Dog Boarding Kennels at Sea View Farm, Redruth

Noise Assessment for Planning Application

21st November 2023

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1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned to assess the impact of potential noise arising from a new dog boarding kennels building (the 'Proposed Development') at Sea View Farm, Old Portreath Road, Redruth, Cornwall (the 'Site').

The following technical noise assessment has been produced to accompany a Planning Application to Cornwall Council and is based upon environmental noise measurements undertaken at the site and a subsequent predictive exercise.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.2. Scope and Objectives

The scope of the noise assessment can be summarised as follows:

- A sound monitoring survey was undertaken at a discrete location adjacent to the closest noise-sensitive receptors to the Site;
- A 3-dimensional noise modelling exercise, in order to quantify the potential noise generation of the proposed site uses;
- An assessment of potential noise impacts with respect to the prevailing acoustic conditions at existing off-site receptors; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England: Noise[1].

[1] Department for Communities and Local Government (DCLG), 2014. National Planning Practice Guidance for England: Noise. DCLG England. DCLG.

2. Legislation and Policy Framework

The development proposals for the Site are guided by the following policy directives and guidance:

2.1. National Policy

2.1.1. National Planning Policy Framework, 2023

The *National Planning Policy Framework* (NPPF)[2] sets out the Government's planning policies for England. Planning policy requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise.

The NPPF is also a material consideration in planning decisions. It sets out the Government's requirements for the planning system and how these are expected to be addressed.

Under Section 15; *Conserving and Enhancing the Natural Environment*, in Paragraph 170, the following is stated:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing both new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability".

Paragraph 180 of the document goes on to state:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

As stated above, this document makes reference to avoiding noise generation from new developments that would adversely impact on health and quality of life. Paragraph 180 refers to the Noise Policy Statement for England, which is considered overleaf.

[2] Ministry of Housing, Communities & Local Government. July 2018. National Planning Policy Framework. HMSO. London.

2.1.2. Noise Policy Statement for England, 2010

The underlying principles and aims of existing noise policy documents, legislation and guidance are clarified in *DEFRA: 2010: Noise Policy Statement for England* (NPSE)[3]. The NPSE sets out the *"Long Term Vision"* of Government noise policy as follows:

"Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development".

The NPSE outlines three aims for the effective management and control of environmental, neighbour and neighbourhood noise:

- *"Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life".*

The guidance states that it is not possible to have a single objective noise-based measure that defines *"Significant Observed Adverse Effect Level (SOAEL)"* that is applicable to all sources of noise in all situations and that not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

2.1.3. National Planning Practice Guidance in England: Noise, 2014

Further guidance in relation to the NPPF and the NPSE has been published in the *National Planning Practice Guidance in England: Noise* (NPPG Noise)[4], which summarises the noise exposure hierarchy, based on the likely average response. The following three observed effect levels are identified below:

- **Significant Observed Adverse Effect Level**: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- **Lowest Observed Adverse Effect Level**: This is the level of noise exposure above which adverse effects on health and quality of life can be detected; and
- **No Observed Adverse Effect Level**: This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

[3] Department for Environment, Food and Rural Affairs (DEFRA), 2010. Noise Policy Statement for England. DEFRA.
[4] Department for Communities and Local Government (DCLG), 2014. National Planning Practice Guidance for England: Noise. DCLG.

Criteria related to each of these levels are reproduced in Table 1.

TABLE 1: SIGNIFICANCE CRITERIA FROM NPPG IN ENGLAND: NOISE

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not Noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and Not Intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and Very Disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.2. Local Policy

2.2.1. Cornwall Council Adopted Local Plan, 2016

The Plan is intended to help deliver the vision and objectives of 'Future Cornwall'; a sustainable community strategy. The underlying principles of the strategy seek to manage future development to ensure all communities in Cornwall have an appropriate balance of jobs, services, facilities and homes.

Future growth in Cornwall will be guided by a 'plan, monitor and manage approach' ensuring that the right policies are in place to reflect changing circumstances.

Policy 12 of the Local Plan, entitled 'Design' stipulates that new development should *avoid unreasonable noise and disturbance*.

Policy 13 of the Local Plan, entitled 'Development Standards' stipulates that all new development should *achieve the avoidance of adverse impacts, either individually or cumulatively, resulting from noise, dust, odour, vibration, vermin, waste, pollution and visual effects. Such adverse impacts should be avoided or mitigated during the construction, operation or restoration stage of development*.

Policy 16 of the Local Plan, entitled 'Health and Wellbeing' stipulates that *To improve the health and wellbeing of Cornwall's communities, residents, workers and visitors, development should: 1. Protect, and alleviate risk to, people and the environment from unsafe, unhealthy and polluted environments by avoiding or mitigating against harmful impacts and health risks such as air and noise pollution and water and land contamination and potential hazards afforded from future climate change impacts*.

2.3. Assessment Criteria

2.3.1. Cornwall Council Public Protection Development Sound Standard

Criterion 1 of the Cornwall Council Public Protection Development Sound Standard (herein referred to as the 'DSS') has been adopted as part of this assessment process. Criterion 1 of the DSS states the following:

"8.1 Sound criterion 1 is applicable:

- *to new noise-sensitive development, or refurbished buildings, undergoing change of use to residential, affected by existing noise sources.*
- *where new noise sources are brought to existing noise-sensitive receptors.*

Sound criterion 1

The ambient sound level $L_{Aeq,T}$ in the presence of the new sound source shall not exceed the external and internal amenity $L_{Aeq,T}$ sound limits contained in Table 1 at noise-sensitive receptors.

8.2 The external lower guideline value of 50 dB LAeq,12hr (0700-1900) will ensure that the recommended daytime internal guideline values are met, allowing 15 dB attenuation for an open window.

