

NOISE IMPACT ASSESSMENT REPORT

March 8th 2020

Noise Control Solutions Limited

Report Reference NCSL 1009

The Stables Wedding Farm, Delph, OL3 5RJ

Issue 1.

NCSL

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1 Introduction

Noise Control Solutions Limited (NCSL) have been commissioned to undertake a noise impact assessment for the proposed rural wedding venue at Slackfield Farm, Knott Hill Lane, Delph, Oldham. The assessment is required in order to accompany the planning application CL/341198/18 which is currently being considered by Oldham Council (OC). The scope of this application is the proposed use of land for a wedding venue for no more than 12 events per calendar year, operating between 16:00 to 23:30. The venue comprises of demountable marquee structures.

Consultee comments were made by Ms Amanda Leonard, Senior Environmental Health Officer for OC, following the submission of the planning application. These comments relate to the requesting of an environmental background noise measurement prior to any events being held at the proposed venue in order to define a suitable noise limit for the specification of any noise control measures. Amplified music from within the proposed demountable marquee structure associated with this application is likely to be the main source of noise and has been cited as a concern by OC.

In order to assess the noise impact at the nearest noise sensitive receptors (NSR), an environmental noise survey has been conducted by NCSL, details of which are described within this report.

Report prepared by  Andrew Todd BA(Hons) MSc MIOA CEng

2 Competence

This report has been prepared by Mr Andrew Todd, a corporate member of the Institute of Acoustics, a holder of a MSc in Acoustics and a Chartered Engineer registered with the United Kingdom Engineering Council. Andrew has over 12 years' experience as an acoustic consultant/engineer working in various aspects of acoustics.

3 Applicable Literature

3.1 BS 4142:2014 Methods for rating and assessing industrial and commercial sound

British Standard 4142:2014 Methods for rating and assessing industrial and commercial sound (BS4142) sets out a methodology to determine the potential impact of proposed industrial and commercial sound sources upon nearby dwellings or premises used for residential purposes. Furthermore, BS4142 is appropriate to consider the impact of existing sources of industrial and commercial sound on proposed receptors.

The methodology prescribes the measurement of the existing acoustic environment at noise sensitive receptor locations, termed the 'background sound level'

A measurement or calculation of the noise generated by the proposed noise source at the receptor location is also required and is termed the 'specific sound level'. This value is then adjusted to reflect any acoustic characteristics which may increase audibility or annoyance to define the 'rating level'.

Once these values have been attained, an analysis can be conducted in order to assess the estimated noise impact that will occur with the introduction of the proposed source into the existing environment.

- In instances where the rating level exceeds background noise level by +10dB, this is an indication of a significant adverse impact, depending upon the context.
- In instances where the rating level exceeds background noise level by +5dB, this is an indication of an adverse impact, depending upon 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 cause and adverse noise 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.

The assessment of a noise impact at a receptor should consider the context in which the sound occurs. BS4142 states that the following factors be included in the context assessment;

- The absolute level of sound;
- The character and level of residual sound; and,
- The sensitivity of the receptor.

3.2 BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings (BS8233) provides guidance on internal noise levels within dwellings allowing for sufficient resting and sleeping conditions, as shown in Table 1.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35dB $L_{Aeq,16hour}$	N/A
Dining	Dining room	40dB $L_{Aeq,16hour}$	N/A
Sleeping	Bedroom	35dB $L_{Aeq,16hour}$	30dB $L_{Aeq,8hour}$

Table 1 - BS 8233:2014: Recommendations for indoor noise levels

BS8233 also provides guidance on estimated noise reduction levels of commonly used building materials and constructions.

3.3 World Health Organisation – Guidelines for community noise 1999.

The World Health Organisation (WHO) provides guidance on maximum recommended noise levels in outdoor living areas. The noise guideline levels are shown in Table 2.

Specific Environment	Critical Health Effect	dB L _{Aeq}	Time (hr)	dB L _{AMax}
Outdoor living area	Serious annoyance daytime and evening.	55	16	NA
	Moderate annoyance daytime and evening.	50	16	NA
Outside bedroom	Sleep disturbance, window open (outdoor values).	45	8	60

Table 2 - WHO Recommendations for outdoor noise levels

3.4 Code of Practice on Environmental Noise Control at Concerts (1995)

This document, published by the Noise Council in 1995, sets out methods for setting reasonable Music Noise Level (MNL) targets at residential premises and best practice methods for minimising disturbance caused by music events.

