ADC ACOUSTICS

PO Box 1030, Warrington, Cheshire WA4 9FJ
t. 01925 723333 www.adcacoustics.co.uk

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10th October 2022

Ormskirk Market

Assessment of proposed hospitality venue at
the former Ormskirk Market, L39 3BH.

Prepared for :-

Epic Ops
25/27 Seel Street
Liverpool
L1 4AU

Prepared by :-

Andrew Raymond

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1.0 SUMMARY

The area is in a lively part of the town centre. On the Thursday evening of the measurements it was busy with traffic, pedestrians, and pubs and bars, mainly in the middle distance, but also some close-by activity. It is likely to be far busier on a Friday or Saturday night.

Music noise, with some sub-bass curtailment, should have minimal impact up to around 23:00 at nearby building facades which we are assuming are residential in the absence of any confirmation that they are not. Beyond this time, some additional mitigation and/or curtailment of bass frequencies may be required.

The impact of customers on the roof terrace has been modelled with 60 customers. With reasonable management control and some relatively minor mitigation, acceptable levels should be achieved at nearby residential properties.

Other issues such as mechanical equipment, customers arriving and leaving, design development, sound system design etc. are discussed in outline as details are not yet available. However, they should be easily controllable by conditions for details to be submitted and approved, testing at completion and a management plan.

[redacted]

A R Raymond

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P J Durell

2.0 INTRODUCTION

ADC was asked to carry out an independent assessment of the above site with regards to its suitability for a hospitality venue from a noise perspective.

This report begins by summarising assessment standards and, where appropriate, discusses alternative interpretations.

After a brief statement of survey details we discuss basic results and the resulting assessment, along with any mitigation which might be implied. We sum-up and conclude at the end, along with brief recommendations.

3.0 ASSESSMENT STANDARDS

3.1 NPPF, NPSE and NPPG

The National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE) and the National Planning Practice Guidance (NPPG) provide nothing in the way of quantitative criteria but instead provide general policy aims and statements and some guidance on how certain situations can be interpreted.

The NPPF's main statement on noise is to be found in paragraph 185:-

> 185. 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[65];
>
> 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; and
>
> c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

Paragraph 187 is also relevant:-

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

The NPPF refers to the NPSE which sets out the following aims:-

1. *avoid significant adverse impacts on health and quality of life;*
2. *mitigate and minimise adverse impacts on health and quality of life;*

   and

3. *where possible, contribute to the improvement of health and quality of life.*

It also introduces the concepts of:

- *NOEL – No Observed Effect Level. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
- *LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.*
- *SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.*

SOAEL is clearly something the policy seeks to avoid in aim 1. Aim 2 represents situations between SOAEL and LOAEL, and seeks to minimise and mitigate the effects.

The NPPG section on noise adds some further detail, much of it reproducing the NPPF and NPSE, but some useful qualitative guidance is provided Noise Exposure Hierarchy, as follows:-

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present 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			
Present 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

It also makes the point that the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation, including the level of the noise in absolute terms and how it might compare with the underlying background noise, the impulsiveness or intermittence pattern of the noise, its spectral content, and the time of day. It discusses in very general terms the issues to consider when introducing noise sources to existing noise sensitive area, new residential development in areas affected by existing noise sources (most of which have their own specific guidance, such as BS 4142, BS 8233, etc.) and the potential impact on wildlife.

3.2 BS 8233

BS 8233 was updated in March 2014. Quantitatively, however, the design criteria are little changed – just expressed differently to reduce ambiguity in certain situations. Its guidance is primarily intended for new buildings, but the criteria are routinely referred to for putting general noise climates into context.

The criteria in Table 4 of BS 8233 are based on WHO guidance and give the desirable criteria for indoor ambient noise levels for dwellings as follows:-

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

Note that the standard accepts the widely used rule of thumb that, for a partly open window, the levels just outside will be 15dB higher than those just inside. This brings us to an external equivalent of the above table, as follows:-

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	50 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	55 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	50 dB $L_{Aeq,8hour}$	45 dB $L_{Aeq,8hour}$

It goes on to state that, where necessary, the criteria can be relaxed by up to 5 dB and still achieve reasonable conditions. Note that the new version does not explicitly state criteria for bedroom noise in terms of dB L_{Amax}.