8.3 The WHO 1999 Guidelines state that no separate time base is given for evenings alone, but typically, guideline values should be 5 –10 dB lower than for a 12 h daytime period.

An evening guideline value of 45 dB LAeq,4hr has therefore been derived accordingly, that reflects the night-time external value. This is further justified by the 5dB evening weighting that is applied under the Environmental Noise Directive.

8.4 The evening external guideline value of 45 dB may also be relevant for established 'quiet' day time periods i.e. Saturday 1300-2300 and all day Sunday.

8.5 The internal guideline values in Table 1 are based on anonymous external sound as it affects the internal acoustic environment i.e. sound without a 'characteristic' such as a tone. The standard recommends that lower sound limits may therefore be applicable. Any characteristics there should be described and accounted for.

8.7 For new sound sources, the recommended guideline values for external areas are the values which should not be exceeded in the presence of the new sound source. Assessment of compliance with Criterion 1 should therefore be the logarithmic addition of the existing ambient sound level and the predicted sound over the relevant time-base.

8.8 Where the existing ambient sound level in the absence of the new sound source already exceeds the external guideline values in Table 1, in most cases any increase in this sound level should be avoided. Sound from the development should therefore aim to be more than 10 dB below the existing ambient sound level.

8.9 Whilst all development should aim to achieve the criteria outlined in Table 1, any variation from the Standard, due to site specific circumstances, will be assessed in accordance with planning policy through the determination process. National Policy does not require LOAEL in all circumstances, providing the exposure has been mitigated and minimized with the context of sustainable development.

8.10 Where criterion 1 cannot be achieved, the sound assessment should include a justification as to why the proposed development should be considered to meet planning policy."

An overview of the sound limits in Sound Criterion 1, relevant to the Proposed Development, equating to a Lowest Observed Adverse Effect LOAEL, are outlined in Table 2, below.

TABLE 2: SOUND CRITERION 1 CORNWALL COUNCIL PUBLIC PROTECTION DSS

T=	07:00 to 19:00	19:00 to 23:00	23:00 to 07:00	07:00 to 19:00	19:00 to 23:00	23:00 to 07:00
Area	DAY External amenity area $L_{Aeq,T}$ (dB)	EVENING External amenity area $L_{Aeq,T}$ (dB)	NIGHT External outside bedroom $L_{Aeq,T}$ (dB)	DAY Indoor living area $L_{Aeq,T}$ (dB)	EVENING Indoor bedroom $L_{Aeq,T}$ (dB)	NIGHT Inside bedroom $L_{Aeq,T}$ (dB)
Lowest observed adverse effect level (LOAEL)	50	45	45	35 (living) 40 (dining)	35	30

Criterion 2 of the Cornwall Council Public Protection DSS has been adopted as part of this assessment process. Criterion 2 of the DSS states the following:

9.1 Sound criterion 2 is applicable to:

- *the assessment of sound from proposed, new, modified or additional source(s) of an industrial and/or commercial nature, where new noise sources are brought to existing noise-sensitive receptors.*
- *the assessment of sound at proposed new dwellings or premises used for residential purposes, where the development will be affected by existing noise of an industrial/commercial nature.*

Sound criterion 2

The rating level $L_{Ar,Tr}$ of sound from the proposed development at the curtilage of amenity areas at Noise Sensitive Receptors should not be greater than the L_{A90} background sound level. The rating level is to be determined in accordance with the methodology prescribed in BS 4142:2014

9.2 Sound criterion 2 will not apply where there are no external amenity areas at the affected properties. The effect of the new sound source on existing noise sensitive receptors, should in most cases be assessed following the guidance in BS 8233:2014.

9.3 The BS 4142 assessment method relies upon a robust derivation of the representative background sound level, which requires comprehensive background monitoring that should "reflect the range of background sound levels for the period being assessed".

9.4 The background monitoring should be undertaken throughout the proposed operational period of the noise source and comprise continuous measurements of normally not less than 15 minutes, which can be contiguous or disaggregated. The readings should then be statistically analysed to determine the representative L90 background sound level.

9.5 Where the predicted rating level is very low (in the region of 15 dB or below) it may not be necessary to undertake background sound monitoring. The acoustician should, however, discuss the case with the area officer to gain prior approval (See EH-TAP Section 1).

9.6 Whilst relevant development should aim to achieve Criterion 2, any variation from the Standard due to site specific circumstances, will be assessed in accordance with planning policy through the determination process.

9.7 Where the initial estimate of the impact needs to be modified due to the context, the onus is on the applicant to provide a contextual argument Where Criterion 2 cannot be achieved, the sound assessment should include a justification as to why the proposed development should be considered acceptable in terms of noise (i.e. meets planning policy)."

2.4. British Standards

2.4.1. BS4142:2014+A1:2019

BS4142:2014+A1:2019 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014+A1:2019 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014+A1:2019 states: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs"*. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- *"Typically, the greater this difference, the greater the magnitude of the impact."*
- *"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."*
- *"A difference of around +5dB 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, depending on the context."*

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

3. Site Description

3.1. Site and Surrounding Area

The Proposed Development is on land to the east of Old Portreath Road at Sea View Farm, Redruth, Cornwall. The Site currently comprises an existing dog kennels and is surrounded by stables and farm land.

The Proposed Development area can be seen in Figure 1, below, outlined in red.

The ambient sound environment across the area was dominated by road traffic noise from the Old Portreath Road to the west and the A30 to the south.

The closest residential property to the Proposed Development is located 75 metres to the south, labelled NSR1 in Figure 1.