The guidance noise levels defined within the document for events held between 09:00 and 23:00 are shown in Table 3.

Concert days per calendar year, per venue	Venue category	Guideline
1 to 3	Urban stadia or arenas	The MNL should not exceed 75dB(A) over a 15 minute period
1 to 3	Other urban and rural venues	The MNL should not exceed 65dB(A) over a 15 minute period
4 to 12	All venues	The MNL should not exceed the background noise level by more than 15dB(A) over a 15 minute period

Table 3 - Guideline noise levels from Code of Practice on Environmental Noise Control at Concerts (1995)

The MNL (Music Noise Level) is defined as the Equivalent, A-weighted noise level ($L_{Aeq,15minutes}$) measured 1m from the Noise Sensitive Receptor (NSR) façade.

The background noise level is derived from the arithmetic average of the hourly L_{A90} values measured over the last four hours of the proposed music event or over the entire period of the proposed event if it is scheduled to last less than four hours.

Furthermore, the document also provides a limit on the acceptable levels of low frequency noise generated by the event. The document states that a level of up to 70dB in either of the 63Hz or 125Hz octave frequency bands is satisfactory.

The document recommends that for any events continuing beyond 23:00, the MNL should not be audible within the NSR with windows open in a typical manner for ventilation.

In addition, the document also sets out best practice methods to minimise disruption within the local environment, this includes:

- Giving sufficient notice to local authorities when events are planned.
- Advertise and operate a complaint telephone number through which noise complaints can be channelled, allowing for an immediate response if necessary.
- Carrying out of a sound test prior to each event to ascertain the maximum level that can be reached to allow guideline noise levels to be met. This effectively 'calibrates' the system taking in to account prevailing weather conditions and the sound insulation of the venue.
- Carry out noise monitoring outside the venue throughout the event.

4 Location

4.1 Site Location

The proposed Stables Wedding Farm venue (reference 'S1') is located within the hillside areas surrounding the village of Delph at an elevation of 266m. This proposed location is of a significantly

higher elevation relative to the village of Delph itself and other surrounding properties. The area surrounding S1 is comprised of undulating hills, foliage and fields. To the North-East is the village of Delph, with Oldham to the South-West. The marquee which will house the audio system during events will be erected to the South of the licensee's residential premises.

4.2 Noise Sensitive Receptor (NSR) Location

The noise sensitive receptor (reference 'NSR1') has been defined as the premises located at The Old Stables, Knott Hill Lane, Delph OL3 5RJ, at an elevation of 285m. This is a detached property located to the North-West of S1. NSR1 is at a higher elevation relative to S1 with the top of proposed marquee position only just visible from the façade of NSR1. This is likely to lead to a reduction in noise at NSR1 due to the effective grazing incidence screening provided by the local terrain. In general, a barrier providing grazing incidence obstruction would be expected to provide approximately 5dB of noise reduction.

The receptor (NSR1) and the proposed venue (S1) are separated from one-another by a distance of approximately 80 metres. This distance has been calculated as a straight-line distance, not taking into account the delta in elevation between S1 and NSR1. This allows for a margin of safety when predicting music noise propagation over distance from the proposed venue.

Further dwellings are located on Stoneswood Road, Delph, however these premises are not considered to be subject to the same level of risk of noise as NSR1, due to the additional distance from S1 and the topography providing a completely blocked line of sight (generally assumed to provide approximately 10dB of attenuation).

4.3 Area map



Figure 1 – 2D Local area map



Figure 2 - 3D Local area map

4.4 Subjective appraisal of background sound

During site visits by NCSL on the 21st February 2020 and the 1st of March 2020, along with audio recordings from the acoustic survey measurements, a subjective assessment of the existing acoustic environment was conducted. At the noise sensitive receptor location, the residual sound is comprised of noise from distant traffic, water run-off from local fields, passing aircraft, rustling of foliage and animal noise.