Garden area criteria are unchanged with 50 dB L_{Aeq} and 55 dB L_{Aeq} being considered desirable and reasonable respectively.

Note that the new version of BS 8233 more explicitly specifies the assessment periods as 16 hour and 8 hour for daytime and night time respectively.

3.3 BS 4142

BS 4142 is the most appropriate tool to assessing the mechanical equipment. It is not suitable for assessing music noise or noise from customers.

It was updated in November 2014. The standard is very complicated but, basically, it describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

a) sound from industrial and manufacturing processes

b) sound from fixed installations which comprise mechanical and electrical plant and equipment

c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises

d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

Characteristics and Context

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, we need to add a character correction to the specific sound level to obtain the rating level.

These features can include tonality, impulsivity and intermittency with corrections typically ranging potentially from 0 dB to 9 dB. Corrections at the higher end would represent characteristics which are highly perceptible in the context of the ambient noise as a whole. Corrections at the lower end would represent characteristics which are just perceptible in the presence of the ambient noise as a whole,

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 effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.

Assessment

We obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and considering the following.

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) 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.

Where the initial estimate of the impact needs to be modified due to the context, pertinent factors need to be taken into consideration, including the following.

1) The absolute level of sound.

   For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

   Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

   Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) The character and level of the residual sound compared to the character and level of the specific sound.

   We need to consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

3.4 Music Noise

Full discussions of various approaches to assessing music noise are very cumbersome and practices vary. They tend to vary for how many events take place and how often, and some reference the impact inside a habitable room and some reference the facades, or even gardens. In all cases we would suggest that context is key.

This section summarises our own recommendations.

For up to 12 events per year, we would suggest the criteria from the Code of Practice on Environmental Noise Control at Concerts. Above this, we suggest that a combination of the annex to the IOA Good Practice Guide and the local authority criteria cited in Noise from Pubs and Clubs, modified for practicalities as discussed.

Inaudibility of music noise is sometimes suggested for regular event and where they run into the night. There may be contexts where this is an appropriate aim, but not for most. It is also impossible to guarantee inaudibility as perceptions obviously differ – does it mean inaudibility while doing normal things, or inaudibility while holding the breath, pressing an ear to the wall, and concentrating hard? Either way, as a guide, music noise which is just audible outside would normally be more or less inaudible inside. Scenario 4 below can be expected to provide such conditions, albeit ultimately subjective.

So, our recommended music noise criteria at the nearest residential properties are as follows:-

1. For up to 3 events per year between 07:00 and 23:00 hours:

   Music noise levels should not exceed 65 dB $L_{Aeq,15min}$ at 1m from the façade of any noise sensitive room.

2. For between 4 and 12 events per year between 07:00 and 23:00 hours:

   Music noise levels measured in terms of $L_{Aeq,15min}$ at 1m from the façade of any noise sensitive room should not exceed the background noise levels (ie. without music playing) measured in terms of L_{A90} by more than 15 dB.

3. For between 12 and 30 events per year between 07:00 and 23:00 hours:

   Music noise levels measured in terms of $L_{Aeq,15min}$ at 1m from the façade of any noise sensitive room should not exceed the background noise levels (ie. without music playing) measured in terms of L_{A90} by more than 5 dB.

   In addition music noise levels measured in the same way as above in the 63 Hz and 125Hz octave bands should not exceed the background noise levels also as measured above by more than 5 dB in respective octave bands.

4. For more than 30 events per year, and/or for times extending beyond 23:00 and 07:00 hours regardless of how many events a year:

   Music noise levels measured in terms of $L_{Aeq,15min}$ at 1m from the façade of any noise sensitive room should not exceed the background noise levels (ie. without music playing) measured in terms of L_{A90}.

