John Rabson's Recreation Ground Skate Park

Noise Assessment for Planning Application

8th August 2024

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1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned by Maverick Industries to prepare a Noise Assessment for the construction of a proposed skatepark on land at John Rabson's Recreation Ground, Reading ('the Site').

The Applicant will be submitting a planning application ('the Application') to Reading Borough Council (RBC). Accordingly, the following technical noise assessment has been produced to accompany the Application to RBC. This report details the existing background sound climate at the nearest receptors, as well as the sound emissions associated with the Proposed Development.

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 baseline sound monitoring survey undertaken in the vicinity of the closest noise-sensitive receptors to the Site;
- Detailed sound modelling using the Cadna/A modelling suite and ISO9613[1] prediction methodology to predict sound levels at the closest noise-sensitive receptors to the Site;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the proposed sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of BS4142:2014+A1:2019[2], the World Health Organisation *Guidelines for Community Noise*[3], and the *Clay Target Shooting, Guidance on the Control of Noise*[4] by the Chartered Institute of Environmental Health Engineers.

[1] International Standards Organisation. ISO 9613-2:1996: Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere.
[2] British Standard Institution. BS4142:2014+A1:2019: Methods for rating and assessing industrial and commercial sound.
[3] World Health Organisation. Guidelines for Community Noise. 1999.
[4] Chartered Institute of Environmental Health Engineers. Clay Target Shooting, Guidance on the Control of Noise. January 2003.

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)[5] sets out the UK 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 180, the following is stated:

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

e) preventing 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 191 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"

Paragraph 191 refers to the Noise Policy Statement for England, which is considered overleaf.

[5] Department for Levelling Up, Housing & Communities (DLUHC), December 2023. 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)[6]. 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, 2019

Further guidance in relation to the NPPF and the NPSE has been published in the *National Planning Practice Guidance in England: Noise* (NPPG Noise)[7], 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.

[6] Department for Environment, Food and Rural Affairs (DEFRA), 2010. Noise Policy Statement for England. DEFRA.
[7] Department for Communities and Local Government (DCLG), 2019. 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
No Observed Effect Level			
Not Noticeable	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Noticeable and Not Intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a 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, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and Disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and Very Disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, 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. Operational Phase Assessment Methodology

In the absence of specific guidance in the National Planning Policy Framework, the following criteria have been used in the assessment of the Proposed Development.

In relation to the noise produced by leisure activities, such as skateboarding, there are no specific assessment methods or criteria in relation to noise impact. There are, however, a number of assessment methods that are related to this type of activity. These methods, as described in the following text, were developed by Alan Saunders Associates (now Clarke Saunders Associates), and have been accepted by the court in the landmark case in relation to skateboard noise; Richardson v Devizes Town Council and have subsequently been adopted by a number of local authorities and other acoustic consultants.

In essence, all of the following three methods of assessment need to show acceptable noise levels for a new skate park, to ensure that complaints in relation to activity noise are unlikely to occur. In practice, the third method of assessment based on the *Clay Target Shooting, Guidance on the Control of Noise*, which relates specifically to the maximum noise levels, the most common cause of complaints, is the most sensitive.

2.3. Relevant Standards

2.3.1. 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."*

2.3.2. World Health Organisation: Guidelines for Community Noise

The WHO document Guidelines for Community Noise sets out guidance on external noise levels at which there will be an unacceptable impact on communities. This guidance considers many different types of noise sources. In paragraph 4.1.7 the impact of noise on dwellings is considered. The document states:

"During the daytime, few people are seriously annoyed by activities with (steady) L_{Aeq} levels below 55 dB; or moderately annoyed with L_{Aeq} levels below 50 dB. Sound pressure levels during the evening and night should be 5 to 10 dB lower than during the day (i.e. 45 to 50 dB serious annoyance; 40 to 45 dB moderate annoyance). It is emphasised that for intermittent noise (such as the skateboarding activities) it is necessary to take into account the maximum (i.e. the L_{Amax}) sound pressure level as well as the number of events."

2.3.3. Clay Target Shooting, Guidance on the Control of Noise

The sudden nature, duration and the character of the skateboard impact noise during jumps and turns, etc, by skateboarders bears close aural similarity with the noise from gunshots at a distance.