5 Proposed Development

The proposed development comprises the erection of a 9m x 18m canvas marquee with UPVC windows and doors upon an existing paddock which is currently used to exercise horses. The paddock has a surface of rubber chippings. Within the marquee, amplified music will be played during wedding events, between the hours of 16:00 and 23:30 (subject to license).

It is believed that an audio system will be permanently installed within the venue, allowing The Stables Wedding Farm to effectively calibrate and control the output levels of the noise to acceptable standards at NSR1 and any other potentially affected premises.

It is believed by NCSL that the application reflects a maximum of twelve events per year.

As noted in Section 1, music noise break-out from the marquee should not cause an adverse effect at existing sensitive receptors as requested by Oldham Council.

6 Acoustic Measurements

Noise measurements have been undertaken in order to assess the existing background noise levels at the noise sensitive receptor location (NSR1). An outdoor microphone was positioned to the rear of the NSR1 at the boundary fence, overlooking the proposed venue location. The microphone was located at a distance of 14 metres from the NSR property façade, at a height of 1.5m. The measurement location is considered to be representative of NSR1.

A 48-hour survey was selected, allowing for two day-time and two night-time measurements to be captured.

The background noise survey commenced on Sunday 1st March 2020 and was completed Tuesday 3rd March 2020.

6.1 Equipment details

All measurements within this report were made using a Class 1 NTi Audio XL2 sound level meter (serial number A2A-15792-E0). Field calibration of the meter was conducted using a Class 1 Bruel & Kjaer Type 4230 94dB acoustic calibrator (serial number 1275784). Pre and post measurement sensitivity checks were conducted and showed no significant deviation to the nominal sound level meter sensitivity of 41.3mV/Pa or reference signal levels. Details of these tests are documented in Table 4.

Test Reference	dB Level	Sensitivity	Comments
Pre-test calibration	94.0dB	41.3 mV/Pa	NA
Post-test check	94.0dB	41.3 mV/Pa	No significant variance

Table 4 – Field Calibration Details

All equipment is calibrated in accordance with IEC 61672-3, ISO/IEC 17025 and BS EN 60942:2003 where applicable. Calibration certificates are available upon request.

6.2 Ground conditions

Ground conditions between S1 and NSR1 consist of undulating field. The ground was wet during periods of the survey, but was not thought to significantly affect the measured noise levels.

6.3 Weather conditions

Weather conditions during the survey were reasonable, with a few periods of rain. No significant level of wind was observed during the commencement or completion of either survey.

Parameter	Commencement	Completion
Barometric Pressure	985 mbar	1002 mbar
Temperature	2° Celsius	4 ° Celsius
Wind-speed	2.6 ms ⁻¹	4.8 ms ⁻¹

Table 5 - Survey 1, environmental conditions

7 Defined Sound Levels

7.1 Background Sound Level

In order to determine the impact of a noise source it is necessary to determine the background sound level which is typical of the local environment without the contribution of the noise source under investigation.

The metric used for the background sound level, ($L_{A90,T}$), is a 90 percentile decibel value derived from statistical analysis of discrete 15-minute night-time and 1-hour day-time measurements. This metric removes noise peaks caused by, for example, a passing car, and allows the determination of the background sound level. BS4142 sets out the method to convert these measurements into a single value background sound level by calculating the modal value of these discrete measurements.

Due to the operational hours of the music from the venue (16:00 to 23:30), day-time noise levels have been calculated from 16:00 to 23:00 and night-time noise levels calculated between 23:00 to 23:30. Day-time noise levels are calculated by the measurement of 1-minute L_{A90} values, logarithmically averaged to discrete 1-hour L_{A90} values.

The calculation of night-time noise level is conducted using the following method. Due to the short measurement period (30 minutes between 23:00 to 23:30) the measurement of 1-minute L_{A90} values has been logarithmically averaged to discrete 30-minute L_{A90} values.

Results of these measurements are shown in Table 6 & Table 7.