In addition music noise levels measured in the same way as above in the 63 Hz and 125Hz octave bands should not exceed the background noise levels also as measured above in respective octave bands.

All of these criteria should be adjusted to any assessment/enforcement position that is closer to (or indeed further away from) the facades of noise sensitive rooms, for instance the site boundary.

The above set of suggested criteria should be considered in the light of the context, for instance a vibrant part of the city centre versus a quiet suburb.

If it is known that the operators intend to run a given number of times a year and up to a given time then the appropriate set of criteria can be suggested. Note, however, that it will not usually be acceptable for the limits to "slide" as the number of events increases. In other words it will not normally be acceptable to work to the 3 events per year limits for the first three events, and then to the 4 to 12 events per years limits, for the next 9 events and so on. If it is intended to hold more than 30 events per year, then that is the limit that should be worked to.

3.5 Perceived Change

The background/ambient noise is predominantly people and traffic. The noise from people on the terrace and from people leaving will also be predominantly people and traffic. For that reason perceived change criteria will be appropriate, along with the general criteria of BS 8233 above.

Quoting from the Guidelines for Noise Impact Assessment (draft 10/04/02) by the Institute of Environmental Management and Assessment and the Institute of Acoustics, the following table shows the effects of changes in noise:-

Change in Level (no other changes of character)	Subjective Effect	Likely Impact
0 dB	No change	None
Up to 3 dB	Imperceptible	Slight
3 to 5 dB	Perceptible	Moderate
5 to 10 dB	Up to a doubling	Substantial
10dB or more	At least doubling	Severe

Note, however, that "Subjective Effects" assume that the nature of the noise is unchanged. Also, many acousticians feel that the wording under the "Likely Impact" column can be unhelpful.

3.6 Local Authority

We are not aware of any criteria proposed by the local authority.

4.0 GUIDE TO MODELLING AND ASSESSMENT

In general terms we have the internal music noise which spreads out to the internal surfaces of the walls and the roof. It then passes through the various elements to become external sources. We also have the noise generation from customers' voices on the roof terrace. These are simple external point sources. From here the various noise elements spread out to the noise-sensitive recipients.

4.1 Inside to Outside

1. We begin with the internal noise. This is based on typical levels associated with a busy bar where music is very much part of the atmosphere – not night club levels and a degree of curtailed bass, but much more than background music levels.

Music Noise	Frequency Band								
	dB(A)	63	125	250	500	1k	2k	4k	8k
SPL at Room Edges	89	96	89	83	85	86	81	74	65

   The levels are assumed to be evenly spread over all internal surfaces. The levels near customer positions closer to the speakers will obviously be higher, which will be important to the operators, but it is the just-inside levels which are important to the noise break-out.

2. We then have the sound insulating properties of the building elements. These are based on what we are advised is the current structure, adapted as necessary and as discussed.

3. Finally, a correction of -6 dB is applied for the internal (reverberant) to external (free field) environments.

4. This leaves us with the sound power level emitted from the various building elements to the outside world, used as external sources as described below.

4.2 Roof Terrace

These are based on source data from previous bub beer garden projects. These are entered in the model as point sources at 1.5 m above the floor level of the terrace area. They include raised speech associated with outdoor drinking, but not shouting, chanting etc. Each source represents two people.

Busy Beer Garden Voices	Frequency Band								
	dB(A)	63	125	250	500	1k	2k	4k	8k
Sound Power per 2 People	75	66	68	70	73	72	66	58	48

The modelling assumes 60 people using the outdoor area.

4.3 External Propagation

We have used the well-established CadnaA modelling software which calculates noise propagation based on the processes of ISO 9613 : Acoustics – Attenuation of sound during propagation outdoors.

Obviously, modelling software is reliant on the inputs and assumptions. The key ones are:-

1. The ground is mainly reflective, with a coefficient of 0.11 assumed.

2. Calculations are based on two orders of reflections.

3. The site building and the surrounding buildings are assumed to be mainly reflective (0.5 dB loss on reflection assumed).