There have been a number of research investigations into what levels of gunshot noise cause annoyance to residential occupants, notably by Sörensen S & Magnusson J, G F Smoorenburg and Hoffman. The current thinking on their impact which generally agrees with the previous research, has been published as 'Clay Target Shooting, Guidance on the Control of Noise' published by the Chartered Institute of Environmental Health Engineers in January 2003. Measurement and social survey work carried out by the Building Research Establishment during 1996/1997 provides the basis for applying limits at noise sensitive premises, which range between the 'mid fifties' (in dB(A) terms) to the 'mid sixties' $SNL_{25\ Shots:30minutes}$.

The above research suggests that there is no fixed level for annoyance to occur. There is, however, 'little evidence of significant annoyance' below a level in the 'mid fifties': $SNL_{25Shots:30minutes}$ and a likelihood of 'significant annoyance being caused' above a level in the 'mid sixties' $SNL_{25Shots:30minutes}$ as measured at the noise sensitive premises. The $SNL_{25Shots:30minutes}$ is the logarithmic average of the loudest 25 shots measured as a maximum (L_{Amax}) in a 30 minute period.

3. Site Description

3.1. Site and Surrounding Area

The Proposed Development is on Land at John Rabson's Recreation Ground. The location of the Proposed Development and the nearest receptors can be seen below in Figure 1.

The nearest noise-sensitive receptor, being a 2-storey house located off Northumberland Avenue, is located some 90 m to the north-east of the Proposed Development.

Figure 1: Plan of Site and Surrounding Area

3.2. Proposed Development Overview

The location of the proposed skatepark can be seen below in Figure 2. It is proposed that the features of the skatepark will be constructed by Maverick Industries Ltd.

FIGURE 2: PROPOSED LOCATION

4. Measurement Methodology

4.1. General

The prevailing noise conditions in the area have been determined by an attended environmental noise survey conducted in the evening of the 24th June 2024.

Table 2: Measurement Position Description

Measurement Position	Description
MP1	The sound environment was characterised by noise of playground and football activity emanating by the nearby playground and football pitches. The area was busy with people occupying the spaces. Dog walkers frequently used the green space north of the football pitches. Traffic noise contributed to the sound environment and diminished towards the end of the measurement period. Residual contributions arose from barking dogs from a nearby house and air planes we're observed overhead intermittently.

Figure 3: Measurement Position

4.2. Weather Conditions

The background sound survey was conducted with wind speeds of less than 5 ms^{-1}, with no periods of precipitation noted during the attended period.

4.3. Sound Indices and Procedure

4.3.1. Background

The background sound measurements were undertaken at a microphone height of 1.5 metres above local ground level, away from reflecting surfaces, other than the ground, with a wind shield used throughout. The parameters reported are the statistical indices $L_{A10,T}$ and the Background Sound Level, $L_{A90,T}$, as well as the Equivalent Continuous Sound Level, $L_{Aeq,T}$ and the Maximum Sound Pressure Level, L_{AFmax}.

4.4. Equipment

The sound measurement exercise was undertaken by a consultant certified as competent in environmental sound monitoring, and, in accordance with the principles of BS 7445[8].

The acoustic measurement equipment used during the sound survey conformed to Type 1 specification of British Standard 61672[9]. A full inventory of this equipment is shown in Table 3 below:

TABLE 3: INVENTORY OF SOUND MEASUREMENT EQUIPMENT

Measurement Position	Make, Model & Description	Serial Number	Calibration Certificate Number	Calibration Due Date
MP1	Rion NL-52 Sound Level Meter	01009671	1141898	20/03/2025
	Rion NH-25 Preamplifier	9976		
	Rion UC-59 Microphone	18146		
MP1	Cirrus CR:515 Acoustic Calibrator	82506	1149834	16/10/2024

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 0.1 dB in the field calibration was found to have occurred on the sound level meter. The microphone was fitted with a protective windshield for the entire measurement period.

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

4.5. Sound Survey Results

4.5.1. Background

The summarised results of the environmental sound measurements, during the evening time period, can be seen below in Table 4.

TABLE 4: LONG-TERM SOUND MEASUREMENT RESULTS

Measurement Position	Period	L_{AFmax} (dB)	$L_{Aeq,T}$ (dB)	$L_{AF90,T}$ (dB)
MP1	Evening 19:00 to 20:00	62	45	40
	Evening 20:00 to 21:00	63	47	39

5. CALCULATIONS

5.1. Methodology

Source sound levels for average and L_{max} events for the use of the proposed skate park are based on historic datasets from other, similar skate parks, and are considered robust.

As such, the sound power levels associated with typical skateboard rolling noise, as well as maximum events, such as grinding or landing, are detailed below in Table 5.