Start Time	Day 1 L_{A90}	Day 2 L_{A90}
16:00	48.8 dB(A)	44.4 dB(A)
17:00	45.8 dB(A)	49.8 dB(A)
18:00	43.1 dB(A)	47.1 dB(A)
19:00	41.9 dB(A)	43.5 dB(A)
20:00	42.2 dB(A)	42.3 dB(A)
21:00	40.8 dB(A)	41.3 dB(A)
22:00	38.7 dB(A)	40.3 dB(A)

Table 6 - Background Sound Measurements (16:00 - 23:00)

Start Time	Night 1 L_{A90}	Night 2 L_{A90}
23:00	38.5 dB(A)	39.9 dB(A)

Table 7 - Background Sound Measurements (23:00 - 23:30)

8 Noise Impact Assessment

It is the recommendation of NCSL that the guidance provided within Code of Practice on Environmental Noise Control at Concerts (1995) (summarised within Section 3.4) is followed to define acceptable noise levels at NSR1 during events and to minimise acoustic disruption from music noise at the proposed venue.

Following guidance within this Code of Practice, the MNL when measured 1 metre from the NSR façade, during the hours of 09:00 to 23:00 should not exceed 55.9 dB(A) in any 15-minute period. This has been calculated by taking the arithmetic average of the lowest hourly background sound levels (L_{A90}) measured over the last four hours of the proposed event and allowing for a 15 dB increase, as specified in the code of practice.

In addition, the guidance document recommends that beyond 23:00, the MNL should not be audible within the NSR. The document goes further, by stating that this is likely to be achieved if music noise is 'just audible' outside the NSR. Based upon this, NCSL recommend that the MNL during the hours of 23:00 to 23:30 should not exceed the current night-time background sound levels. Based upon the findings of the environmental noise survey, the MNL during this time period should not exceed 38.5dB(A).

The document also recommends that amplified sound in the 63Hz and 125Hz octave band should not exceed 70dB at any time. This limit should be applied between the hours of 16:00 to 23:00, however NCSL recommend that a more stringent limit is implemented between the hours of 23:00 and 23:30.

A limit for low frequency noise between 23:00 and 23:30 is proposed by NCSL based upon the logarithmic average of L_{Z90} values measured in the relevant octave bands during the acoustic survey measurements.

All limit values are shown in Table 8.

Time Period	Background Sound Level	Limit at NSR1	
		Overall Sound Pressure Level (dB(A))	55.9 dB(A)
16:00 – 23:00	40.9 dB(A)	63Hz Octave Band Sound Pressure Level (dB(Z))	70 dB(Z)
		125Hz Octave Band Sound Pressure Level (dB(Z))	70 dB(Z)
		Overall Sound Pressure Level (dB(A))	38.5 dB(A)
23:00 – 23:30	38.5 dB(A)	63Hz Octave Band Sound Pressure Level (dB(Z))	44.0 dB(Z)
		63Hz Octave Band Sound Pressure Level (dB(Z))	38.5 dB(Z)

Table 8 - Limit Sound Pressure Levels at NSR1

It is believed that adherence to these limit values will minimise the risk of noise complaints occurring during events.

9 Noise Level Predictions

In order to estimate the noise level observed at NSR1 due to music noise generated at S1, calculations have been undertaken to understand the propagation of sound from the venue to NSR1. These values should be used for indication only, and acoustic measurements are recommended to accurately define the acoustic propagation between S1 and NSR1 prior to any events taking place.

Based upon a straight-line distance between S1 and NSR1, with the marquee modelled as an area source, it is expected that a reduction in noise level in the order of 35 dB will be achieved due to geometric divergence over the 80 metre distance between NSR1 and S1. This has been calculated assuming a marquee dimensions of 9m (shortest length) and 2.5m (height)

Therefore, between 16:00 and 23:00, noise from within the marquee should not exceed 90dB(A) when measured directly outside of the façade of the marquee which is closest to NSR1. Between 23:00 and 23:30, the noise limit at the façade of the marquee should be 73.5dB(A).

Music noise contains a number of different frequency components, and usually contains high sound energy in the low frequency range. Therefore, it is not appropriate to provide only a single broadband level to be achieved. To comprehensively define the noise level limits, further analysis has been undertaken, as described below.

9.1 Spectral Noise Level Predictions 16:00 to 23:00.

Spectral calculations have been undertaken based upon the simulated program signal defined within IEC 268-1:1985. This spectra is used for audio system assessment, and closely resembles the average of the mean power spectral density (PSD) of a wide range of programme material, including both speech and music of several kinds.