4. The just-outside levels of the various building elements, are entered into the CadnaA model as area sources.

5. The customer voices are entered as point sources.

6. The software then calculates the noise at nearby noise-sensitive properties. The predicted façade noise levels are calculated for all floors and the software automatically displays the noisiest floor level.

5.0 SURVEY DETAILS

5.1 Site Times and Personnel

The survey was carried out on 1st September 2022 by Mark Pickering of ADC Acoustics from shortly after 22:30, through to shortly after 02:00. The time were chosen to cover the late evening, up the potential options for closing times.

5.2 Instrumentation

Instrumentation used was a Rion NL-52. This is a Class I sound level meter which holds a current calibration certificate and which was field-calibrated as necessary with no drift noted. The meter was set up to measure continuous 5 minute samples in terms of dB L_{eq}, dB L_{max} and dB L_{90} in overall A-weighted terms, and in octave bands across the frequency range. See Definition of Acoustic Terms in Appendix 1.

5.3 Measurement Positions

The main measurement position was as shown by on the following plan.

It was not entirely clear where the nearest residential locations were. The area was generally reconnoitred and the position shown by the yellow star above appeared to be the most appropriate. The courtyard just the NE of the site, for instance was quite noisy as it included the rear beer garden of the Queen's Head as well as mechanical equipment. It should be representative of most potential residential locations.

The microphone was mounted to a lamppost at a height of around 3 m where it drew no attention and was undisturbed. Note however, that the measurements were fully attended at all times.

5.4 Survey Conditions

We have no reason to believe that the conditions we found on the survey were anything other than representative of normal conditions. It was a Thursday evening and was busy, but unlikely to be anywhere near as busy as Friday or Saturday night and so it should represent a robust assessment. Weather conditions were as follows :-

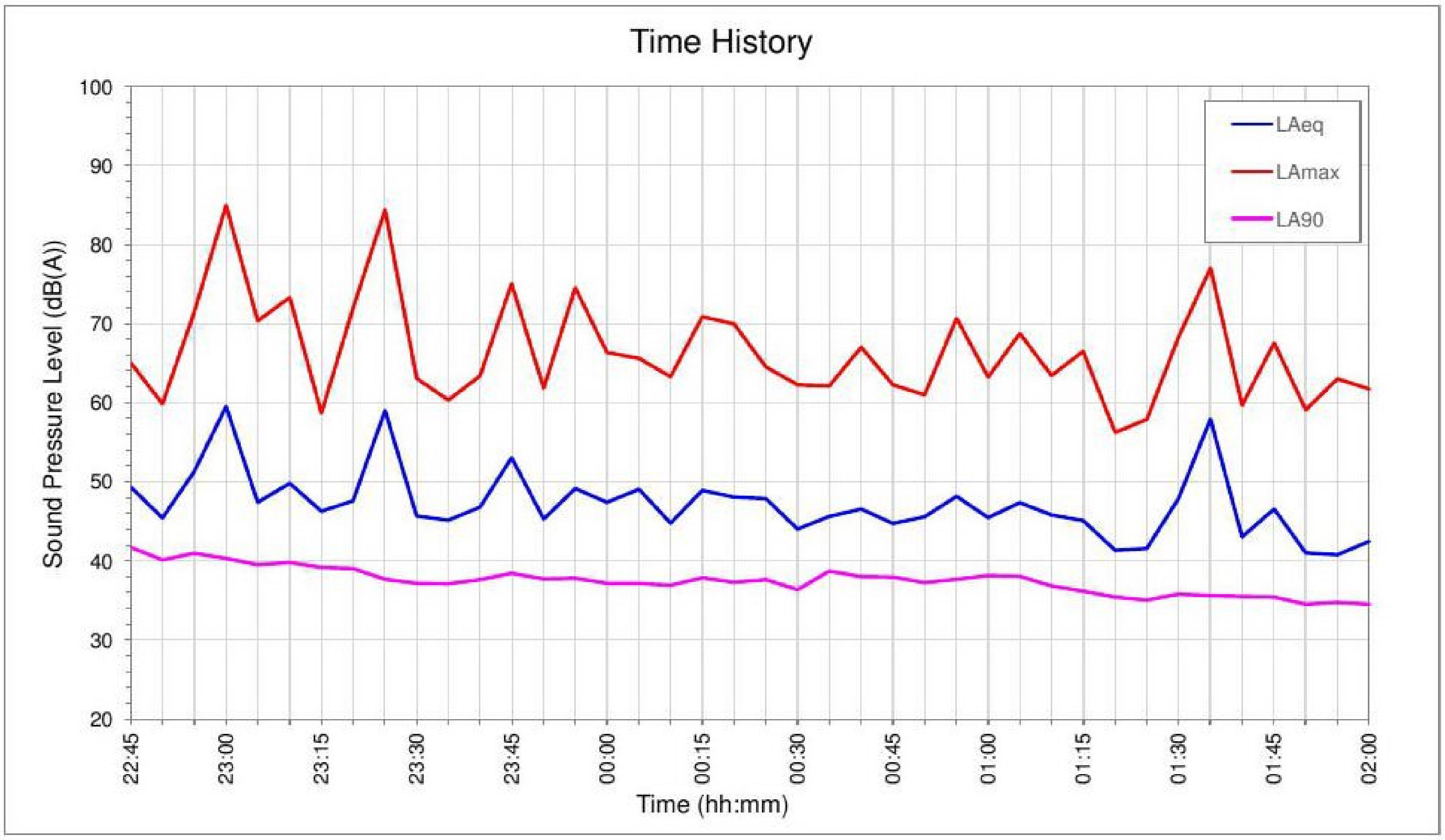
Rain	:	none, dry roads
Cloud	:	40%
Temperature	:	18 to 19 Celsius
Wind	:	negligible.