TABLE 5: SOURCE DATA

Process	A-weighted Octave Band Sound Power Level (dB)							A-weighted Broadband Sound Power Level, L_{WA} (dB)
	63	125	250	500	1k	2k	4k	
Skateboard Run	84	87	85	86	82	75	66	92
Skateboard Landing	79	93	100	96	107	103	101	110

5.1.1. CAD Model

In order to accurately model the land surrounding the proposed development, an AutoCAD DXF drawing was produced, which was based on data provided by the Ordnance Survey.

5.1.2. Calculation Process

Calculations were carried out using Cadna/A, which undertakes its calculations in accordance with guidance given in ISO9613-1:1993 and ISO9613-2:1996.

5.1.3. Acoustic Modelling Scenarios

We have calculated the specific sound pressure level assuming skateboards operating throughout the skate park features.

5.2. Predictions

5.2.1. Specific Sound Level Predictions

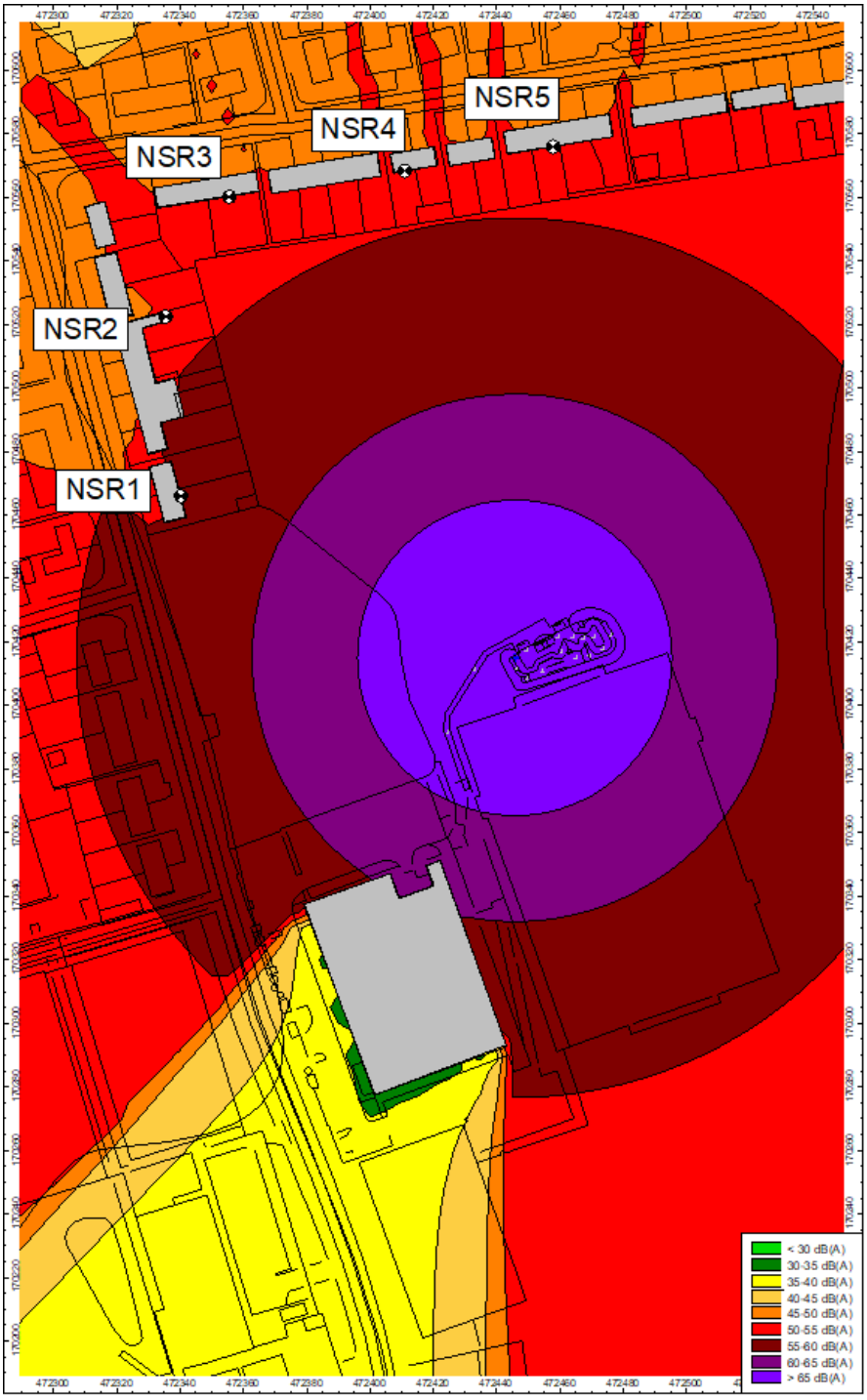
The resultant specific sound level at the nearest noise sensitive receptors has been calculated. A sound map indicating the propagation of sound from the skatepark can be seen below in Figure 4.

