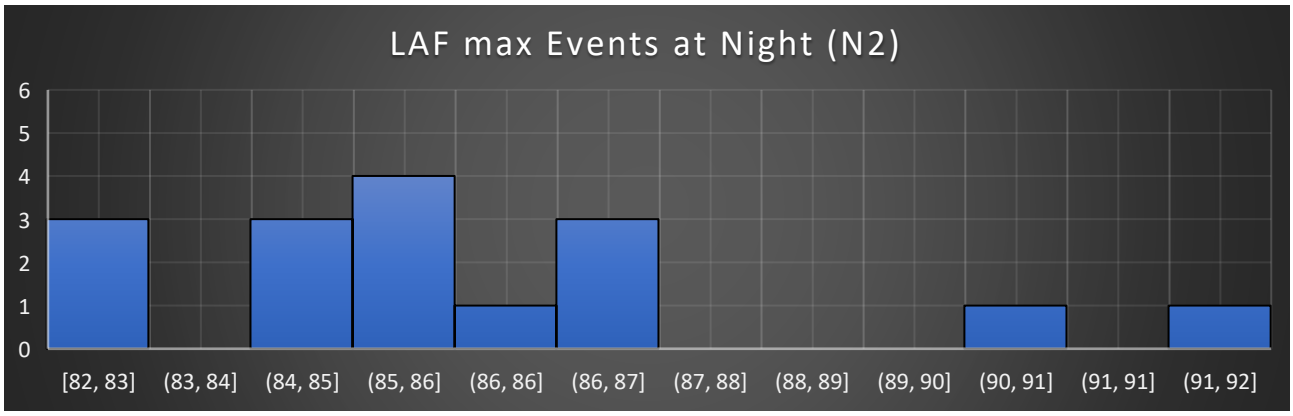


Figure 11: Distribution of the magnitude of LAFmax events (N6)



As can be seen the L_{AFmax} values typically range from 82 to 92 dB during the night period at points N2.

In addition to the unattended monitor, various attended spot measurements were conducted around the site. The results of these measurements are presented in tables below.

3.7 Survey Results (Additional attended 'spot' measurements)

Four short term measurement locations were selected as shown in Figure 7 and the tables below. These were completed along with the Unattended Environmental Noise Survey. Table below presents a summary of noise levels measured during the noise survey for both day and night-time periods from 08th - 09th August 2024.

Table 10: 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)	09:00 - 09:30	67	63	56	89
	09:30 - 10:00	66	65	58	84
	10:00 - 10:30	66	64	57	83
	Average	**66**	**64**	**57**	**85**
Location No.3 (Night)	23:30 – 00:00	56	59	50	72
	00:00 – 00:30	54	57	49	70
	Average	**56**	**58**	**50**	**71**

Table 11: 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)	11:00 - 11:30	64	66	61	79
	11:30 - 12:00	64	65	56	82
	12:00 - 12:30	63	64	55	78
	Average	**64**	**65**	**57**	**70**
Location No.4 (Night)	01:00 – 01:30	55	58	49	71
	01:30 – 02:00	55	59	50	71
	Average	**55**	**59**	**50**	**71**

Table 12: 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)	13:00 - 13:30	60	61	54	80
	13:30 - 14:00	59	60	53	78
	14:00 - 14:30	60	61	53	79
	Average	**60**	**61**	**53**	**79**
Location No.5 (Night)	03:00 – 03:30	51	54	45	69
	03:30 – 04:00	50	53	44	68
	Average	**51**	**54**	**45**	**69**

Table 13: Noise Survey at Location No.6

Monitoring Location	Period	L_{Aeq}dB	L_{A10}dB	L_{A90}dB	L_{Amax}dB
Location No.6 (Day)	15:00 - 15:30	59	61	53	77
	15:30 - 16:00	60	62	54	78
	16:30 - 17:00	60	62	55	79
	Average	**60**	**62**	**54**	**78**
Location No.6 (Night)	04:30 – 05:00	49	53	44	66
	05:00 – 05:30	51	54	45	67
	Average	**50**	**54**	**45**	**67**

Table 14: Noise Survey Summary (Daytime)

Monitoring Location	L_{Aeq}dB	L_{A10}dB	L_{A90}dB	L_{Amax}dB
Location No.3	66	64	57	85
Location No.4	64	65	57	70
Location No.5	60	61	53	79
Location No.6	60	62	54	78

Table 15: Noise Survey Summary (Nighttime)

Monitoring Location	L_{Aeq}dB	L_{A10}dB	L_{A90}dB	L_{Amax}dB
Location No.3	56	58	50	71
Location No.4	55	59	50	71
Location No.5	51	54	45	69
Location No.6	50	54	45	67

The noise climate at the site is dominated by road traffic noise from Long Mile Road (R110) to the north of the site and from the Robinhood Road to the west of the site. The industrial estate roads are also a contribution to noise across the site. Background noise from people working in the neighbouring industrial estates was also noise source at the proposed site. During the survey traffic flow on the Long Mile Road (R110) was noted as being continuous during the daytime and frequent at night-time. The traffic flow on the Robinhood Road was noted as being frequent during the daytime and infrequent during the night-time.

3.8 Noise Model of Site

3.8.1 Methodology

Proprietary noise calculation software was used for the purposes of establishing the prevailing noise levels on the proposed site. The selected software, SoundPlan, calculates noise levels in on the Department of Transport Calculation of Road Traffic Noise (CoRTN) and ISO 9613 noise propagation methodology.

The following information was included in the model:

- Site layout drawings of the proposed development.
- OS mapping of the surrounding environment, and
- Topographical survey data for the development and adjacent road.

3.8.2 Model Validation

Noise levels recorded during the environmental noise survey were used to calibrate the noise model. It is considered that a strong correlation in respect of predicted noise levels has been achieved. Noise levels are calculated over daytime periods, i.e., 07:00 to 23:00 hrs and night-time periods, 23:00 to 07:00 hrs. Table 16-17 details the results of the noise model predictions and compares them to the measured values at each survey location.

Table 16: Daytime Modelled vs. Monitored Results L_{Aeq}, T

Monitoring Position	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between modelled and measured noise level (dB)
N1	59	62	3
N2	72	73	1
N3	66	68	2
N4	64	63	1
N5	60	58	2
N6	60	59	2

All values are sound pressure levels in dB re: 2x 10-5 Pa.

Table 17: Night-time Modelled vs. Monitored Results L_{Aeq}, T

Monitoring Position	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between modelled and measured noise level (dB)
N1	54	57	3
N2	68	68	0
N3	56	58	2
N4	55	57	2
N5	51	53	2
N6	50	52	2

All values are sound pressure levels in dB re: 2x 10-5 Pa.

As all of the verification points show a divergence between monitored and modelled results of no more than 3 dB, the models are considered suitably verified.

3.8.3 Noise Model Output

To assess the initial noise risk assessment across the development site the noise model has been used to prepare noise contour maps for both daytime and night-time periods. These maps are presented in Figures 12 to 15.