6.0 RESULTS AND DISCUSSIONS

The area was quite busy with noise from traffic, pedestrians, and pubs and bars, mainly in the middle distance, but also some close-by activity.

6.1 Background/Ambient Noise

Basic results are shown graphically over time as follows:-



A summary of the lowest periods of background noise is as follows:-

*Lowest 15 Minute Period**	*Index*	***dB(A)***	*63*	*125*
Up to 23:00	Leq	**49**	55	50
	Lmax	**68**	76	65
	L90	**41**	48	46
23:00 to 00:00	Leq	**46**	53	48
	Lmax	**62**	70	64
	L90	**37**	46	41
00:00 to 01:00	Leq	**47**	51	46
	Lmax	**67**	71	68
	L90	**37**	45	41
01:00 to 02:00	Leq	**41**	48	44
	Lmax	**62**	63	60
	L90	**35**	44	41

* In terms of the dB L_{A90} Index

There is no particular requirement for us to use the lowest measurement periods, but it allows for a robust assessment and accounts for possible variations on different days.

Note that the above table shows the overall dB(A) levels and also the octave band (frequency bad) levels at 63 Hz and 125 Hz which are useful for assessment the music noise.

6.2 <u>Music Noise</u>

The following image shows the results of the modelling of internal music noise as described in 4.1.

Note that:-

- The beige shapes are buildings.
- The hatched blue represents the area sources of the roof. See 3D image in 6.4 below.
- The coloured octagons are the noise levels at the residential facades.
- The contours are for guidance only to illustrate how the noise propagates. They are at a height of 4 m.
- The model is overlaid on a Google Earth image.

In overall dB(A) terms. The predicted levels are well below existing levels. However, for music noise we also need to consider the levels in the 63 Hz and 125 Hz frequency bands as these low frequencies tend not to affect the overall dB(A) levels very much. The following table shows the predicted results across the frequency range at the worst affected position:-

Music Noise	*Frequency Band*								
	dB(A)	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
At Worst Affected Facade	**32**	56	43	26	14	9	-1	-16	-27

If we compare the 63 Hz band to the measured L_{90} background noise levels in the same band (see 6.1 above) we can see that the predicted levels are significantly above. Although the music noise criteria discussed above refer to the levels within habitable rooms, the result is likely to mean means that the music noise may need curtailment in this frequency band. Frequencies below 100 Hz are regarded as sub-bass and simply not fitting subwoofers/bass bins should be adequate to ensure this.