FIGURE 4: SPECIFIC SOUND LEVEL ($L_{AEQ,T}$) MAP

5.2.2. Maximum Sound Pressure Level Predictions

The resultant maximum sound level at the nearest noise sensitive receptors has been calculated. A sound map indicating the propagation of sound from the skatepark, with a skateboard using the grind rail, can be seen below in Figure 5.

FIGURE 5: MAXIMUM SOUND LEVEL (L_{AFMAX}) MAP



5.2.3. Sound Level Summary

A summary of the predicted specific and maximum sound levels at the NSRs, based on the sound maps shown in Figure 4 and Figure 5, can be seen below in Table 6.

TABLE 6: PREDICTED SPECIFIC SOUND LEVEL SUMMARY

NSR	Specific Sound Level, L_{Aeq} (dB)	Maximum Sound Level, L_{AFmax} (dB)
1	45	57
2	44	54
3	43	53
4	44	54
5	44	54

6. Noise Assessment

6.1. BS4142:2014+A1:2019

6.1.1. Rating Penalty

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

Given that the Proposed Development is not operational, the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014+A1:2019, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.

Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

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."*

Intermittency

BS4142:2014+A1:2019 states that when the *"specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time … if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."*

6.1.2. Rating Penalty Assessment

Considering the content of Section 6.1.1, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, and has been detailed in Table 7 below.

TABLE 7: RATING PENALTY ASSESSMENT

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
Skateboard	0 dB	+6 dB	+3 dB	0 dB	Impulsivity may be *"clearly perceptible"* if the specific sound level is high enough.

BS 4142 advocates that rating penalties should be applied to the most significant acoustic characteristic and not necessarily linearly added, so on that basis a +6 dB rating penalty is considered appropriate to take account of impulsivity.

6.1.3. 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.

6.1.4. 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 8 below.

TABLE 8: MEASUREMENT UNCERTAINTY FACTORS

Measurement Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Residual acoustic environment is simple.
d)	0 dB	Measuring on land associated with all receptors may have yielded a typical, worst-case baseline for assessment, with any variations throughout the assessment area being insignificant.
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	Measurements were undertaken over a representative time period.
i)	0 dB	The periods of data used to derive the typical background sound levels comprised relatively neutral weather conditions; therefore, the impact on the measured values would have been minimal.
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.

6.1.5. 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 9 below.

TABLE 9: CALCULATION UNCERTAINTY FACTORS

Measurement Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Sound source levels have been measured at an equivalent site.
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, therefore, an uncertainty factor of +1 dB is considered appropriate.

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.

6.1.6. Rating Sound Level

Incorporating the rating penalties detailed in Section 5.2.2 with the predicted specific sound levels, as detailed in Table 6, the rating sound levels have been derived and have been detailed in Table 10 below.

TABLE 10: RATING SOUND LEVELS

NSR	Specific Sound Level (dB)	Rating Sound Level (dB)
1	45	54
2	44	53
3	43	52
4	44	53
5	44	53

6.1.7. Assessment

The rating sound level, as calculated from the predicted specific sound level, has been assessed in accordance with BS4142:2014+A1:2019, at all NSRs. It has been assumed that the skatepark will typically operate between 08:00 and 22:00, therefore negating the need to assess the impact of the Proposed Development during the night-time period.

The BS4142:2014+A1:2019 assessment during the daytime period, can be seen below in Table 11.

TABLE 11: DAYTIME BS4142:2014+A1:2019 ASSESSMENT SUMMARY

NSR	Rating Sound Level (dB)	Evening Time Background Sound Level (dB)	Excess of Rating over Evening Time Background Sound Level (dB)
1	51	39	+12
2	50	39	+11
3	49	39	+10
4	50	39	+11
5	50	39	+11

The assessment in accordance with BS4142:2014+A1:2019 indicates that a *Significant Adverse Impact* is likely to be caused by the Proposed Development, ***depending on the context***.

6.2. WHO Assessment

The World Health Organisation's *Guidelines for Community Noise* states that few people are *"seriously annoyed"* by sound pressure levels below L_{Aeq} 55 dB.