Figure 12: Daytime Noise Levels Undeveloped Site

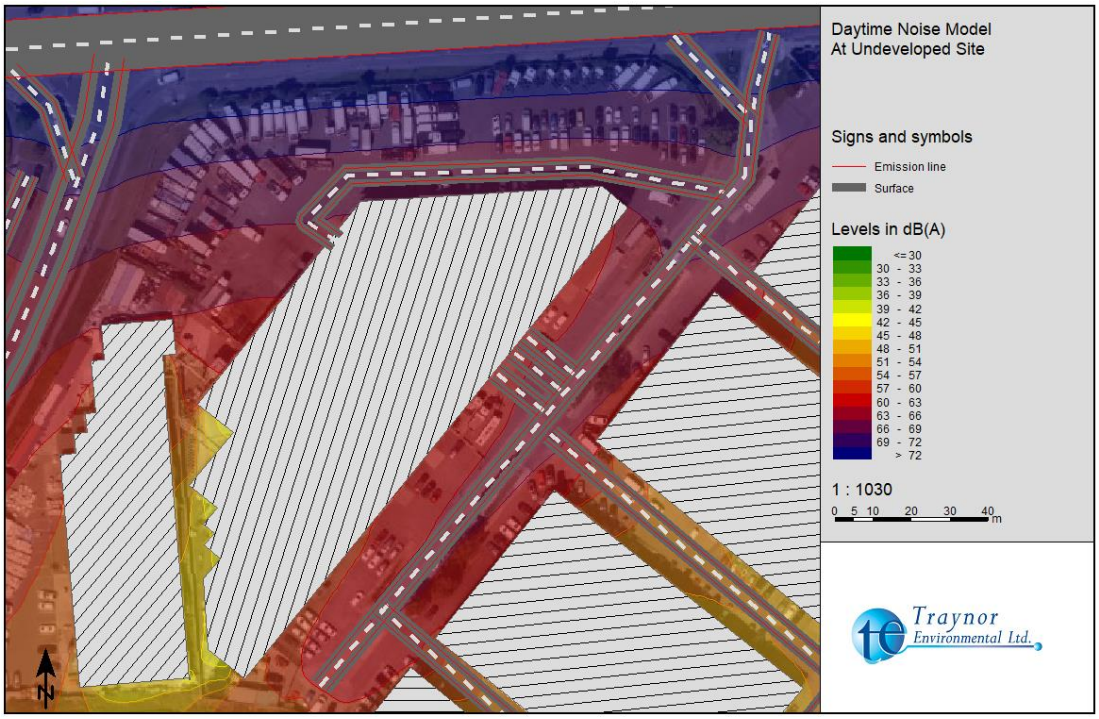


Figure 13: Night-time Noise Levels Undeveloped Site

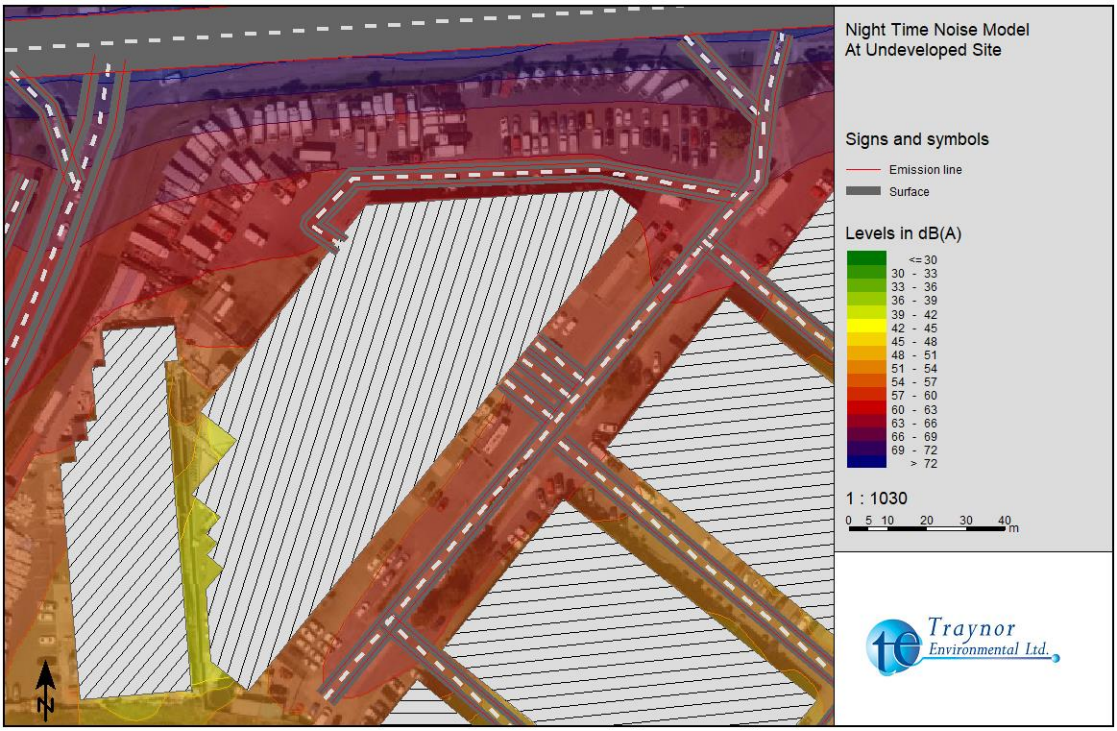


Figure 14: Daytime Noise Levels at Developed Site

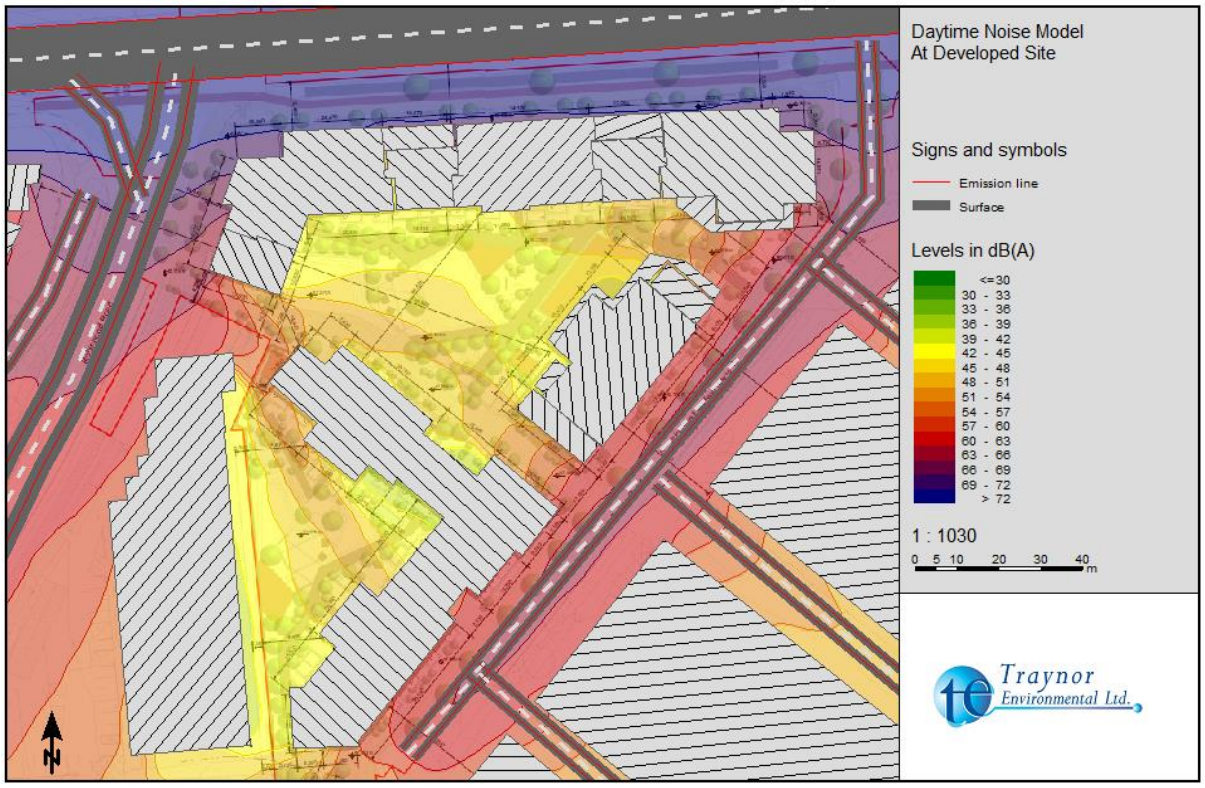
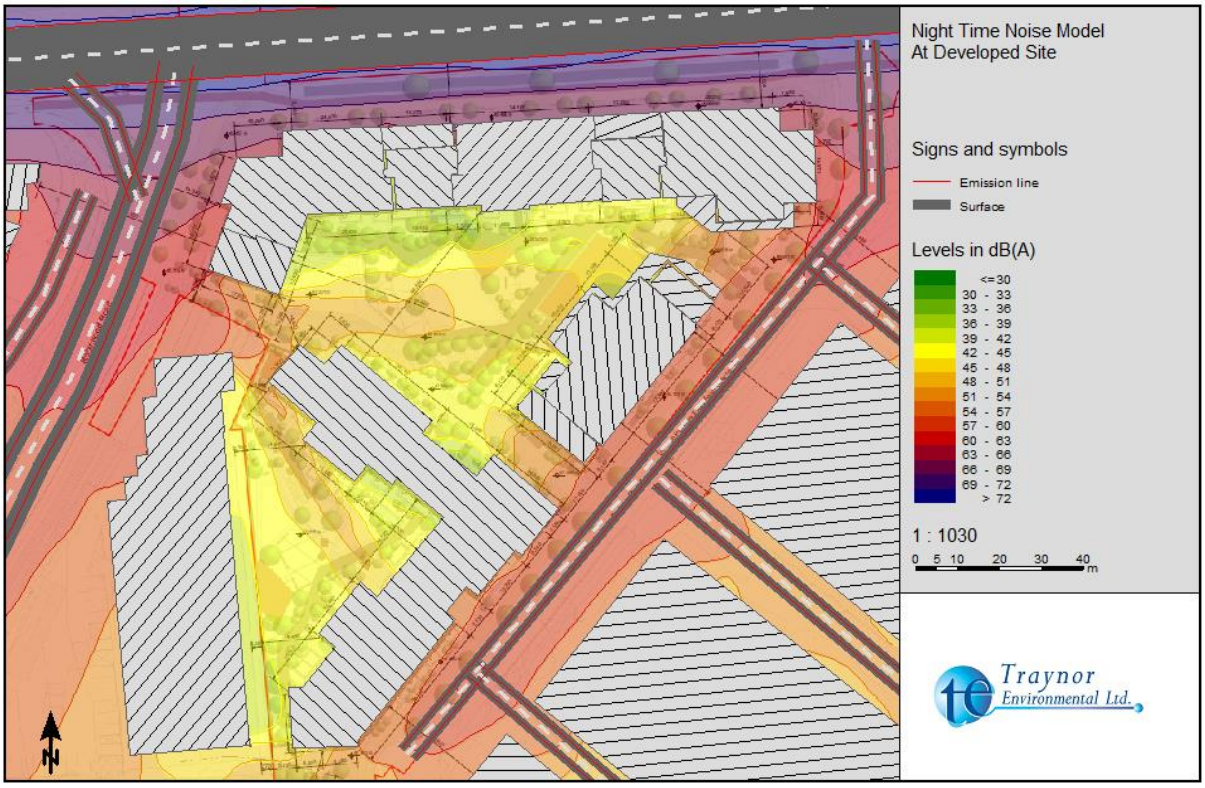


Figure 15: Night-time Noise Levels at Developed Site



3.9 Noise Risk Assessment Conclusion

The Stage 1 Noise Risk Assessment requires analyses of the LAF_{max} noise levels. In the case of the Traynor Environmental Ltd survey the LAF_{max} noise levels typically ranged from 82 to 92 dB during the night at N2. The results indicate that there is the potential for LAF_{max} noise levels to exceed 80 dB more than 20 times per night at the site. ProPG recommends that a site is considered as high risk if the LAF_{max} noise levels exceed 80 dB more than 20 times per night. The proposed site is considered as high risk.

ProPG states the following with respect to high risks:

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

Given the above it can be concluded that the development site may be categorised as high risk and as such an Acoustic Design Strategy will confirm how the adverse impacts of noise will be mitigated and minimised and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.

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

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

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

4.0 ProPG STAGE 2 – ACOUSTIC DESIGN STATEMENT

4.1 Element 1 – Good Acoustic Design Process

4.1.1 ProPG Guidance

In practice, good acoustic design should deliver the optimum acoustic design for a particular site without adversely affecting residential amenity or the quality of life or occupants or compromising other sustainable design objectives. It is important to note that ProPG specifically states that good acoustic design is not equivalent to overdesign or "gold plating" of all new development but that it seeks to deliver the optimum acoustic environment for a given site.

Section 2.23 of the ProPG outlines the following checklist for Good Acoustic Design (GAD):

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

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

4.1.2 Application of GAD Process to Proposed Application

Relocation or Reduction of Noise from Source

The Long Mile Road (R110) and Robinhood Road is located outside the redline boundary of the site and therefore it is beyond the scope of this development to introduce any noise mitigation at source.

Planning, Layout and Orientation

Mitigating against noise from the neighbouring roads and industrial estates has formed an integral part of the design process. This exercise established that the most appropriate and beneficial form of mitigation is the positioning of the buildings facing Long Mile Road (R110) to act as a barrier.

Select Construction Types for meeting Building Regulations

Masonry constructions will be used in constructing the external walls of the development. This construction type offers high levels of sound insulation performance. However, as is typically the case the glazed elements and ventilation will be the weakest elements in the façade in terms of sound insulation performance.

Consideration will therefore be given to the provision of upgraded glazing and mechanical ventilation. The proposal here will be to provide dwelling units with glazed elements that have good acoustic insulation properties so that when the windows are closed the noise levels internally are good.

In order to ensure indoor air-quality, a mechanical ventilation system with heat recovery will be utilised as per Part F of the Building Regulations, providing the requisite air changes per hour. The fresh air provided to all the apartments is tempered and

filtered as part of the delivery process. Residents will not need to open their windows in terms of providing fresh air. In terms of extract, all of the bathrooms, kitchens and utility spaces will be exhausted to the outside via the mechanical ventilation system on a continuous basis. Inhabitants will be able to open the windows if they wish, however, doing so will increase the internal noise level. This approach to mitigation is supported in ProPG where it states the following:

2.22 Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided; occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open. Solely relying on sound insulation of the building envelope to achieve acceptable acoustic conditions in new residential development, when other methods could reduce the need for this approach, is not regarded as good acoustic design. Any reliance upon building envelope insulation with closed windows should be justified in supporting documents "

Note 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g., trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal LAeq target levels should not normally be exceeded

2.34 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g., trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal LAeq target levels should not normally be exceeded

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

The good acoustic design measures that have been implemented on site, e.g., placing outdoor space on the quiet side of buildings, are considered to be cost neutral and do not have any significant impact on other issues.