At the 125 Hz band the predicted levels are within the existing background levels up to 23:00, but a little above at later times as the background level drops. This means that additional sound insulation will be required if it is intended to open beyond 23:00, or a small further curtailment of the music noise in this frequency band.

General assumptions and recommendations are as follows:-

1. We are advised that all walls are solid masonry. Where there are imperfections these should be made good.

2. Entrance doors are assumed to be closed. In practice this likely to mean a lobby arrangement with at least two sets of doors.

3. We are advised that the roof is traditional tiles, underdrawn with a 12 mm plasterboard ceiling. Again this is assumed to be in good condition and so imperfections should be made good.

4. The edges of the building need to be buffered from the main area, especially at first floor and roof levels. This is straight forward enough for the northern and eastern edges, but will also need to be incorporated into the eastern edge as well. The basic idea is shown by the blue line below. Note that the buffer must extend through to the outer roof to be effective.

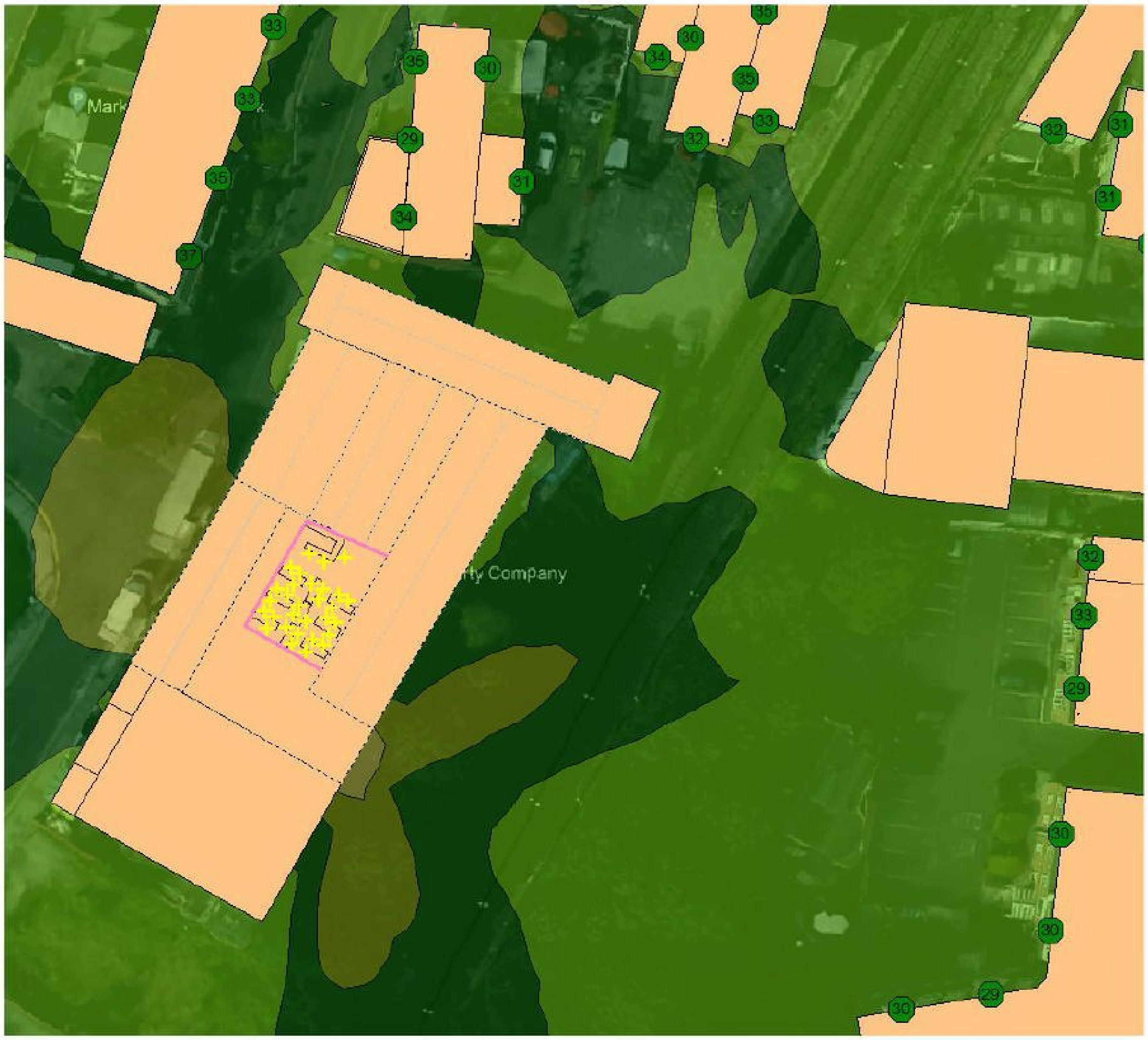
5. Sub woofers/bass bins are unlikely to be worthwhile as bass frequencies will need curtailing.