The spectra defined in IEC 268-1:1985 has been A-weighted and normalised to provide an equivalent overall sound pressure level of 90dB(A) external to the marquee. This allows for the A-weighted one-third octave sound pressure levels external to the marquee to be estimated. Using the geometric divergence values calculated above, it is possible to estimate the overall sound pressure level and frequency spectra observed at NSR1 between the hours of 16:00 to 23:00. The one-third octave band values are shown in Figure 3.

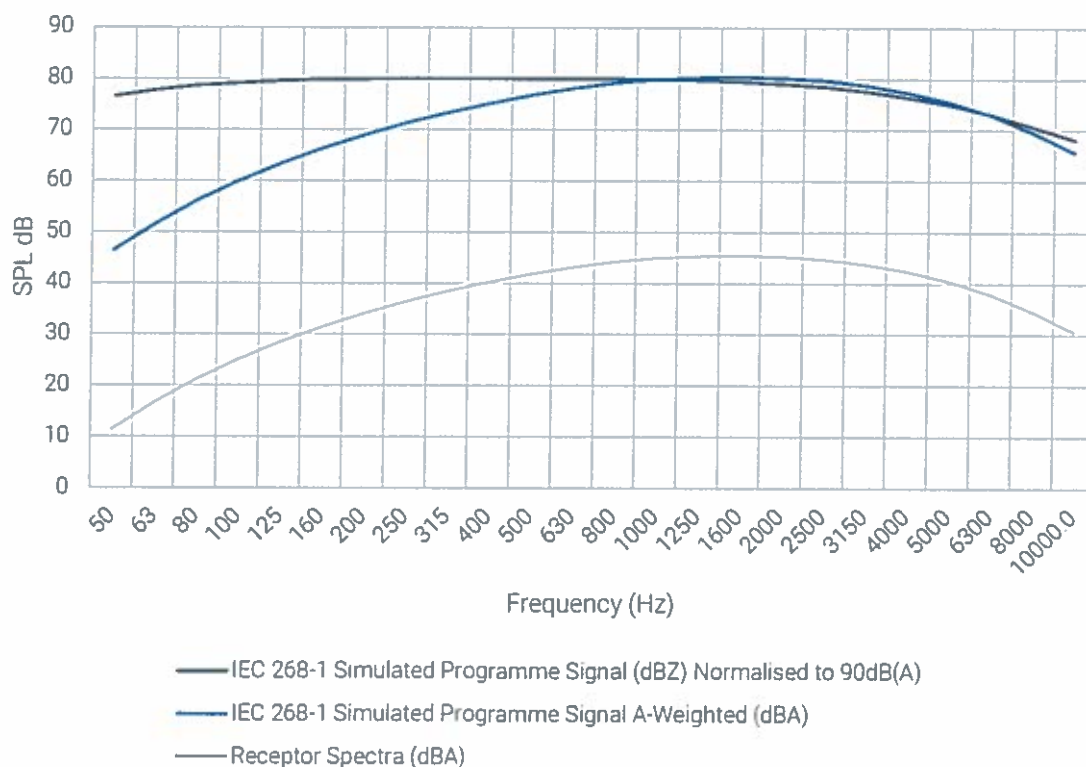


Figure 3 - Spectral Calculations (16:00 - 23:00)

This calculation defines a spectral noise limit external to the marquee, which should result in an A-weighted sound pressure level of 55dB(A) at NSR1 and acceptable noise levels in the 63Hz and 125Hz octave bands as defined by The Code of Practice on Environmental Noise Control at Concerts (1995) during the hours of 16:00 to 23:00. These predicted values are noted in Table 9.

Parameter	Noise level limit at the façade of the marquee closest to NSR1	Noise level at NSR1	Limit at NSR1
Overall SPL (dB(A))	90.0 dB(A)	55.0 dB(A)	55.0 dB(A)
63Hz octave band	82.5 dB(Z)	47.5 dB(Z)	70.0 dB(Z)
125Hz octave band	84.2 dB(Z)	49.2 dB(Z)	70.0 dB(Z)

Table 9 - Noise Level Calculations (16:00 to 23:00)

It is estimated that a music level of 90 dB(A) external to the marquee will ensure that entertainment sound levels within NSR1 will not cause any adverse effects at NSR1. In addition, music noise within the marquee, is considered suitable for the enjoyment of the wedding venue guests.