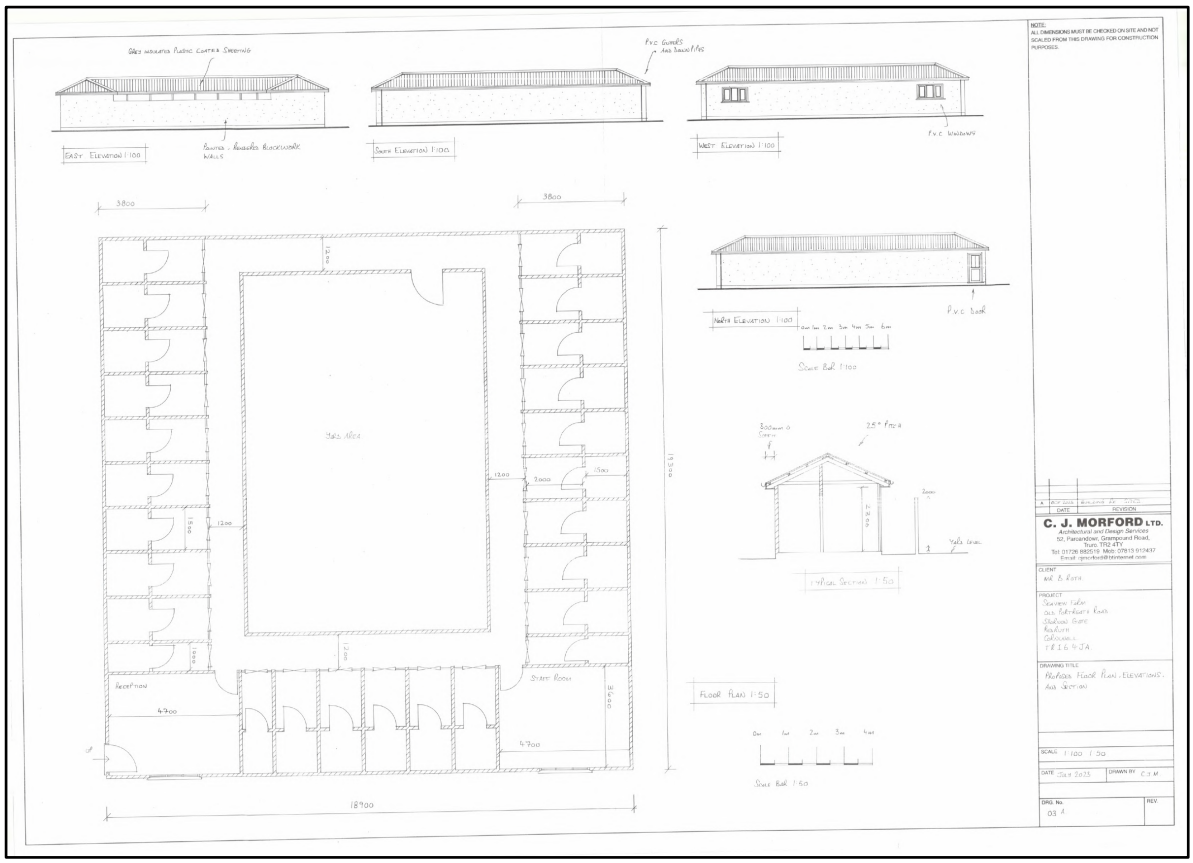
Figure 1: Proposed Development Site and Surrounding Area

3.2. Proposed Development Overview

The proposals comprise a commercial dog kennels facility, as shown in Figure 2. The Proposed Development is intended to update the existing kennel with the new building.

The Proposed Development comprises 26 kennels, a reception, a staff room and an open-air yard area in the centre of the building, this is where most noise breakout will occur and forms the basis of the assessment.

FIGURE 2: PROPOSED DEVELOPMENT LAYOUT



As noted, the kennels is an established business, so the impact of exercising dogs in the field etc has not been considered further, as this activity will not fundamentally alter as a result of the Proposed Development.

4. Measurement Methodology

4.1. General

The prevailing noise conditions in the area have been determined by an environmental noise survey conducted during both daytime and night-time periods between Friday 29th September 2023 and Tuesday 3rd October 2023.

4.2. Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[5].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[6]. A full inventory of this equipment is shown in Table 3 below.

Table 3: Inventory of Sound Measurement Equipment

Position	Make, Model & Description	Serial Number	Calibration Certificate Number	Calibration Due Date
MP1	Larson Davis 820 Sound Level Meter	A1110	1148127	02/08/2025
	Larson Davis PRM828 Preamplifier	3029		
	Larson Davis PCB 377B02 Microphone	171603		
All	Rion NC-74 Acoustic Calibrator	34984020	1131148	10/08/2024

The sound measurement equipment used during the survey was field calibrated at the start and end of the measurement period. A calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements. A drift of less than 0.2 dB in the field calibration was found to have occurred on the sound level meter.

The weather conditions during the survey were conducive to noise measurement; it being predominantly dry, with low wind speeds, as measured on-site using a rain-tipping gauge and anemometer, respectively. When periods of inclement weather occurred, they have been removed from the dataset used to derive the typical ambient and background sound levels. Wind direction was variable but predominantly from the south-west.

The microphones were fitted with protective windshields for the measurements, which are described in Table 4, with an aerial photograph indicating their locations shown in Figure 3.

[5] British Standard 7445: 2003: *Description and measurement of environmental noise*. BSI.
[6] British Standard 61672: 2013: *Electroacoustics. Sound level meters*. Part 1 *Specifications*. BSI.

Table 4: Measurement Position Description

Measurement Position	Description
MP1	Largely unattended daytime and night-time measurement of sound under free-field conditions, at a height of 1.5 metres above local ground level (approximately 1 metre above road level), located at the south boundary of the Site. The sound environment at this location was dominated by road traffic noise from the Old Portreath Road to the west and the A30 to the south.