Assess Viability of Alternative Solutions

It is considered to use the following glazing:
Façade along Long Mile Road: Sound insulation performance of 43dB Rw
Façade along Robinhood Road: Sound insulation performance of 40dB Rw
Façade along industrial estate: Sound insulation performance of 35dB Rw
All other facades: Standard glazing (sound insulation performance of 31dB Rw

This glazing will attenuate traffic and industrial estate noise would be effective providing, they comply with industry standard. Please see Appendix D for glazing locations.

Assess External Amenity Area Noise

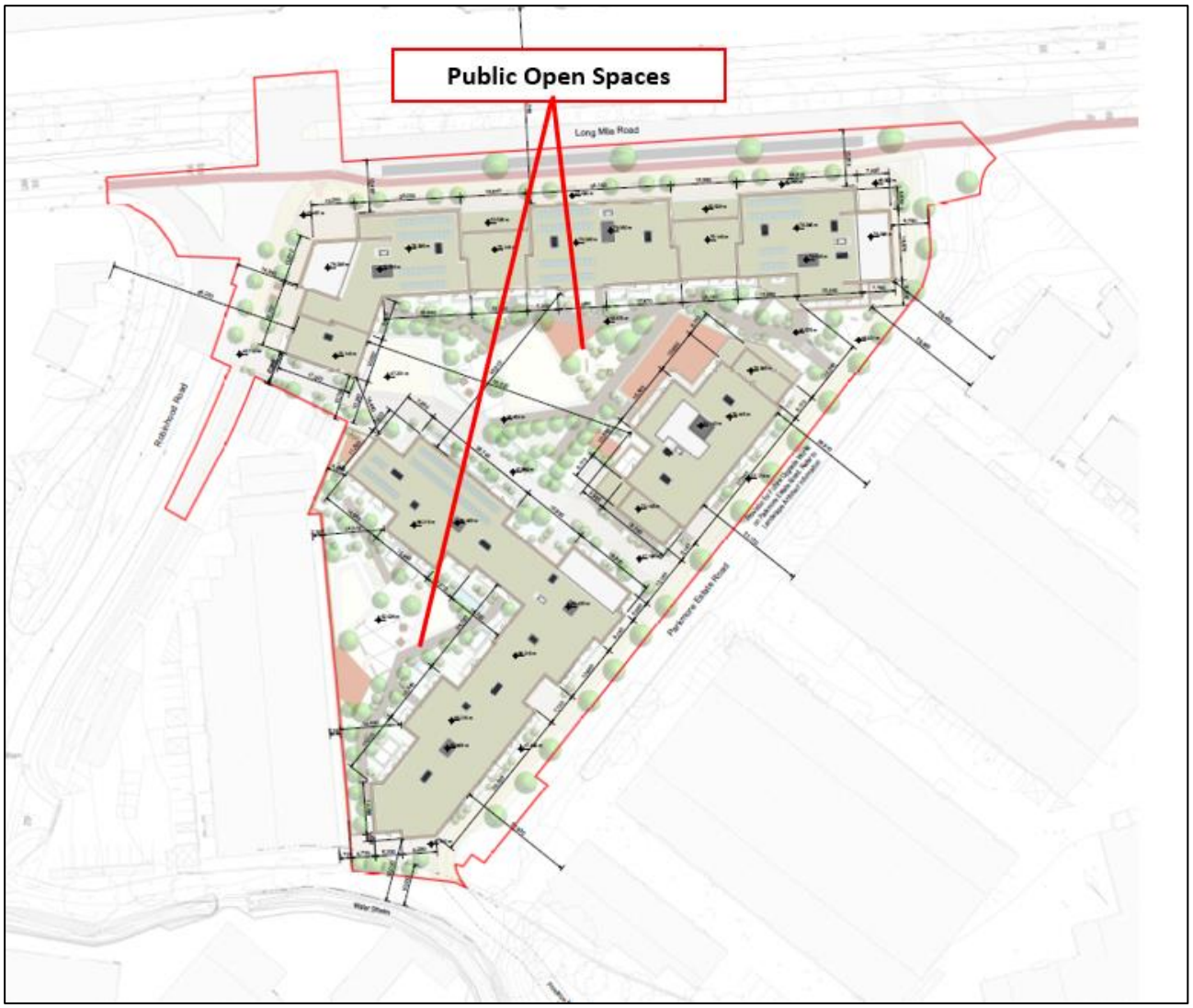
ProPG provides the following advice with regards to external noise levels for amenity areas in the development:

"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB LAeq,16hr."

In general, it is expected to achieve daytime noise levels of the order of 55 dB LAeq,16hr or lower at ground level. Referring to the guidance in ProPG this level of external noise would be considered to offer good amenity for an outdoor space.

There are open spaces onsite. Figure 16 illustrates that the open spaces. The vast majority of the open spaces achieves a noise level ≤ 55 dB LAeq,16hr.

Figure 16: Open Spaces



Summary

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

In terms of viable alternatives to acoustic treatment of façade elements, there are no further options for mitigation outside of proprietary glazing and mechanical ventilation.

4.2 Element 2 – Internal Noise Guidelines

4.2.1 Internal Noise Criteria

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 and WHO's Community Noise Guidelines. The recommended indoor ambient noise levels are set out in Table 18 and are based on annual average data, that is to say they omit occasional events such as New Year's Eve.

Table 18: ProPG Internal Noise Levels

Activity	Location	(07:00 to 23:00hrs)	(23:00 to 07:00hrs)
Resting	Living room	35 dB LAeq,16hr	-
Dining	Dining room/area	40 dB LAeq,16hr	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq,16hr	30 dB LAeq,8hr 45 dB Lama, T*

*Note: The document comments that the internal LAFmax, T noise level may be exceeded no more than 10 times per night without a significant impact occurring.

Considering the external noise levels, it will be necessary to use glazing and mechanical ventilation to meet the recommended internal noise levels.

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

4.2.2 Façade Levels

Table 19 along with Figures 17 and 18 present the noise levels predicted to be incident on the façade during:

1. Day periods (16hr) when developed.
2. Night-time periods (8hr) when developed.

Figure 17: Designation of Predicted Noise Levels for Each Façade (Lower Levels)

Figure 18: Designation of Predicted Noise Levels for Each Façade (Upper Levels)

Table 19: Summary of Predicted Façade Noise Levels

Ref	Period	LAeq, T dB
N1	Day (16hr)	73
	Night (8hr)	68
N2	Day (16hr)	76
	Night (8hr)	71
N3	Day (16hr)	76
	Night (8hr)	71
N4	Day (16hr)	76
	Night (8hr)	71
N5	Day (16hr)	71
	Night (8hr)	66
N6	Day (16hr)	65
	Night (8hr)	60
N7	Day (16hr)	64
	Night (8hr)	59
N8	Day (16hr)	49
	Night (8hr)	46
N9	Day (16hr)	61
	Night (8hr)	57
N10	Day (16hr)	51
	Night (8hr)	47
N11	Day (16hr)	50
	Night (8hr)	46
N12	Day (16hr)	72
	Night (8hr)	67
N13	Day (16hr)	74
	Night (8hr)	69
N14	Day (16hr)	74
	Night (8hr)	69
N15	Day (16hr)	74
	Night (8hr)	69
N16	Day (16hr)	70
	Night (8hr)	65
N17	Day (16hr)	66
	Night (8hr)	59
N18	Day (16hr)	64
	Night (8hr)	59
N19	Day (16hr)	57
	Night (8hr)	53
N20	Day (16hr)	65
	Night (8hr)	60
N21	Day (16hr)	55
	Night (8hr)	49
N22	Day (16hr)	52
	Night (8hr)	45

4.2.3 Proposed Façade Treatment

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

The Standard allows the acoustic performance of the building to be assessed considering the following:

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

The principals outlined in BS EN 12354-3 are also referred to in BS8233 and Annex G of BS8233 provides a calculation method to determine the internal noise level within a building using the composite sound insulation performance calculated using the methods outlined in BS EN 12354-3. The methodology outlined in Annex G of BS8233 has been adopted here to determine the required performance of the building facades.

Glazing

As is the case in most buildings, the glazed elements of the building envelope are typically the weakest element from a sound insulation perspective. Glazing Type 1 offers a minimum sound insulation performance of 31dB Rw. A standard thermal double-glazed system will typically achieve this level of performance.

The glazing specifications have been determined for the residential properties to achieve the recommended internal noise levels for day and night-time periods within living rooms and bedrooms. Please see Appendix D for glazing locations.

Table 20: Required Sound Insulation Performance Per Octave Band for The Glazing Specification

Glazing Specification	Description of Typical Construction	Minimum Required (Rw+Ctr)
Type 1	Optifloat 4 mm / 20 Ar /Optifloat 4mm	31
Type 2	Optilam 6,4 mm 33.1/16 Ar / Optifloat 4mm	35
Type 3	LSG 44.2 phon/cavity 16mm (AR)/ LSG 33.1	40
Type 4	Optifloat 10 mm/ 18 Ar / Optiphon 8,8mm 44.2	43

It is important to note that the acoustic performance specifications detailed herein are minimum requirements which apply to the overall glazing system. In the context of the acoustic performance specification the 'glazing system' is understood to include any and all of the component parts that form part of the glazing element of the façade, i.e., glass, frames, seals, openable elements etc.

The assessment has demonstrated that the recommended internal noise criteria can be achieved through consideration of the proposed façade elements at the design stage. The calculated glazing specifications are preliminary and are intended to form the basis for noise mitigation at the detailed design stage. Consequently, these may be subject to change as the project progresses.

Wall Construction

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

Internal Noise Levels

Considering the external façade levels and the specified building envelope the internal noise levels have been calculated. In all instances the good internal noise criteria are achieved for daytime and night-time

4.3 Element 3 – External Amenity Area Noise Assessment

In general, at ground level. Referring to the guidance in ProPG this level of external noise would be considered to offer good amenity for an outdoor space.

As previously discussed, the development is expected to achieve daytime noise levels of the order of 55 dB LAeq,16hr or lower. In terms of the external area the majority of this area achieves a noise level of ≤ 55 dB LAeq,16hr.

4.4 Element 4 – Assessment of Other Relevant Issues

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

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

Each is discussed in turn below.

4.4.1 Compliance with Relevant National and Local Policy

There are no National policy documents relating to the acoustic design of residential dwellings. Locally Dublin City Council Air Quality Monitoring and Noise Control Unit has produced a Good Practice Guide for Construction and Demolition.

In relation to Noise at Planning Stage the Dublin Agglomeration Environmental Noise Action Plan (NAP) 2024 – 2028 specifies that Dublin City Council will consider the location of noise-sensitive developments, including the horizontal and vertical layout of apartment schemes, so as to ensure they are protected from major noise sources where practical.

4.4.2 Magnitude and Extent of Compliance with ProPG

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

- All dwellings as part of the development have been designed to achieve the good level of internal noise levels specified within ProPG.
- All external amenity areas have been shown to have an external noise level that complies with the recommended criterion set out in ProPG.

Based on the preceding it is concluded that the proposed development is in full compliance with the requirements of ProPG.

4.4.3 Likely Occupants of the Development

The proposed development will be occupied by occupants for the full year. The criteria adopted in this assessment is based upon criteria recommended for long- term/permanent dwellings and therefore considered appropriate.