The highest calculated specific sound level for at any of the NSRs is L_{Aeq} 54 dB, therefore indicating that few people are likely to be *"seriously annoyed"* by the presence of the Proposed Development in the ambient sound climate, within the context of the WHO Guidelines.

It should also be noted that ambient sound pressure level in the area ranged between $L_{Aeq,T}$ 48-51 dB during the evening time period, so it is likely that during the core daytime, the average noise levels from the skatepark will be within the context of the current baseline conditions.

6.3. Clay Target Shooting Assessment

The Chartered Institute of Environmental Health Engineers' *Clay Target Shooting, Guidance on the Control of Noise* states that there is *"little evidence of significant annoyance"* for maximum pressure levels below $SNL_{25Shots:30minutes}$ 55 dB.

TABLE 12: CLAY TARGET SHOOTING ASSESSMENT SUMMARY

NSR	Predicted Shot Noise Level (dB)	Clay Target Shooting Criteria (dB)	Excess of Clay Target Shooting Criteria (dB)
1	57	55	+2
2	54	55	-1
3	53	55	-2
4	54	55	-1
5	54	55	-1

6.4. Overall Context and Discussion

The assessment in accordance with BS4142:2014+A1:2019, the World Health Organisation's *Guidelines for Community Noise*, and the Chartered Institute of Environmental Health Engineers' *Clay Target Shooting, Guidance on the Control of Noise* criteria indicate that, compliance with these measures is achievable at all of the receptors.

The guidance in the World Health Organisation's *Guidelines for Community Noise*, and the Chartered Institute of Environmental Health Engineers' *Clay Target Shooting, Guidance on the Control of Noise*, have been broadly achieved, with the only minor exceedance of the No Observed Adverse Effect Level at R8 by 2 dB, however, the ambient sound environment at this receptor is normally between L_{AFmax} 62 to 63 dB, so the predicted maxima events from the Proposed Development is comfortably below this level. As such, it is asserted that the compliance with the World Health Organisation's *Guidelines for Community Noise*, and the Chartered Institute of Environmental Health Engineers' *Clay Target Shooting, Guidance on the Control of Noise*, has been achieved.

The assessment in accordance with BS4142:2014+A1:2019 has demonstrated that there is predicted to be an exceedance of +10 dB to +12 dB at the closest receptors; 6 dB of which is due to the rating penalty applied to the potential characteristic of the sound associated with the Proposed Development. This is the only potential negative element to the assessment; however, it is considered that the broad equivalence of the predicted peak specific sound levels to the ambient sound level of the area, does reduce the significance of this element, especially when considered alongside the L_{AFmax} and WHO outcomes.

As the L_{AFmax} element of the assessment indicates broad compliance with the thresholds for the Lowest Observed Adverse Effect Level, it is asserted that the Proposed Development will therefore not engender a change in receptor behaviour on this front; however, the BS4142 element of the assessment does indicate that this threshold is likely to be breached under peak use conditions.

7. Conclusion

inacoustic has been commissioned to prepare a Noise Assessment for the construction of a proposed skatepark on land at John Rabson's Recreation Ground, Reading.

It can be seen that from the assessment in accordance with the World Health Organisations' *Guidelines for Community Noise* and the Chartered Institute of Environmental Health Engineers' *Clay Target Shooting, Guidance on the Control of Noise*, that *"significant"* annoyance is likely to be experienced by the nearest existing receptors to the proposed skate park, when considered within the context of the baseline conditions currently experienced by the nearest receptors.

Furthermore, the assessment in accordance with BS4142:2014+A1:2019 has indicated that there is potential for a *"significant adverse impact"*, although it is asserted that the applicability of BS4142:2014+A1:2019 in this instance should be considered for context only, rather than being solely relied upon to make a decision.

For context, the skatepark would be in-keeping with the recreational use of the area, with leisure activities such as football already occurring in this area.

The evaluation of the Proposed Development indicates a potential to surpass the Lowest Observed Adverse Effect Level (LOAEL) on the basis of the BS4142 element of the assessment, with all other assessment aspects indicating a compliance with this threshold. This is the threshold at which a planning application for a Proposed Development may require more nuanced consideration to balance the strict interpretation of National Planning Policies with wider considerations, especially need. Consequently, noise could be considered a constraint to the approval of this Planning Application; however, it is also noted that a proven local need or desire for the development may be sufficient to override this particular conclusion of this noise assessment report.

8. Appendices

8.1. 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 A1: 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.

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