Figure 3: Measurement Position

4.3. Sound Indices

The parameters reported are the average Equivalent Continuous Sound Level, $L_{Aeq,T}$, the statistical index (typical) Background Sound Level, $L_{A90,T}$, as well as the and the typical Maximum Sound Pressure Level, L_{AFmax}. An explanation of the sound units presented is given in Appendix A.

The measured L_{Aeq}, L_{AFmax}, and L_{AF90} sound levels are presented as time histories in a graph in Appendix B. Furthermore, the statistical distribution of the measured background sound levels to derive the typical representative $L_{A90,T}$ values are presented in a graphical format in Appendix C.

4.4. Summary Results

The summarised results of the environmental sound measurements, during the day and night-time periods, can be seen below in Table 5. Values have been rounded to the nearest whole number.

TABLE 5: SUMMARY OF SOUND MEASUREMENT RESULTS

Measurement Position	Period	$L_{Aeq,T}$ (dB)	$L_{AF90,T}$ (dB)	L_{AFmax} (dB)
MP1	Day	50	35	75
	Night	42	27	68

5. Operational Noise Assessment

5.1. Assessment Methodology & Approach

The methodology adopted for this assessment has been based on determining a representative baseline noise climate for the nearest noise-sensitive receptors to the Proposed Development, and assessing the impact of the Proposed Development on those receptors.

The assessment has assumed a potential level of activity noise, comprising of dogs barking, mostly simultaneously to demonstrate a reasonable worst-case scenario.

Noise predictions have been carried out using iNoise 2023 computer noise-modelling package, which employs the ISO9613 prediction methodology. In addition to the source noise levels used in the predictions, the prediction also considers the effects of acoustic reflections and screening from surrounding buildings'

5.2. Source Data Levels

To determine whether the noise emissions from the Proposed Development fall within acceptable limits, it is necessary to predict the noise levels that are likely as a result of the anticipated use of the Proposed Development.

Source data, relating to noise generation from dogs barking has been taken from our accumulated archive and is set out below:

Table 6: Dogs Barking Sound Power Level

Z-Weighted Octave Band Sound Power Level, L_{Zeq} (dB)								A-weighted Broadband Sound Power Level, L_{WA} (dB)
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
45	56	74	99	95	86	82	74	101

Table 7: Dogs Barking Sound Pressure Level

Z-Weighted Octave Band Reverberant Sound Pressure Levels, L_{Zeq} (dB)							
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
60	62	80	98	102	104	82	74

It is proposed that the walls are constructed of concrete block and timber cladding. As such, the overall sound reduction indices have been used in this calculation process, as detailed below in Table 8.

TABLE 8: OVERALL SOUND REDUCTION INDICES

Item	Octave Band Sound Reduction Index, Hz (dB)							
	63	125	250	500	1k	2k	4k	8k
Walls & Roof	10	14	16	18	22	26	28	28
Doors	9	12	13	14	16	18	24	26
Overall SRI	10	13	15	17	21	24	27	27

The sound power level used have been factored assuming a probable worst-case, comprising barking continuously.

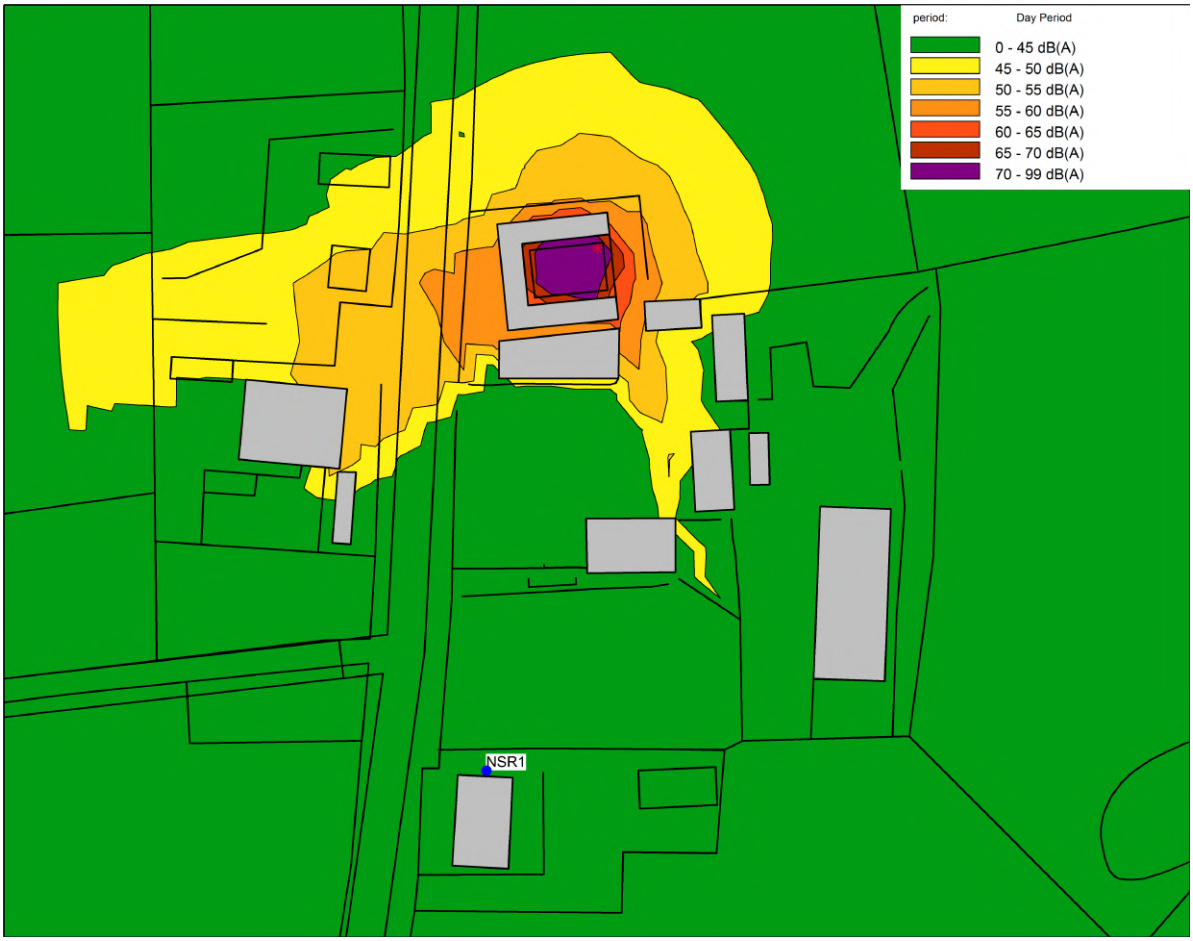
Noise levels from such developments are likely to be highly variable. This dataset is viewed as a robust basis for the assessment, providing reasonable worst-case noise generation statistics, which are repeatable.