4.4.4 Acoustic Design v Unintended Adverse Consequences

Design measures taken to reduce intrusion by noise have not had any unintended adverse consequences for the proposed development or the nearby environment.

4.4.5 Acoustic Design v Wider Planning Objectives

This assessment has demonstrated the living areas of the proposed development will achieve a good internal noise environment.

4.5 Predicted Impact

4.5.1 Proposed Development on Existing Noise Sensitive Locations

Based on the existing environmental noise results, it was considered reasonable to assume that the majority of local NSLs will not find a noticeable change to the ambient sound character from the Proposed Development during the operational phase.

4.5.2 Construction Impact on Existing Noise Sensitive Locations

The Site is in close proximity to offsite NSLs therefore there is the potential for the exceedance of construction phase limits during the construction phase. However, best practice methods and mitigation measures, including the preparation of a site-specific CEMP incorporating the noise mitigation principles within this document, by the appointed Contractor will ensure compliance with the construction limits.

4.5.3 Impact of the Existing Environment on the Proposed Development

The existing environment is dominated by traffic on the Long Mile Road (R110) and the Robinhood Road to the north and west of the site. There is also background noise from people working in the neighboring industrial estates. The proposed development utilising acoustic design as per ProPG to minimise impacts of noise on proposed residential developments has shown that the proposed development will not be adversely impacted by the existing environment.

4.6 Acoustic Design Statement Conclusion

An initial site noise risk assessment has been carried out on the proposed residential development at Parkmore Industrial Estate, Dublin 22. The assessment has classified the development site as having a noise risk of high. This was determined through a combination of measurements of noise levels on site and through the development of noise models of the site and surrounds.

Further discussion is presented in terms of the likely noise impact of both the external and internal areas of the proposed development. It has been found that the majority of the inhabitants will have access to open spaces that achieve daytime noise levels of the order of 55 dB LAeq,16hr or lower. All habitable rooms will achieve a good internal noise environment with the enhanced acoustic glazing and mechanical ventilation.

5.0 OPERATIONAL PHASE

The potential noise impacts associated with the operational phase of the proposed development are discussed in the following sections.

5.1 Noise

There are eight primary potential sources of noise associated with the development once operational these are:

- Additional vehicular traffic on public roads
- Inward Noise Impact
- Mechanical plant noise.
- Residential
- Community Café
- Commercial/ Employment Area
- Childcare Facility
- Central Amenity Space

Each of these primary noise sources is addressed in turn in the following sections.
Note there is no significant source of vibration associated with the operational phase of the proposed development.

5.1.2 Additional Traffic on Adjacent Roads

During the operational phase of the proposed development, there will be a slight increase in vehicular traffic associated with the site on some surrounding roads. With the scale of this development, the predicted change in noise level associated with additional traffic accessing the proposed development, for the existing road network, has a negligible effect.

5.1.3 Inward Noise Impact

An assessment of the inward noise impact from road traffic sources has been carried out. In summary the noise levels across the site ranges from low to medium noise risk in accordance with the guidance in ProPG.

5.1.4 Mechanical Plant

It is expected that the principal items of building and mechanical plant noise will be associated with the proposed Community Café, Commercial/ Employment Area and Childcare Facility. These items will be selected at a later stage, however, they will be designed and located so that there is no negative impact on sensitive receivers within the development itself. The services plant will be designed/attenuated to meet the relevant plant noise criteria for day and night-time periods at nearby sensitive receivers as set out in table 1.

Considering the recommendation from BS 4142 that if the plant noise level does not exceed the background sound level it is an indication of a low impact, it is recommended in this instance that noise emissions from all plant installed on site (considered cumulatively) do not exceed the background noise levels on site.

It is understood that various external plant items are proposed for the development. These items of plant have the potential to emit noise to the environment and consequently an exercise should be undertaken at detailed design stage to ensure that the finalised items of plant do not exceed the proposed noise thresholds.

5.1.5 Residential

The noise impact of the residential aspect of the development on the receiving environment will be slight. It will be limited to internal vehicle movements entering and exiting the carparking areas and residents using their communal open areas.

5.1.6 Community Café

The Community Café of the development will also have a potential noise impact on the residential aspect of the development; however, this aspect of the development will not occur during the night-time period. All deliveries will be only permitted between 07:00hrs – 19:00hrs, in order to ensure that this activity does not impact the more sensitive night-time period. The Café/restaurant shall be posted appropriate signage to this effect.

5.1.7 Commercial/ Employment Area

The Commercial/ Employment Area of the development will have a potential noise impact on the residential aspect of the development; however, this aspect of the development will not occur during the night-time period. The main noise associated with a commercial premises is from deliveries by lorries or vans. External speakers shall not be used at any of the retail units. All deliveries will be only permitted between 07:00hrs – 19:00hrs, to ensure that this activity does not impact the more sensitive night-time period. retail units shall be posted appropriate signage to this effect.

Commercial/ Employment Area shall be designed and insulated to ensure a high degree of sound insulation between adjoining rooms. Mechanical services associated with these areas will be selected with low noise/vibration capabilities.

5.1.8 Childcare Facility

The Childcare Facility which is located to the east of the site will serve the residents of the development. The opening hours of the creche is expected to be from 7am – 7pm Monday to Friday. No early morning noise associated with the creche is expected before 7am. The noise of children playing in any environment is regarded as a natural aspect of life in any area of a development.

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

5.1.9 Central Amenity Space

The Central Amenity Space of the development will also have a potential noise impact on the residential aspect of the development; however, this aspect of the development will not occur during the night-time period. The main noise associated with Central Amenity Space is from people movement and communicating.

The Central Amenity Space shall be designed and insulated to ensure a high degree of sound insulation between adjoining rooms. Mechanical services associated with these areas will be selected with low noise/vibration capabilities.

6.0 CONSTRUCTION PHASE

A variety of items of plant will be in use for the purposes of site clearance/groundworks and construction. There will be vehicular movements to and from the site that will make use of existing access. Due to the nature of these activities, there is potential for the generation of elevated levels of noise.

During the construction phase which includes demolition, it is anticipated that there will be a number of HGV's to/from site. Excavators will be employed to move existing ground and piling rigs will be used for foundation work following which standard construction tools and methods will be employed for general construction and landscaping.

It is possible to predict indicative noise levels using guidance set out in BS 5228- 1:2009+A1:2014 for the main phases of the proposed construction works. Table 24 summarises the construction noise prediction calculations at the nearest residences (i.e., NSL2, 40m from the residence to the outline plan of the proposed development). The predictions assume a 66 % on-time for all items of plant (i.e., the items of plant are operational for 8 of the 12-hour period) and 15 dB attenuation due to partial screening of plant from the receptors.

Table 21: Description of NSLs and Noise Levels

Noise Sensitive Locations	Description	L_{Aeq}dB
Location NSL1	This represents commercial units to the west of the proposed site approximately 5m from the potential nearest significant site work.	61
Location NSL2	This represents residential dwellings along the Robinhood Road to the west of the proposed site approximately 40m from the potential nearest significant site work.	60
Location NSL3	This represents commercial units to the northwest of the proposed site approximately 47m from the potential nearest significant site work.	70
Location NSL4	This represents commercial units to the north of the proposed site approximately 44m from the potential nearest significant site work.	71
Location NSL5	This represents commercial units to the north of the proposed site approximately 47m from the potential nearest significant site work.	69
Location NSL6	This represents commercial units to the east of the proposed site approximately 24m from the potential nearest significant site work.	66
Location NSL7	This represents commercial units to the east of the proposed site approximately 24m from the potential nearest significant site work.	65
Location NSL8	This represents commercial units to the east of the proposed site approximately 24m from the potential nearest significant site work.	65
Location NSL9	This represents commercial units to the east of the proposed site approximately 11m from the potential nearest significant site work.	60

Figure 19: Site Context & Noise Assessment Locations

Table 22 sets out the BS 5228 'ABC' noise threshold categories at each NSL.

Table 22: Construction Phases L_{Aeq}, T noise levels and associated 'ABC' assessment category At Each NSL

NSL	Noise Levels L_{Aeq}dB	ABC Category	Construction Noise Limit L_{Aeq}, T dB
1	61	A	65
2	60	A	65
3	70	B	70
4	71	B	70
5	69	B	70
6	66	A	65
7	65	A	65
8	65	A	65
9	60	A	65

6.1 Predicted Construction Noise Levels

Predicted noise levels for construction of the Proposed Development have been based upon construction methods used for other similar developments. As a conservative approach, it is assumed that all plant and activities will be taking place at the closest approach to each NSLs, whereas in reality this will not always be the case and, in any event, activities are unlikely to occur for any significant duration. It is possible to predict typical noise levels using guidance set out in BS 5228-1:2009+A1:2014. Table 23 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction.

Table 23: Predicted Noise Levels from Key Pieces of Equipment

Activity	Item of Plant (BS5228 Ref)	Noise level at 10m Distance (dB $L_{Aeq\ (1hour)}$)
Site Preparation	Wheeled Loader Lorry (D3 1)	75
	Track Excavator (C2 22)	72
	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
	Cumulative Site Preparation	82
Demolition Phase	Pulveriser on Tracked Excavator (C1.5)	72
	Tracked Crusher (C1.14)	82
	Pulveriser on Tracked Excavator (C1.4)	76
	Dump Truck (C2.30)	79
	Diesel Generator (C4.76)	61
	Cumulative Demolition	85
General Construction	Dump Truck (C2.30)	79
	Tracked excavator (02.21)	71
	Compressor (D7.08)	70
	Telescopic Handler (C4.54)	79
	Handheld Circular Saw (C4.72)	79
	Diesel Generator (C4.76)	61
	Internal Fit out	70
	Piling (C3.14)	83
	Cumulative General Construction	87
Road Works/Landscaping	Asphalt Paver & Tipping Lorry (C5.30)	75
	Electric Water Pump (C5.40)	68
	Vibratory Roller (C5.20)	75
	Cumulative General Landscaping and Road Work	78

The calculations also assume that the equipment will operate for 66% of the 12-hour working day (i.e., 8 hours). It is assumed that construction works will take place during normal working hours only.

Predicted Noise Level at Various Locations

Table 24 below presents the predicted daytime noise levels from an indicative construction period at the NSLs.