6. Planners are likely to require music noise limiting, and this will need to be set up to ensure acceptable levels at residential properties.

7. We note that no detailed design has been carried out at this stage and the recommendations are general in nature. They are therefore subject to design development and detailing. However, a condition requiring details to be submitted and approved, and a test at completion should be an adequate control for planners.

6.3 Roof Terrace

The following image shows the results of the modelling of the roof terrace as described in 4.2.



Note that (in addition to the notes below the modelling image in 6.2):-

- The yellow crosses are the point sources of the occupiers of the terrace area. Each cross represents two people. They are evenly spread for the purposes of the modelling.
- The magenta line is an acoustic barrier at a height of 1.8 m

In overall dB(A) terms. The predicted levels are well below existing levels, and should be similar in character to the existing noise. They are well below any of the criteria discussed above.

General assumptions and recommendations are as follows:-

1. There are assumed to be 60 people using the terrace in total, 54 seated (an average of 6 per table) and 6 at the bar. This is not necessarily proposed as a limit although, once more detail is available, it might be necessary to accept a limit as part of a management plan.

2. Customers are assumed to be behaving reasonably. Raised speech influenced by alcohol is assumed, but not shouting, chanting, etc. Planners are likely to require the general control of external behaviour included in the management plan.

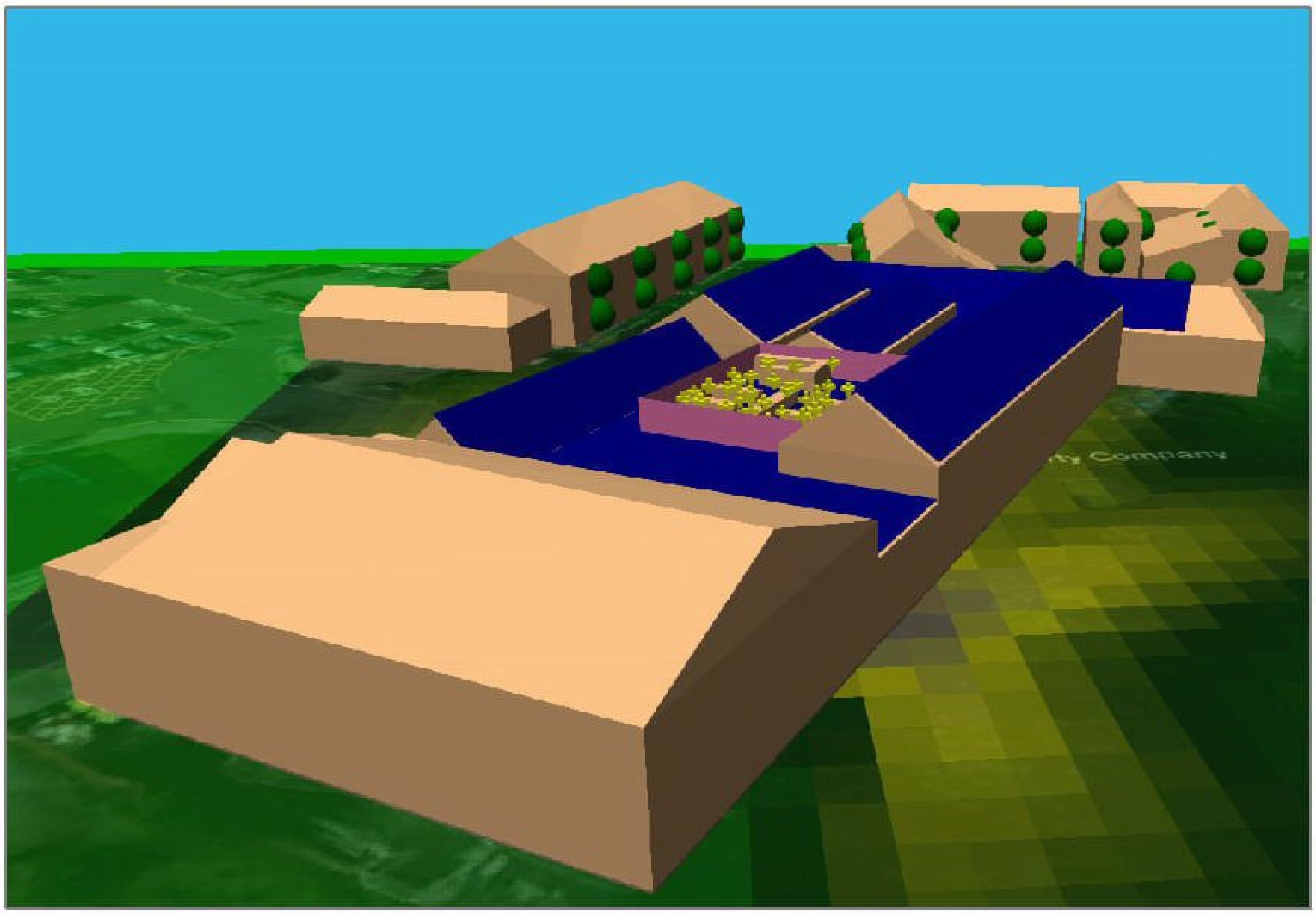