Predictions of received noise levels have been undertaken at the closest noise-sensitive receptor, namely the closest residential dwelling to the Proposed Development; NSR1.

5.2.1. Specific Sound Level Noise Map

The sound map showing the specific sound level emissions from the Proposed Development during daytime hours (07:00-23:00) can be seen in Figure 4.

FIGURE 4: SPECIFIC SOUND LEVEL MAP - DAYTIME



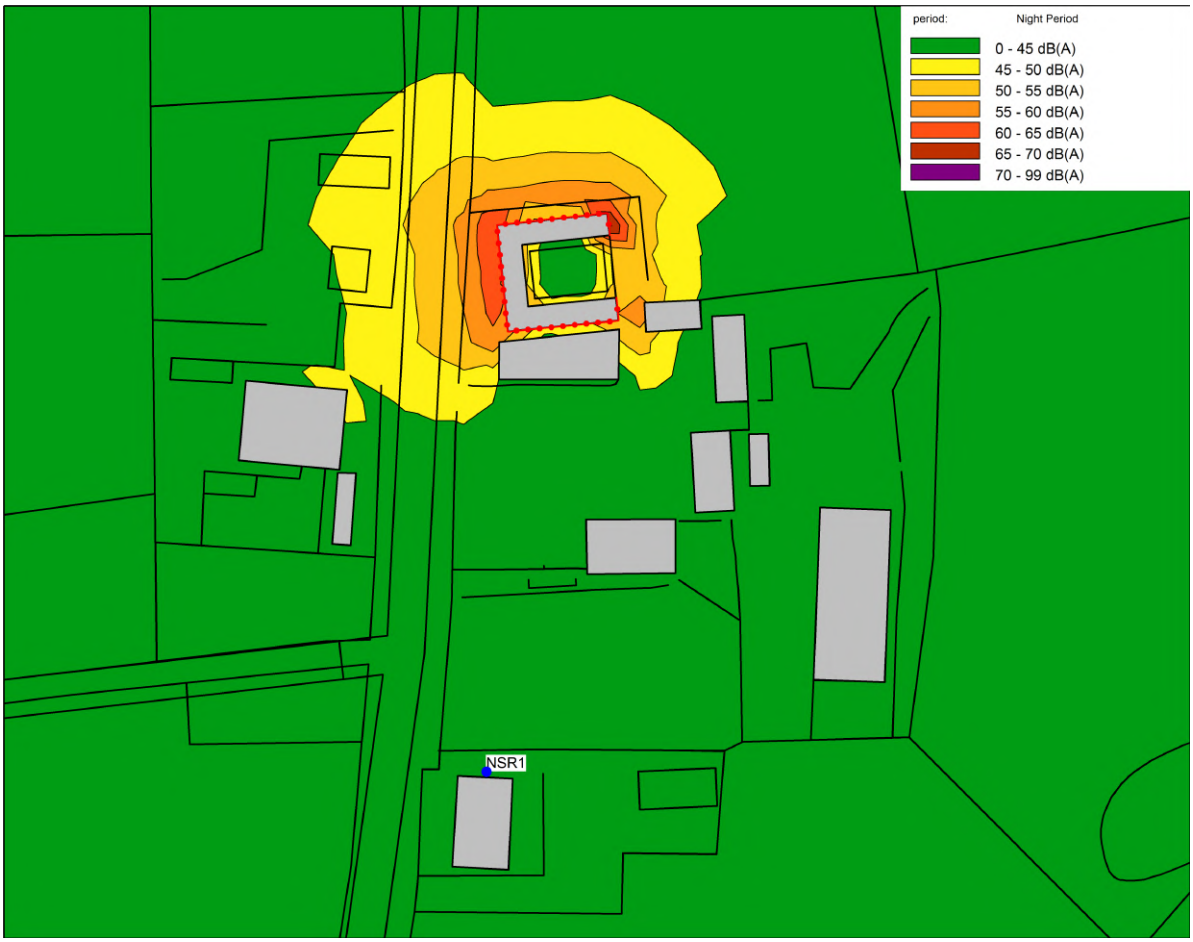
The result of the predictive exercise is set out in Table 9.

TABLE 9: PREDICTED NOISE LEVEL AT RECEPTOR - DAYTIME

Receptor	Specific Sound Level (dB)
NSR1	31

The sound map showing the specific sound level emissions from the Proposed Development during night time hours (23:00-07:00) can be seen in Figure 5, when the dogs will be located inside the proposed building.

FIGURE 5: SPECIFIC SOUND LEVEL MAP – NIGHT TIME



The result of the predictive exercise is set out in Table 10.

TABLE 10: PREDICTED NOISE LEVEL AT RECEPTOR – NIGHT TIME

Receptor	Specific Sound Level (dB)
NSR1	22

5.3. Assessment – Sound Criterion 1

An assessment of the likely change in ambient noise levels has been undertaken in accordance with Criterion 1 of the Cornwall Council Public Protection Development Sound Standard.