Table 24: Indicative Construction Noise Levels at Nearest Noise Sensitive Locations

Construction Phase	Item of Plant (BS5228-1 Ref)	L_{Aeq} at distance (m)								
		NSL1	NSL2	NSL3	NSL4	NSL5	NSL6	NSL7	NSL8	NSL9
		5m	40m	47m	44m	47m	24m	24m	24m	11m
		dB	dB	dB	dB	dB	dB	dB	dB	dB
Site Preparation	Wheeled Loader Lorry (D3 1)	81	60	59	60	59	64	64	64	75
	Track Excavator (C2 22)	78	57	56	57	56	61	61	61	72
	Dozer (C2.13)	84	62	61	62	61	67	67	67	78
	Dump Truck (C4.2)	84	62	61	62	61	67	67	67	78
	Cumulative Site Preparation	**88**	**67**	**66**	**67**	**66**	**71**	**71**	**71**	**82**
Demolition Phase	Pulveriser on Tracked Excavator (C1.5)	78	67	56	67	56	61	61	61	72
	Tracked Crusher (C1.14)	88	67	66	67	66	73	73	73	82
	Pulveriser on Tracked Excavator (C1.4)	82	61	60	61	60	67	67	67	76
	Dump Truck (C2.30)	85	64	63	64	63	68	68	68	79
	Diesel Generator (C4.76)	67	46	45	46	45	50	50	50	61
	Cumulative Demolition	**91**	**70**	**69**	**70**	**69**	**74**	**74**	**74**	**85**
General Construction	Dump Truck (C2.30)	85	64	63	64	63	68	68	68	79
	Tracked excavator (02.21)	67	56	55	56	55	60	60	60	71
	Compressor (D7.08)	76	55	54	55	54	59	59	59	70
	Telescopic Handler (C4.54)	85	63	62	63	62	68	68	68	79
	Handheld Circular Saw (C4.72)	85	63	62	63	62	68	68	68	79
	Diesel Generator (C4.76)	67	46	45	46	45	50	50	50	61
	Internal Fit out	76	55	54	55	54	59	59	59	70
	Piling (C3.14)	89	68	67	68	67	72	72	72	83
	Cumulative General Construction	**93**	**72**	**71**	**72**	**71**	**76**	**76**	**76**	**87**
Road Works/ Landscaping	Asphalt Paver & Tipping Lorry (C5.30)	81	60	59	60	59	64	64	64	75
	Electric Water Pump (C5.40)	74	53	52	53	52	57	57	57	68
	Vibratory Roller (C5.20)	81	60	59	60	59	64	64	64	75
	Cumulative General Landscaping and Road Work	**84**	**63**	**62**	**63**	**62**	**67**	**67**	**67**	**78**

A comparison of the predicted noise levels at NSLs with the BS 5228 ABC threshold values is provided in Table 25.

Table 25: Predicted construction noise level above threshold value.

NSL	Limits	Construction Phases			
		Cumulative Site Preparation	Demolition Phase	Cumulative General Construction	Cumulative General Landscaping & Roadwork
1	Construction Limit	65	65	65	65
	Level above limit	+23	+26	+28	+19
	Magnitude of Impact	High	High	High	High
2	Construction Limit	65	65	65	65
	Level above limit	+2	+5	+7	-2
	Magnitude of Impact	Low	Medium	Medium	Negligible
3	Construction Limit	70	70	70	70
	Level above limit	-4	-1	+1	-8
	Magnitude of Impact	Negligible	Negligible	Low	Negligible
4	Construction Limit	70	70	70	70
	Level above limit	-3	0	+2	-7
	Magnitude of Impact	Negligible	Negligible	Low	Negligible
5	Construction Limit	70	70	70	70
	Level above limit	-4	-1	+1	-8
	Magnitude of Impact	Negligible	Negligible	Low	Negligible
6	Construction Limit	65	65	65	65
	Level above limit	+6	+9	+11	+2
	Magnitude of Impact	Medium	Medium	High	Low
7	Construction Limit	65	65	65	65
	Level above limit	+6	+9	+11	+2
	Magnitude of Impact	Medium	Medium	High	Low
8	Construction Limit	65	65	65	65
	Level above limit	+6	+9	+11	+2
	Magnitude of Impact	Medium	Medium	High	low
9	Construction Limit	65	65	65	65
	Level above limit	+17	+20	+22	+13
	Magnitude of Impact	High	High	High	High

The effects of the predicted daytime construction noise levels on NSLs have been classified by considering the daytime ABC noise threshold values.

At NSL1 (commercial unit), predicted noise levels did exceed the TII limit of 65 dB LAeq during site preparation, demolition, general construction and roadworks/landscaping phases (88, 91, 93 & 84 dB LAeq). Using the ABC method in BS 5228, the magnitude of impact during activities is high, resulting in a significance of effect of high in the absents of mitigation.

At NSL2 (residential), predicted noise levels did exceed the TII limit of 65 dB LAeq during site preparation, demolition, general construction phases (67, 70 & 72 dB LAeq). Using the ABC method in BS 5228, the magnitude of impact during activities is negligible to medium, resulting in a significance of effect of slight in the absents of mitigation.

At NSL3 (commercial unit), predicted noise levels exceed the TII limit of 70 dB LAeq during the general construction phase (71dB LAeq). Using the ABC method in BS 5228, the magnitude of impact during activities is either negligible or low, resulting in a significance of effect of slight (not significant)

At NSL4 (commercial unit), predicted noise levels exceed the TII limit of 70 dB LAeq during the general construction phase (72dB LAeq). Using the ABC method in BS 5228, the magnitude of impact during activities is either negligible or low, resulting in a significance of effect of slight (not significant)

At NSL5 (commercial unit), predicted noise levels exceed the TII limit of 70 dB LAeq during the general construction phase (71dB LAeq). Using the ABC method in BS 5228, the magnitude of impact during activities is either negligible or low, resulting in a significance of effect of slight (not significant)

At NSL6 (commercial unit), predicted noise levels did exceed the TII limit of 65 dB LAeq during site preparation, demolition, general construction and roadworks/landscaping phases (71, 74, 75 & 67 dB LAeq). Using the ABC method in BS 5228, the magnitude of impact during activities ranges from low to high, resulting in a significance of effect of slight too high in the absents of mitigation.

At NSL7 (commercial unit), predicted noise levels did exceed the TII limit of 65 dB LAeq during site preparation, demolition, general construction and roadworks/landscaping phases (71, 74, 75 & 67 dB LAeq). Using the ABC method in BS 5228, the magnitude of impact during activities ranges from low to high, resulting in a significance of effect of slight too high in the absents of mitigation.

At NSL6 (commercial unit), predicted noise levels did exceed the TII limit of 65 dB LAeq during site preparation, demolition, general construction and roadworks/landscaping phases (71, 74, 75 & 67 dB LAeq). Using the ABC method in BS 5228, the magnitude of impact during activities ranges from low to high, resulting in a significance of effect of slight too high in the absents of mitigation.

At NSL8 (commercial unit), predicted noise levels did exceed the TII limit of 65 dB LAeq during site preparation, demolition, general construction and roadworks/landscaping phases (82, 85, 87 & 78 dB LAeq). Using the ABC method in BS 5228, the magnitude of impact during activities ranges from low to high, resulting in a significance of effect of slight too high in the absents of mitigation.

6.2 VIBRATION ASSESSMENT - CONSTRUCTION PHASE

In terms of vibration, *British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration* recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero. It is therefore common, on a cautious basis to use this lower value. Taking the above into consideration the vibration criteria in Table 26 are recommended.

Table 26: Recommended Vibration Criteria During Construction Phase

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

Human Perception

People are sensitive to vibration stimuli at levels orders of magnitude below those which have the potential to cause any cosmetic damage to buildings. There are no current standards which provide guidance on typical ranges of human response to vibration in terms of PPV for continuous or intermittent vibration sources.

BS5228-2:2009+A1:2014, provides a useful guide relating to the assessment of human response to vibration in terms of the PPV. Whilst the guide values are used to compare typical human response to construction works, they tend to relate closely to general levels of vibration perception from other general sources.
Table 27 below summarises the range of vibration values and the associated potential effects on humans.

Table 27: Guidance on Effects of Human Response to PPV Magnitudes

Vibration Level, PPV (mm/s)	**Effect**
0.140	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies. At lower frequencies people are less sensitive to vibration.
0.30	Vibration might be just perceptible in residential environments
1.00	It is likely that a vibration level of this magnitude in residential environments will cause complaint.

Vibration typically becomes perceptible at around 0.15 to 0.3 mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short-term duration, particularly during construction projects and when the origin and or the duration of vibration is known. For example, ground-breaking can typically be tolerated at vibration levels up to 2.5 mm/s if adequate public relations are in place and timeframes are known. These values refer to the day-time periods only. During surface construction works (demolition and groundbreaking etc.) the vibration limits set within would be perceptible to building occupants and have the potential to cause subjective effects. The level of effect is, however, greatly reduced when the origin and time frame of the works are known and limit values relating to structural integrity are adequately communicated. In this regard, the use of clear communication and

information circulars relating to planned works, their duration and vibration monitoring can significantly reduce vibration effects to the neighbouring properties.

Interpretation of the Human Response to Vibration

In order to assist with interpretation of vibration thresholds, Table 28 presents the significance table relating to potential impacts to building occupants during construction based on guidance from BS5228-2:2009+A1:2014.

Table 28: Human Response Vibration Significance Ratings

Criteria	Impact Magnitude	Significance Rating
10 mm/s PPV	Very High	Very Significant
1 mm/s PPV	High	Moderate to Significant
0.3 mm/s PPV	Medium	Slight to Moderate
0.14 mm/s PPV	Low	Not significant to Slight
Less than 0.14 mm/s PPV	Very Low	imperceptible to Not significant

Additional measures will be adopted by the Contractor during construction as per health and safety requirements and best practice as per Section 7.3 below

6.3 Construction Mitigation Measures

With regard to construction activities, best practice control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2. Whilst construction noise impacts are expected to vary during the construction phase depending on the distance between the activities and noise sensitive locations, the contractor will ensure that all best practice noise control methods will be used, as necessary in order to ensure impacts at off-site noise sensitive locations are minimised.

The best practice measures set out in BS 5228 (2009) Parts 1 and 2 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- Selection of quiet plant.
- Noise control at source.
- Screening.
- Liaison with the public
- Monitoring

A detailed comment is offered on these items in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures, and screens around noise sources, limiting the hours of work and noise and vibration monitoring, where required.

6.3.1 Selection of Quiet Plant

This practice is recommended in relation to static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should

a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether said item can be replaced with a quieter alternative.

6.3.2 Noise Control at Source

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

Referring to the potential noise generating sources for the works under consideration, the following best practice mitigation measures should be considered:

- Site compounds will be more than 30m from residential noise sensitive receptors within the site constraints. The use of lifting bulky items, dropping, and loading of materials within these areas should be restricted to normal working hours.
- For mobile plant items such as dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant should be switched off when not in use and not left idling.
- For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover. For concrete mixers, control measures should be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- For compressors, generators, and pumps, these can be surrounded by acoustic lagging or enclosed with in acoustic enclosures providing air ventilation.
- Demountable enclosures can also be used to screen operations using hand tools and will be moved around site, as necessary.
- All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.
- Maintaining site access roads even so as to mitigate the potential for vibration from lorries.
- Selection of plant with low inherent potential for generation of noise and/ or vibration.
- Erection of barriers as necessary around items such as generators or high duty compressors.
- Situate any noisy plant as far away from sensitive properties as is reasonably practicable and the use of vibration isolated support structures where necessary.
- Appointing a site representative responsible for matters relating to noise and vibration.

6.3.3 Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. Construction site hoarding will be constructed around the site boundaries as

standard. The hoarding will be constructed of a material to reduce noise by 28dB along proportion of the west boundary, by 15dB along the east and proportion of the west boundaries and 5dB along the north boundary of the site as shown is Appendix C. This will ensure guidance limit for construction noise at nearest noise sensitive location is followed and potential impacts relating to noise nuisance and disturbance and vibration impacts are effectively minimised and controlled.