8.2 Spectral Noise Level Predictions 23:00 to 23:30.

The noise limit at NSR1 is reduced between 23:00 and 23:30, therefore, it is necessary to determine a different spectral noise limit using the process described above.

The spectra defined in IEC 268-1:1985 has been A-weighted and normalised to provide an equivalent overall sound pressure level of 73.5dB(A) external to the marquee. This also allows for the A-weighted one-third octave sound pressure levels external to the marquee to be estimated. Using the geometric divergence values calculated above, it is possible to estimate the overall sound pressure level and frequency spectra observed at NSR1 between the hours of 23:00 to 23:30. The one-third octave band values are shown in Figure 4.

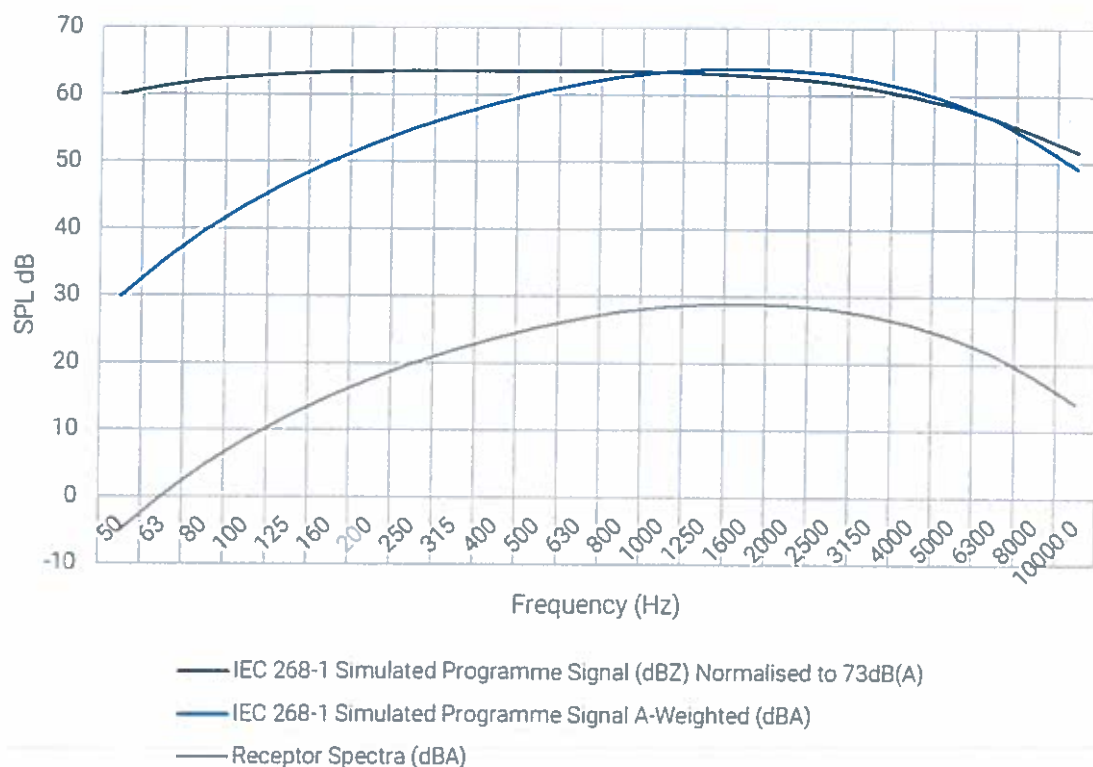


Figure 4 - Spectral Calculations (23:00 - 23:30)

This calculation defines a spectral noise limit external to the marquee, which should result in an A-weighted sound pressure level of 38.5dB(A) at NSR1 and acceptable noise levels in the 63Hz and 125Hz octave bands as defined by The Code of Practice on Environmental Noise Control at Concerts (1995) during the hours of 23:00 to 23:30. These predicted values are noted in Table 10.