Table 11 presents the assessment in noise from the Proposed Development at NSR1 during the daytime period, the closest receptor.

TABLE 11: PREDICTED CHANGE IN DAYTIME AMBIENT SOUND LEVEL AT RECEPTOR

Receptor	Predicted Specific Noise Level – $L_{Aeq,1\text{-}hour}$ dB	Prevailing Ambient Sound Level - $L_{Aeq,T}$ dB	Cumulative Ambient Sound Level - $L_{Aeq,T}$ dB	Excess over Criterion 1 of DSS
NSR1	31	50	50	0

Table 12 presents the assessment in noise from the Proposed Development at NSR1 during the night time period, the closest receptor.

TABLE 12: PREDICTED CHANGE IN NIGHT TIME AMBIENT SOUND LEVEL AT RECEPTOR

Receptor	Predicted Specific Noise Level – $L_{Aeq,1\text{-}hour}$ dB	Prevailing Ambient Sound Level - $L_{Aeq,T}$ dB	Cumulative Ambient Sound Level - $L_{Aeq,T}$ dB	Excess over Criterion 1 of DSS
NSR1	21	46	46	0

The assessment detailed in Table 11 and Table 12 above identifies that under worst-case, peak use conditions, noise impacts from the operation of the Proposed Development are predicted to be at least 10 dB below the prevailing ambient noise level at NSR1, thus achieving the requirements of Criterion 1 of the Cornwall Council Public Protection Development Sound Standard at the nearest noise sensitive receptors, as per Paragraph 8.8 of the aforementioned document.

It can therefore be concluded that the requirements of Sound Criterion 1 has been achieved.

5.4. Assessment – Sound Criterion 2

5.4.1. Rating Penalty Principle

Section 9 of BS4142:2014+A1:2019 describes how the rating sound level should be derived from the specific sound level, by determining a rating penalty.

BS4142:2014+A1:2019 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

a) subjective method;
b) objective method for tonality;
c) reference method."

BS4142:2014+A1:2019 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

Tonality

A rating penalty of +2 dB is applicable for a tone which is *"just perceptible"*, +4 dB where a tone is *"clearly perceptible"*, and +6 dB where a tone is *"highly perceptible"*.

Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is *"just perceptible"*, +6 dB where it is *"clearly perceptible"*, and +9 dB where it is *"highly perceptible"*.

Other Sound Characteristics

BS4142:2014+A1:2019 states that where *"the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied."*

5.4.2. Rating Penalty Assessment

Considering the content of Section 5.4.1, an assessment of sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, and has been detailed in Table 13 below.

TABLE 13: RATING PENALTY ASSESSMENT

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
Dogs Barking	0 dB	+3 dB	0 dB	0 dB	Dogs Barking has been assumed to be continuous, hence no correction for intermittency. There may be a tone associated with dog barking, however, the most significant rating characteristic of dog barking is impulsivity, therefore, it has been assumed that, if the specific sound level is great enough, then dog barking would be *"just perceptible"*. The specific sound level is predicted to be some 19dB below the prevailing ambient sound level, which is already partially characterised by dog barking sound, so will not be outwith the character of the area.

In summary, a rating penalty of +3 dB has been considered in the assessment process.

Uncertainty

BS4142:2014+A1:2019 requires that the level of uncertainty in the measured data and associated calculations is considered in the assessment. The Standard recommends that steps should be taken to reduce the level of uncertainty.

Measurement Uncertainty

BS4142:2014+A1:2019 states that measurement uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

"
...
b) the complexity and level of variability of the residual acoustic environment;
...
d) the location(s) selected for taking the measurements;
...
g) the measurement time intervals;
h) the range of times when the measurements have been taken;
i) the range of suitable weather conditions during which measurements have been taken;
...
k) the level of rounding of each measurement recorded; and
l) the instrumentation used."

Each of the measurement uncertainty factors outlined above have been considered and discussed in Table 14.

TABLE 14: MEASUREMENT UNCERTAINTY FACTORS

Measurement Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Residual acoustic environment is relatively constant, hence no correction for a complex residual acoustic environment.
d)	0 dB	The measurements were undertaken at a location considered to be robustly representative of the closest noise-sensitive receptors to the site.
g)	0 dB	Measurement time intervals were set in accordance with BS4142:2014+A1:2019, hence no further correction needs to be made.
h)	0 dB	Background measurements were undertaken over continuous daytime and night-time periods.
i)	0 dB	The weather conditions were locally monitored throughout the measurement period and minimal periods of significant wind or precipitation were noted. Where inclement weather did occur, these periods have been removed from the dataset.
k)	0 dB	Measured values were rounded to 0.1 dB, therefore rounding would not have had a significant impact on the overall typical background sound levels.
l)	0 dB	The acoustic measurement equipment accorded with Type 1 specification of British Standard 61672, and were deployed with appropriate wind shields.

In summary, no correction has been included in the assessment, to account for measurement uncertainty.

Calculation Uncertainty

BS4142:2014+A1:2019 states that calculation uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

" ...

b) uncertainty in the operation or sound emission characteristics of the specific sound source and any assumed sound power levels;
c) uncertainty in the calculation method;
d) simplifying the real situation to "fit" the model (user influence on modelling); and
e) error in the calculation process."

Each of the calculation uncertainty factors outlined above have been considered and discussed in Table 15 below.

TABLE 15: CALCULATION UNCERTAINTY FACTORS

Calculation Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Sound levels for all sources/activities have been based on measured data at an existing operational site, as well as from robust archive data.
c)	0 dB	Calculations were undertaken in accordance with ISO 9613-2, which is considered a *"validated method"* by BS4142:2014+A1:2019.
d)	0 dB	The real situation has not been simplified for the purposes of this assessment.
e)	+1 dB	ISO 9613-2 indicates that there is a ±3 dB accuracy to the prediction method, dependent upon input variables and propagation complexities.