6.3.4 Liaison with the Public

A designated liaison officer(s) will be appointed to site during construction works. Any noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, where a particularly noisy construction activity is planned or other works with the potential to generate high levels of noise, or where noisy works are expected to operate outside of normal working hours etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

The Liaison officer(s) will also take notes of the following during complaint logging:

- Maintenance of a site complaints log detailing
- Name and address of complainant
- Time and date complaint was made.
- Date, time, and duration of noise.
- Characteristics, such as rumble, clatters, intermittent, etc.
- Likely cause or source of noise
- Weather conditions, such as wind speed and direction
- Investigative and follow-up actions.
- Response to complainant

The Liaison officer(s) will also:

- Liaison with Local Community and Businesses
- Appointment of a Liaison Officer as a single point of contact to engage with the community and respond to concerns.
- Keeping residents informed of progress and timing of construction activities that may impact on them.

6.3.5 Monitoring

It is recommended that monthly noise and vibration monitoring surveys be carried along the boundary of the proposed site to monitor the effectiveness of noise and vibration management for the duration of the construction phase. Noise and vibration levels at Noise Sensitive Locations should not exceed the construction phase noise and vibration limit criteria. Any breaches of these limits will require a review of operations and mitigation measures if the exceedance is due to the construction works on site.

To effectively manage noise and vibration at residential dwelling located approximately 4m east of the proposed site, installation of continuous data logging live noise and vibration monitoring system is required. This software will require remote login, data download and text/email alert functionality. It will measure key noise and vibration parameters (e.g., LAeq, LAFMAX, LA90, LA10, PPV (mm/sec) and Frequencies as Hz.

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

6.3.6 Project Programme

The phasing programme will be arranged to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. During excavation or when other high noise generating works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased to prevent unacceptable disturbance at any time.

7.0 CONCLUSIONS

- The noise impact of the construction/demolition phase and operational phase of the proposed development has been assessed.

- During the construction/demolition phase noise is predicted while works are taking place in proximity to the nearest NSL's. Mitigation measures have been recommended so that any negative impact may be reduced, it is not expected that a negative impact will occur on existing noise sensitive locations.

- With respect to inward noise impact, to ensure that the noise climate within the residential units is appropriate, the following internal noise criteria are proposed:
    - Daytime in living areas – 35 dB L_{Aeq},16hr; and,
    - Night-time in bedrooms – 30 dB L_{Aeq},8hr.

- The measured noise levels across the site have been used to calculate noise levels at specific facades of proposed residential properties and to predict the internal noise levels within living room and bedroom spaces, taking account of the proposed building envelope and conditions in the receiving rooms (e.g., volumes and room acoustic characteristics).

- It is predicted that the open spaces will experience noise levels of the order ≤55dB L_{Aeq},16hr in line with the recommended noise level.

- Using guidance outlined in the current Dublin Agglomeration Environmental Noise Action Plan (Volume 2) December 2018 – July 2023, British Standard B5 8233 (2014), WHO Community Noise (1999) and ProPG (2017) an inward noise impact assessment inclusive of noise modelling has been undertaken at the proposed development site.

- The results of the assessment have concluded that during daytime and night-time periods, internal noise levels are calculated to be within acceptable levels for bedroom, living and dining areas, taking account of the proposed glazing and ventilation strategy recommended for the development.

- The assessment has recommended four glazing types on the façades.

- Mechanical ventilation is recommended for the development.

- With the implementation of the recommendations included in the report, it is concluded that a suitable level of protection against noise will be provided for the occupants of the proposed development.

ENVIRONMENTAL NOISE ASSESSMENT

LARGE SCALE RESIDENTIAL DEVELOPMENT (LRD)

PARKMORE INDUSTRIAL ESTATE

DUBLIN 12

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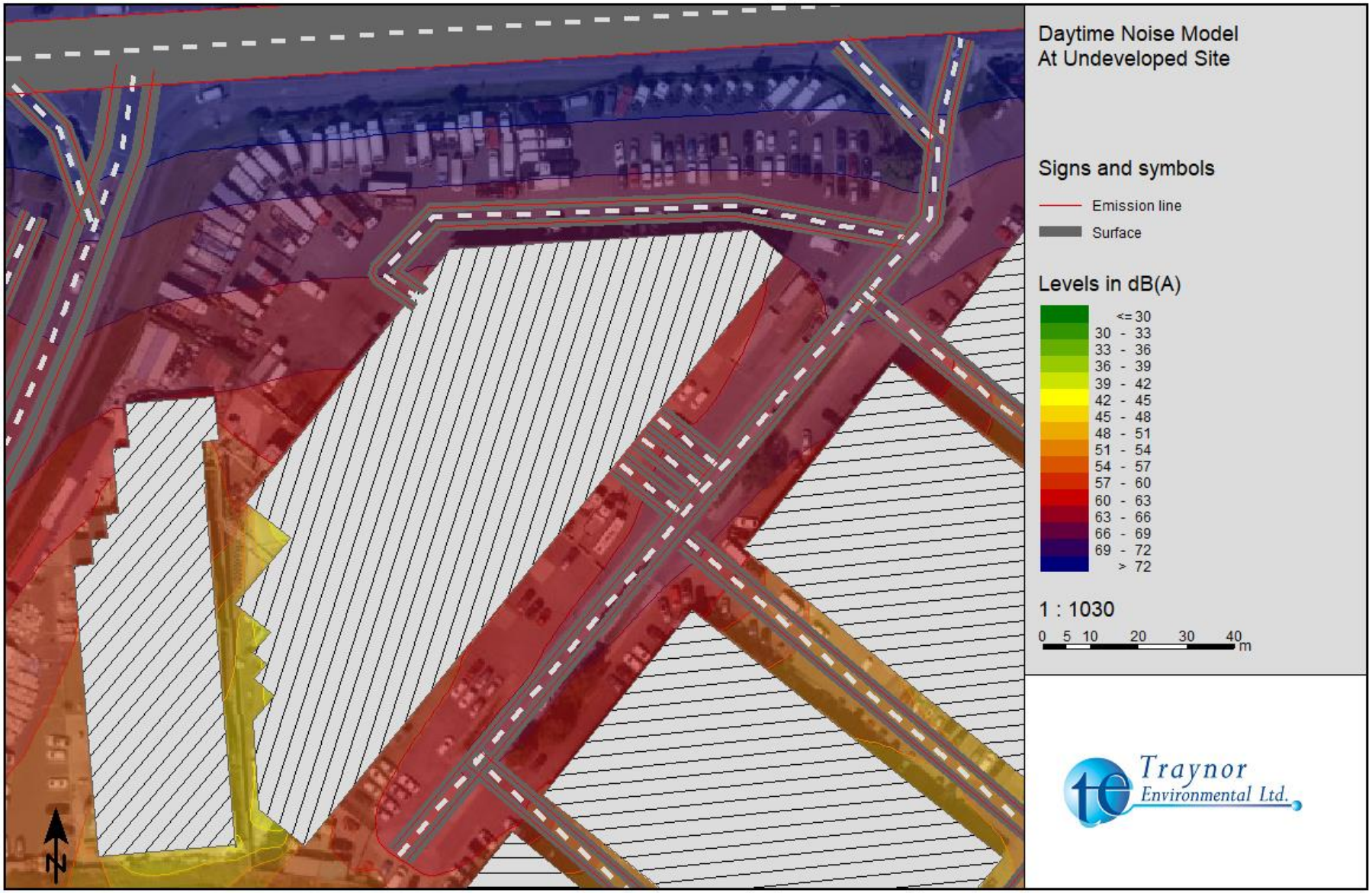
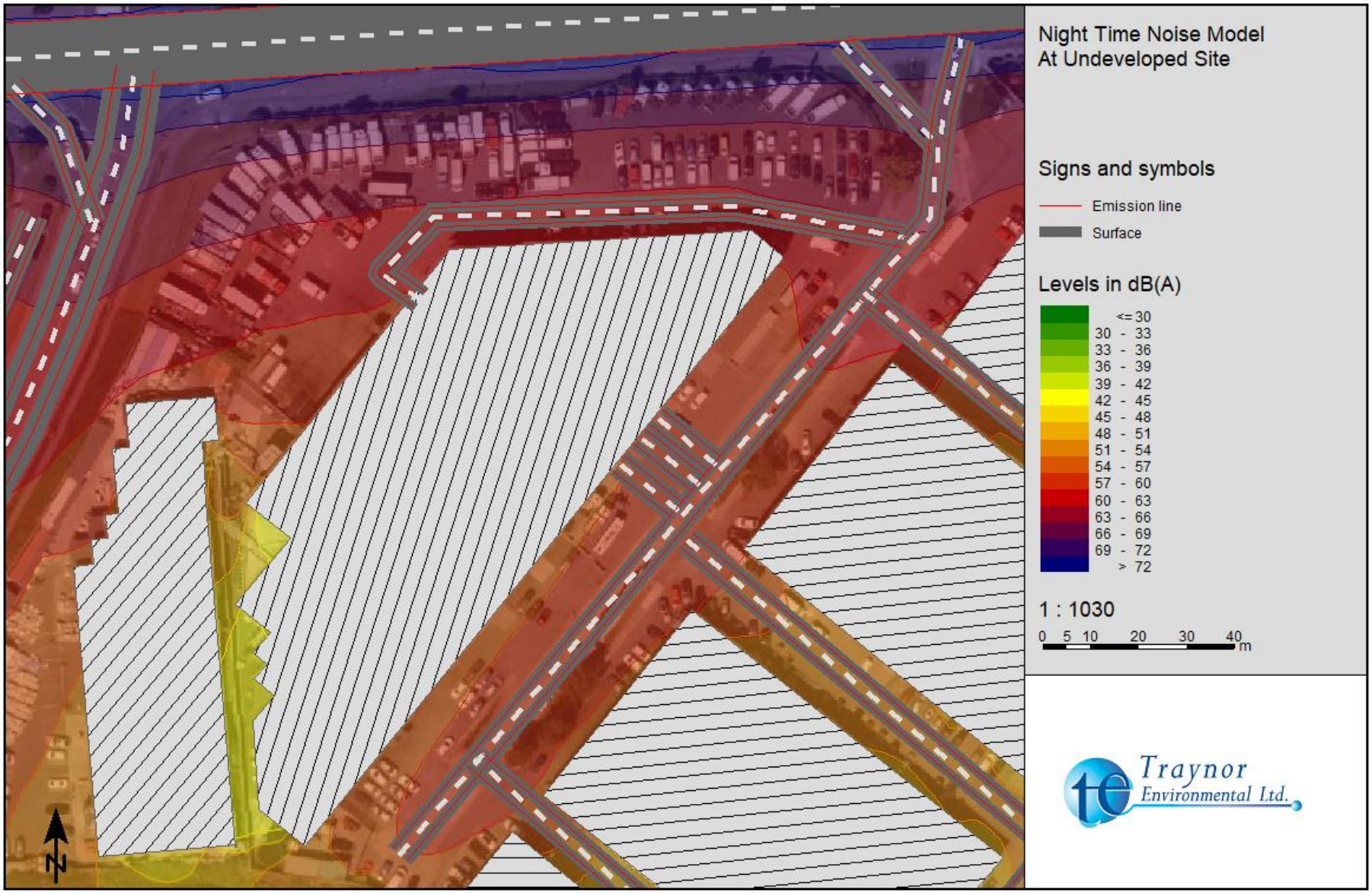
APPENDIX A – NOISE MODEL - NOISE AT UNDEVELOPED SITE