Parameter	Noise level limit at the façade of the marquee closest to NSR1		Limit at NSR1
	Noise level at NSR1		
Overall SPL (dB(A))	73.5 dB(A)	38.5 dB(A)	38.5 dB(A)
63Hz octave band	66.0 dB(Z)	31.0 dB(Z)	44.0 dB(Z)
125Hz octave band	67.5 dB(Z)	32.7 dB(Z)	38.5 dB(Z)

Table 10 - Noise Level Calculations (23:00 to 23:30)

Further attenuation during outdoor sound propagation is provided by the absorption of acoustic energy by the air, ground effect and the effective barriers provided by local topography. These absorption mechanisms are likely to be significant in this situation, however they have not been included in these calculations in order to give a further margin of safety.

The predicted noise levels shown within this section are based upon a linear audio system frequency response and audio spectra similar to that defined by the IEC 268-1 simulated programme signal.

The calculations detailed within this report provide confidence that noise impact due to music noise can be successfully managed within the Stables Wedding Farm venue, but it is strongly recommended that verification measurements are conducted. This is particularly relevant in this case due to the topography of the local area, where acoustic interactions are likely to be complex.

9 Recommendations

It is the recommendation of NCSL that a permanent audio system is installed with the Stables Wedding Farm venue, which is fully controlled by the licensees.

Once this system is installed, it is recommended that one of the following noise control measures is implemented to prevent disturbance at NSR1 or other local premises:

- Acoustic measurements conducted to define the maximum audio system amplifier settings and graphic equaliser settings which will provide adherence to the limit values defined in Section 8. This will only be feasible if the same audio equipment is used for every event.
- Acoustic measurements conducted to define the maximum allowable sound pressure level settings for noise limiting systems installed within the marquee to provide adherence to the limit values defined in Section 8.
- Real-time monitoring of noise levels at NSR1 during events. This should include feedback to the licensee to allow adjustments to the audio system output levels quickly if limit noise levels are exceeded.

Furthermore, the following guidelines should be followed to minimise disruption within the local environment.

- Audio output should not extend below 50Hz, this could be implemented with the use of a suitable high pass filter system.
- Where possible, ingress and egress points of the marquee should be positioned so they do not face towards any local premises.
- Where possible, doors of the marquee should be designed so that they cannot be left open, for example, spring loading.
- Good public relations should be maintained between the licensee and local residents as this can help to minimise annoyance. For example, communication with the local residents to inform them of the time and duration of any events can be an effective and simple mitigation measure.
- Any control measures should be implemented and assessed, with input from local residents, before any events occur. For example, a 'dummy' event could be run, with representative noise levels and timings of a real event. This would allow for the subjective feedback from residents and alterations can be made to control measures if required.

- It is recommended that any changes to the site layout, the audio system, or any other factors influencing noise level at local premises is over-checked with acoustic measurements.

10 Summary & Conclusions

Noise Control Solutions Limited (NCSL) have been commissioned to undertake a noise impact assessment for the proposed rural wedding venue at Slackfield Farm, Knott Hill Lane, Delph, Oldham. The venue license will allow for 12 events per calendar year, operating between 16:00 to 23:30.

A noise sensitive receptor (NSR1) has been identified as the premises located at The Old Stables, Knott Hill Lane, Delph, OL3 5RJ. It is believed this premises is at the highest risk of noise impact due to the proximity to the proposed venue (S1).

A 48-hour noise survey has been conducted at the NSR to define existing background sound levels and provide a baseline for any proposed noise level limits.

A literature review has been conducted by NCSL and it is proposed that the guidance provided within The Code of Practice on Environmental Noise Control at Concerts (1995), published by The Noise Council, is followed. This specifies methods to set limit noise levels at NSR premises based upon existing background noise levels. These limits are detailed in Section 8 of this report.

In order to provide confidence that the proposed limits can be met, predictive calculations have been conducted by NCSL. Based upon these calculations (documented in Section 9) it is believed that the Music Noise Level (MNL) from the venue can meet the proposed limits at NSR1 with sufficient control strategies in place. These calculations should be validated with acoustic measurements to ensure accuracy.

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Furthermore, no guarantee is given regarding the effectiveness of any proposed palliative measures. The client is responsible for any palliative measures, including, but not limited to, the sourcing of suppliers, the quality of installation, the cost of all materials / installation, maintenance and safety.

NCSL provide no guarantee that adherence to provided specifications will result in no further noise and/or vibration complaints and/or the elimination of noise and/or vibration issues.

NCSL do not supply, procure, install or maintain any materials.