In summary, an uncertainty budget of ±1 dB has been considered in the assessment, to account for calculation uncertainty.

The overall uncertainty is considered to be small enough that it would not affect the conclusions of the assessment.

5.4.3. BS4142:2014+A1:2019 Assessment

The rating sound level, as calculated from the predicted specific sound level, has been assessed in accordance with BS4142:2014+A1:2019, at the closest receptor, NSR1.

The resultant assessment summary for noise generated from the Proposed Development can be seen in Table 16 below.

TABLE 16: BS4142:2014+A1:2019 ASSESSMENT SUMMARY

Receptor	Period	Rating Sound Level - $L_{Aeq,\,T}$ (dB)	Typical Background Sound Level – $L_{A90,\,T}$ (dB)	Excess of Rating over Background Sound Level – $L_{A90,\,T}$ (dB)
NSR1	Daytime (07:00-23:00)	34	35	-1
	Night-time (23:00-07:00)	25	27	-2

It can be seen that the rating sound level is predicted to be less than the typical background sound level during the day and night time periods, thus equating to a 'Low Impact' is BS4142-terms.

It can therefore be concluded that the requirements of Sound Criterion 2 has been achieved.

6. Conclusion

inacoustic has been commissioned to assess the impact of potential noise arising from a new dog boarding kennels building at Sea View Farm, Old Portreath Road, Redruth, Cornwall.

This technical noise assessment has been produced to accompany a Planning Application to Cornwall Council and is based upon environmental noise measurements undertaken at the site and a subsequent predictive exercise.

The assessment considers the potential noise emissions arising from periods of peak activity at the Proposed Development.

In accordance with the guidance given in the Cornwall Council Development Sound Standard, the sound from the Proposed Development is predicted to give rise to a low impact (depending on the context) at the nearest residential receptor, during peak periods of activity throughout the daytime and night-time periods. Considering the predicted sound level in the context of the ambient sound level, identifies that the overall effect is likely be negligible.

On the basis of this worst-case scenario assessment, the predicted sound impacts have been identified to be in the range of the NOAEL category in NPPG England.

In light of the above, it is considered that the potential noise impacts associated with the Proposed Development can be adequately controlled and that noise should not be considered a material constraint to the granting of planning permission for the proposals in their current form.

7. APPENDICES

7.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE 17: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

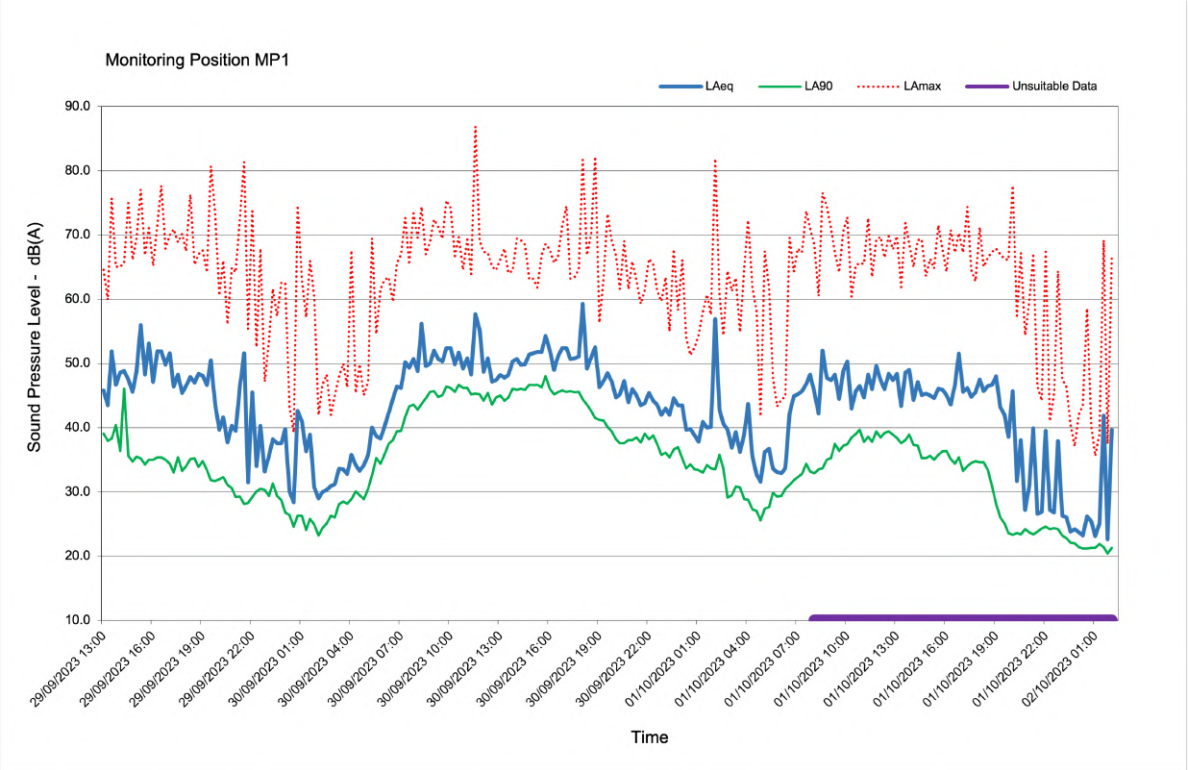
This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