Noise Model of Daytime L_{Aeq} at the Undeveloped Site



Noise Model of Night-time L_{Aeq} at the Undeveloped Site



ENVIRONMENTAL NOISE ASSESSMENT
LARGE SCALE RESIDENTIAL DEVELOPMENT (LRD)
PARKMORE INDUSTRIAL ESTATE
DUBLIN 12
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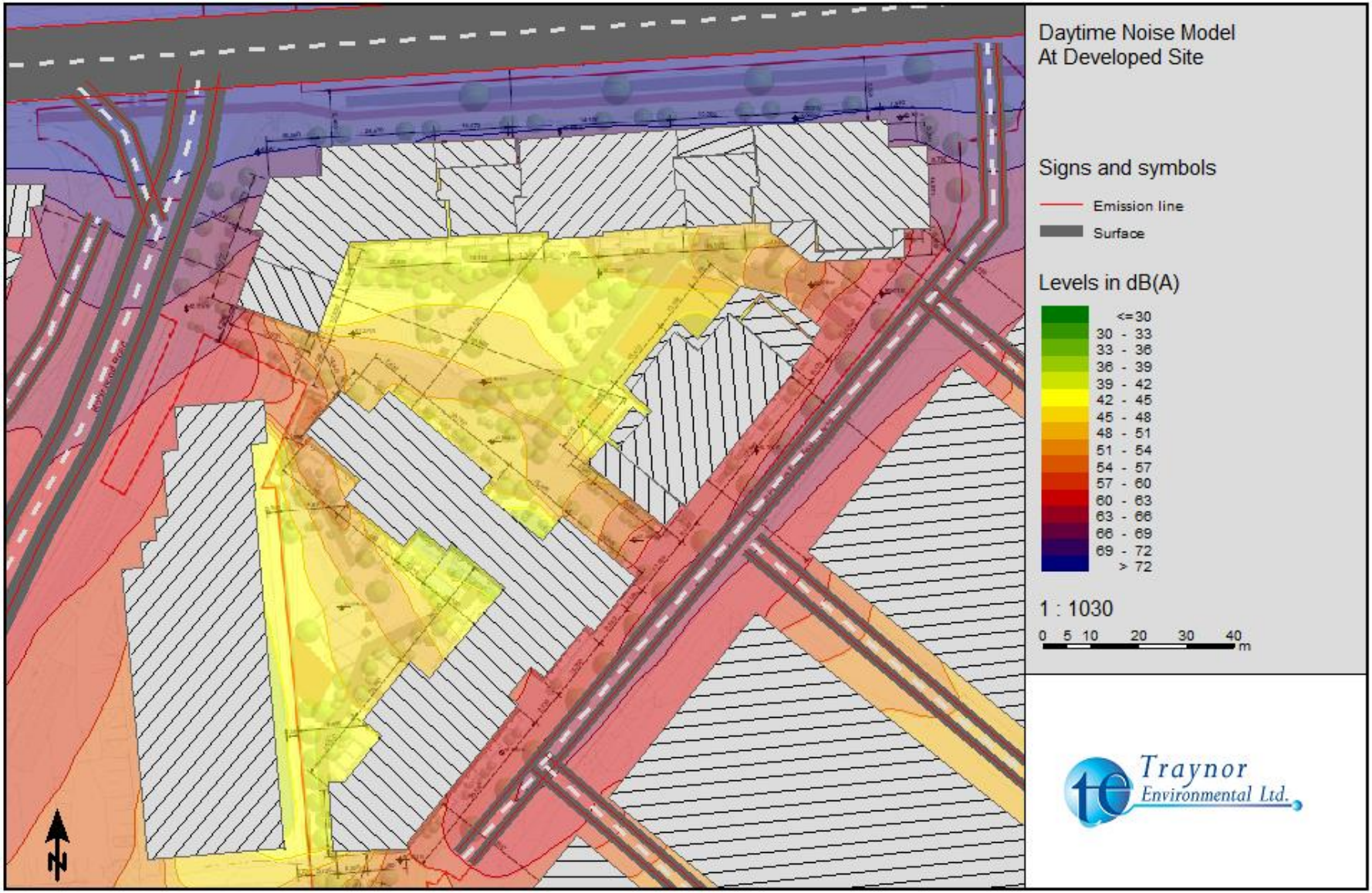
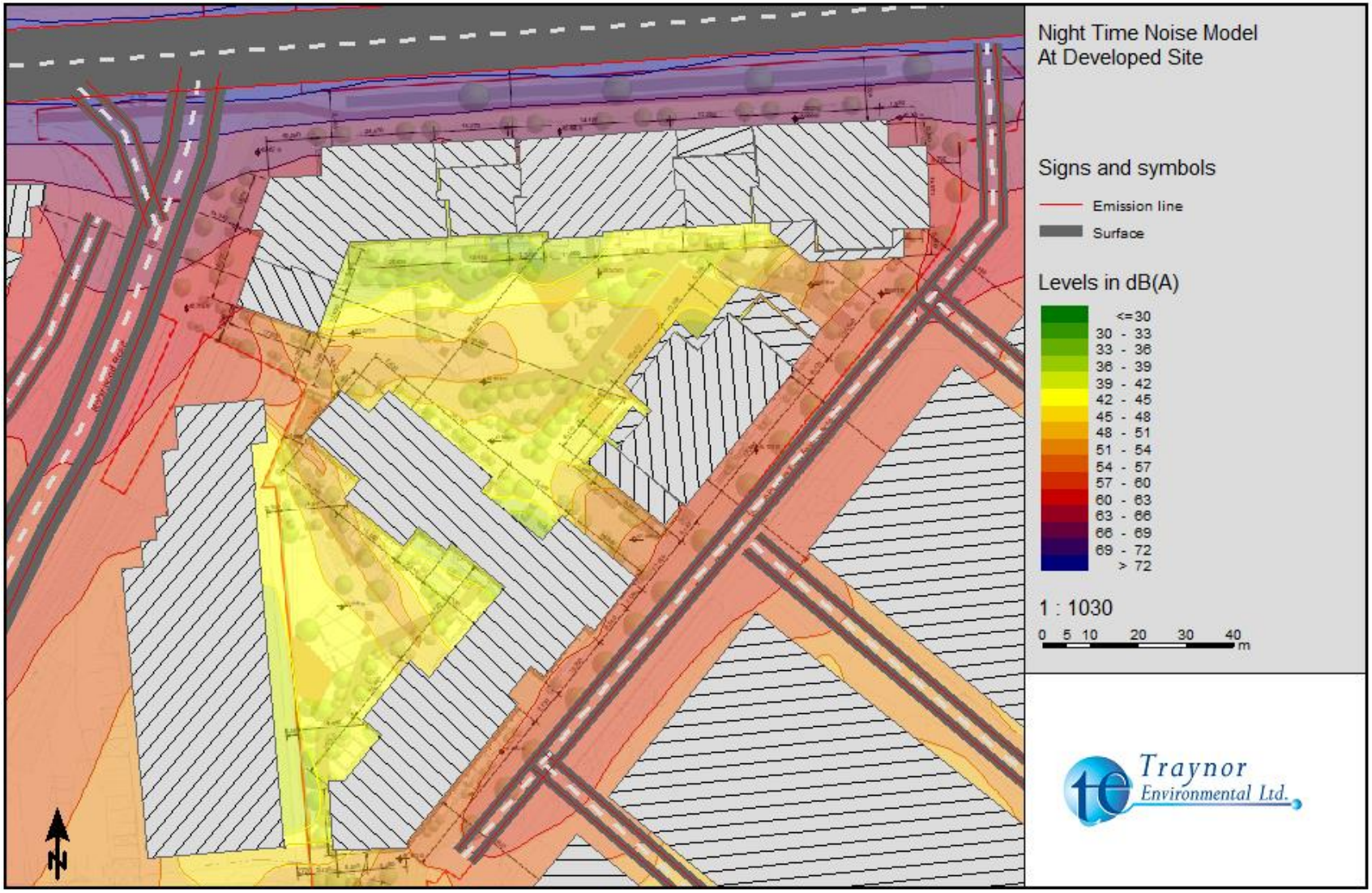
APPENDIX B – NOISE MODEL PREDICTED - BUILDINGS CONSTRUCTED AND OPERATING

Predicted (development built and operational) Daytime Noise Model of L_{Aeq} at the site.



Predicted (development built and operational) Noise Model of L_{Aeq} at the site. (Night-time)



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LARGE SCALE RESIDENTIAL DEVELOPMENT (LRD)

PARKMORE INDUSTRIAL ESTATE

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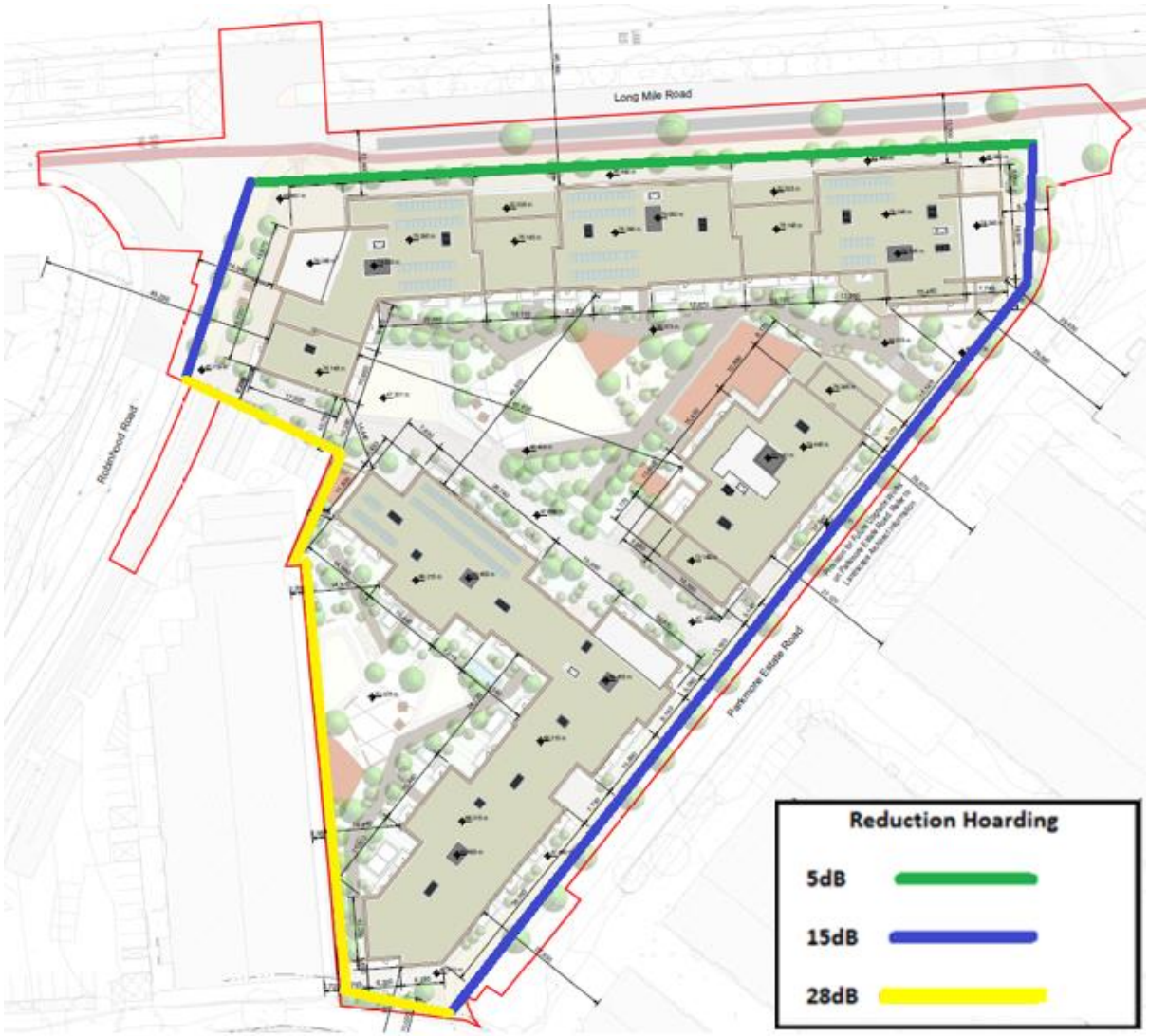
APPENDIX C – LOCATIONS OF SITE HOARDING FOR CONSTRUCTION PHASE