7.2. Appendix B – Sound Measurement Results

FIGURE 6: MEASURED TIME HISTORY – MP1



7.3. Appendix C – Statistical Analysis

FIGURE 7: STATISTICAL ANALYSIS OF L_{A90} BACKGROUND – DAYTIME - MP1

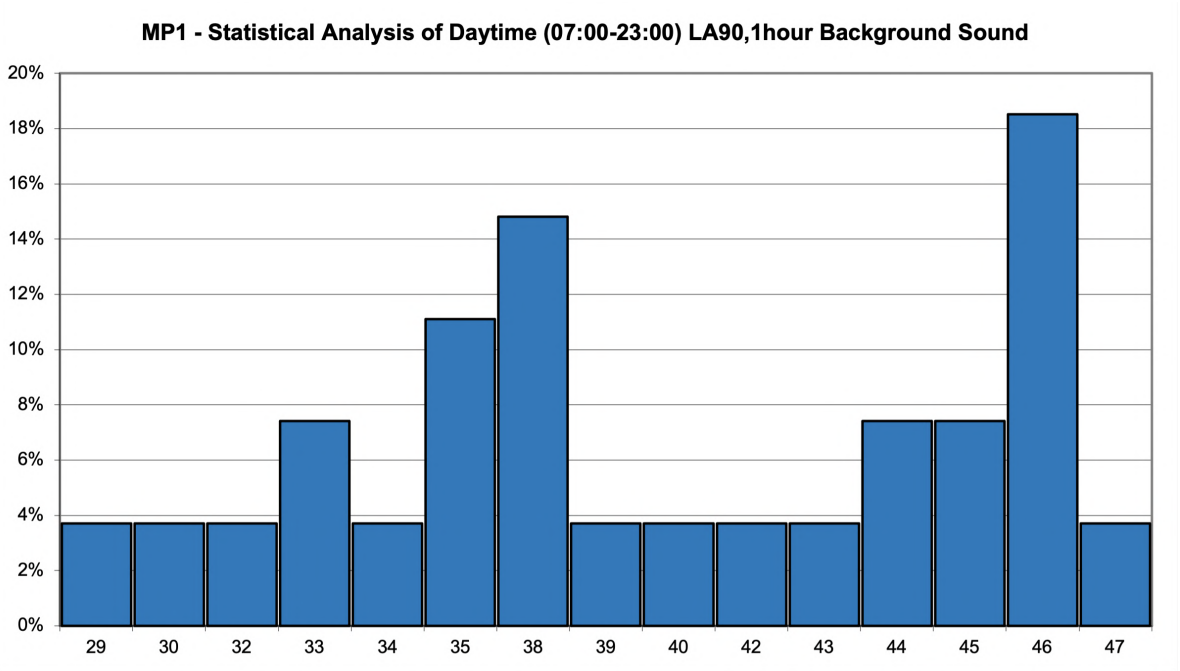
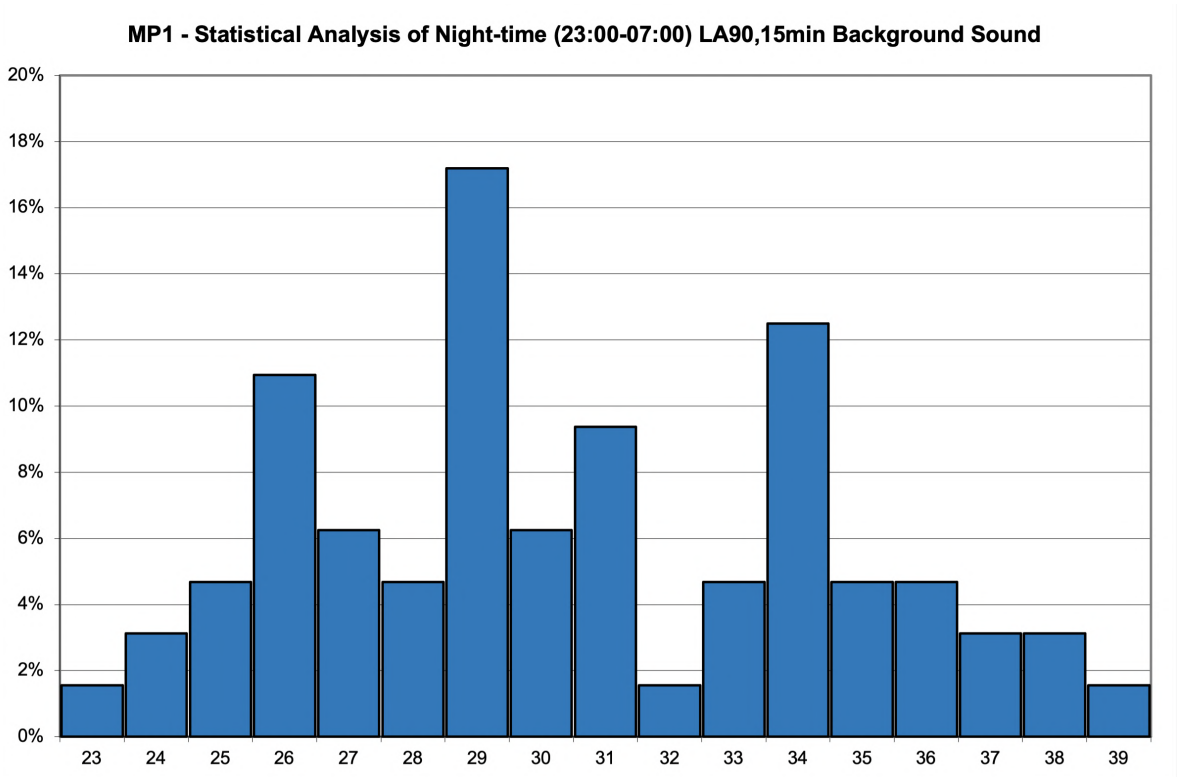


FIGURE 8: STATISTICAL ANALYSIS OF L_{A90} BACKGROUND – NIGHT-TIME - MP1



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