Long Mile Road
Rosemond Road
Parkmore Estate Road
Reduction Hoarding
5dB
15dB
28dB

ENVIRONMENTAL NOISE ASSESSMENT

LARGE SCALE RESIDENTIAL DEVELOPMENT (LRD)

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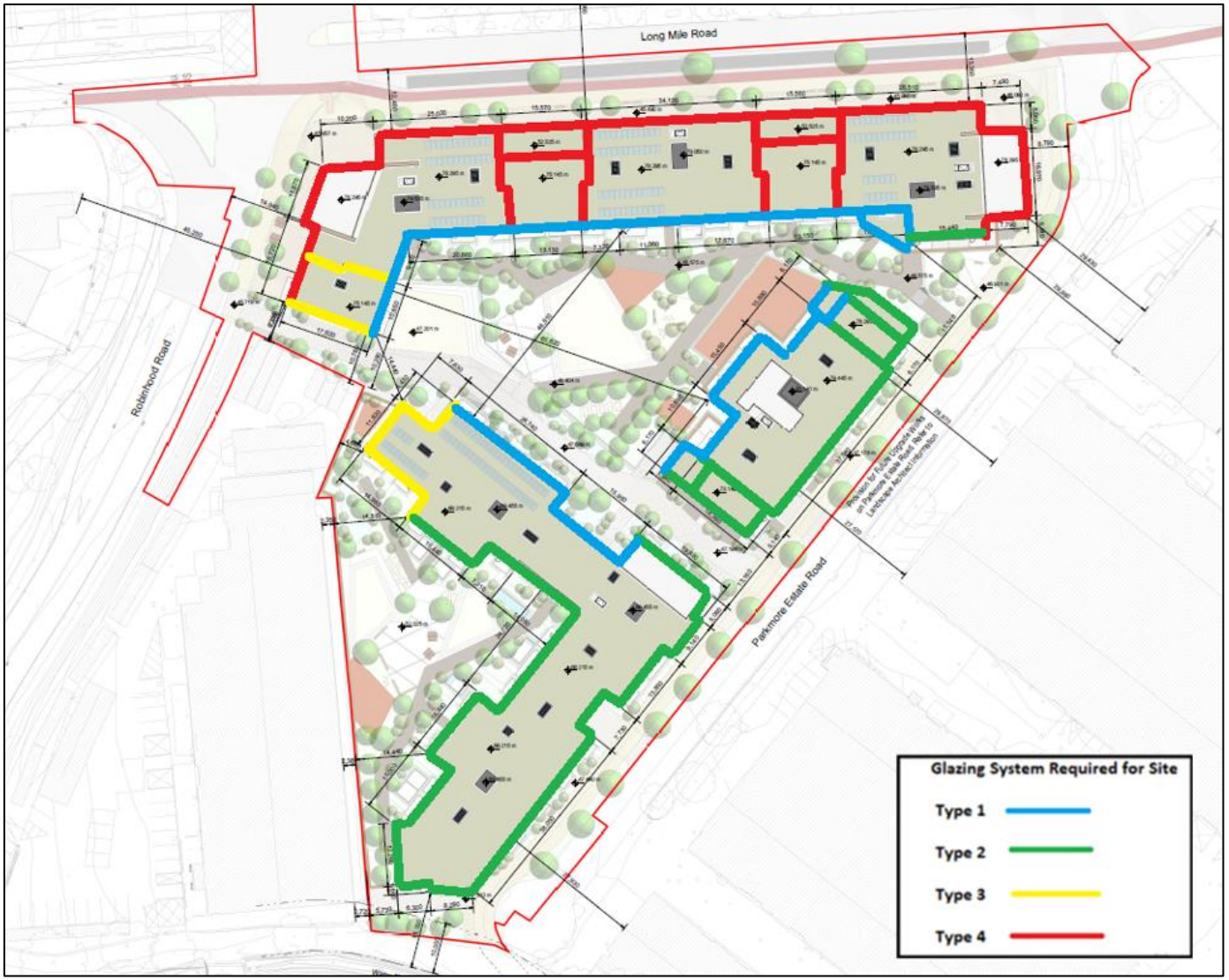
APPENDIX D – ACOUSTIC SPECIFICATION FOR FACADES SYSTEM


Long Mile Road
Robinhood Road
Parkmore Estate Road
Glazing System Required for Site
Type 1
Type 2
Type 3
Type 4

APPENDIX E – NOISE METER CALIBRATION CERTIFICATES OF CALIBRATION

Traynor Environmental Ltd.

Calibration Certificate

Certificate Number 2024002399

Customer:
Traynor Environmental Ltd
Belturbet Business Park
Creeny,Belturbet,C. Cavan
H14Ay94

Model Number	377C20	***Procedure Number***	D0001.8387
Serial Number	332422	***Technician***	Abraham Ortega
Test Results	**Pass**	***Calibration Date***	13 Feb 2024
Initial Condition	As Manufactured	***Calibration Due***	
Description	1/2 inch Microphone - RI - 0V	***Temperature***	23.2 °C ± 0.01 °C
		Humidity	42.7 %RH ± 0.5 %RH
		Static Pressure	101.55 kPa ± 0.03 kPa

Evaluation Method Tested electrically using an electrostatic actuator.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.
Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

For microphone sensitivity measurements, simple acceptance criteria is used with an expanded uncertainty not to exceed 0.25 dB for microphone sensitivities above 1 mV/Pa and 0.65 dB for microphone sensitivities below 1 mV/Pa.

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1681 West 820 North
Provo,UT 84601,United States
716-684-0001

Calibration Certificate

Certificate Number 2024002391

Customer:
Traynor Environmental Ltd
Belturbet Business Park
Creeny,Belturbet,C. Cavan
H14Ay94

Model Number	831C		***Procedure Number***	D0001.8384	
Serial Number	12494		***Technician***	Jacob Cannon	
Test Results	**Pass**		***Calibration Date***	13 Feb 2024	
Initial Condition	As Manufactured		***Calibration Due***		
Description	Larson Davis Model 831C Class 1 Sound Level Meter Firmware Revision: 04.9.6R1		***Temperature***	23.64 °C	± 0.25 °C
			Humidity	51.9 %RH	± 2.0 %RH
			Static Pressure	85.93 kPa	± 0.13 kPa

Evaluation Method ***Tested with:*** ***Data reported in dB re 20 µPa.***

Larson Davis CAL291, S/N 0108
Larson Davis CAL200. S/N 9079
Larson Davis PRM831, S/N 077643
PCB 377C20. S/N 332422

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61260:2014 Class 1	ANSI S1.11-2014 Class 1
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Correction data from Larson Davis SoundAdvisor Model 831C Reference Manual, I831C.01 Rev M, 2019-09-10

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to 1/2" adaptor is used with the preamplifier.

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ACCREDITED

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Calibration Certificate

Certificate Number 2024002379
Customer:
Traynor Environmental Ltd
Belturbet Business Park
Creeny,Belturbet,C. Cavan
H14Ay94

Model Number	831C	***Procedure Number***	D0001.8378
Serial Number	12494	***Technician***	Jacob Cannon
Test Results	**Pass**	***Calibration Date***	13 Feb 2024
Initial Condition	As Manufactured	***Calibration Due***	
Description	Larson Davis Model 831C Class 1 Sound Level Meter Firmware Revision: 04.9.6R1	***Temperature***	23.62 °C ± 0.25 °C
		Humidity	51.8 %RH ± 2.0 %RH
		Static Pressure	86.02 kPa ± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRM831 S/N 077643 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1
IEC 61260:2014 Class 1	ANSI S1.11-2014 Class 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Correction data from Larson Davis SoundAdvisor Model 831C Reference Manual, I831C.01 Rev M, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

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ilac-MRA A2LA ACCREDITED CERT #3822.01

LARSON DAVIS
A PCB DIVISION

Calibration Certificate

Certificate Number 2024001391
Customer:
Traynor Environmental Ltd
Belturbet Business Park
Creeny,Belturbet,C. Cavan
H14Ay94

Model Number	PRM831	***Procedure Number***	D0001.8383		
Serial Number	077643	***Technician***	Ashley Anderson		
Test Results	**Pass**	***Calibration Date***	24 Jan 2024		
Initial Condition	As Manufactured	***Calibration Due***			
		Temperature	23.36	°C	± 0.01 °C
Description	Larson Davis 1/2" Preamplifier for Model 831 Type 1	***Humidity***	51.7	%RH	± 0.5 %RH
		Static Pressure	86.1	kPa	± 0.03 kPa

Evaluation Method Tested electrically using a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level. Tests are considered to pass when the measured value is within the acceptance limits, which are derived from industry standards.

Simple acceptance criteria is used with an expanded uncertainty not to exceed 0.20 dB for all measurements below 100 kHz and 0.50 dB for measurements above 100 kHz.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis Model 2900 Real Time Analyzer	02/13/2023	02/13/2024	001447
Hart Scientific 2626-S Humidity/Temperature Sensor	02/20/2023	08/20/2024	006946
Agilent 34401A DMM	10/12/2023	10/12/2024	007116
SRS DS360 Ultra Low Distortion Generator	03/31/2023	03/31/2024	007174

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PARKMORE INDUSTRIAL ESTATE
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APPENDIX F – 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