3. The acoustic fence is not necessarily essential, but it does allow for greater numbers to use the area. It does not have to be particularly high spec – for instance an 18 mm timber fence, with overlapping boards to allow for warping and shrinkage should be acceptable. Better still would be an absorbent inner face. Planners are likely to require details to be submitted and approved.

4. It is unlikely that music will be acceptable on the terrace area unless it is at a very low background level, and so probably not worthwhile.

6.4 Combined Model

Although music noise and noise from customers' voices are assessed in entirely different ways, the following image shows the combined model of all sources.

The following 3D image should help to visualise the model.



6.5 Other Issues

We have no details on mechanical equipment but these should be easily controllable with a condition requiring details to be submitted and approved.

We have no information about the arrangements for customers arriving and leaving and the potential for noisy behaviour outside the front. However this would be a matter the management plan as it is clearly the case that customers who disperse quietly will cause no disturbance, and those who congregate and behave rowdily could cause disturbance.

The above sections shows that reasonable operating conditions are achievable within the venue, while meeting the acceptable criteria at the surrounding properties. In the most basic way, planners can be comfortable with tamper-proof music noise limiters which are set up in consultation with relevant parties. The simplest limiters are only suitable for pubs and small clubs and cut out the power after a set level has been breached. The more sophisticated ones will give far more satisfactory performance (mainly for the operators) by actually limiting the levels to a fixed amount, rather than simply shutting down at the trigger point. They can also be set for different frequency bands. We recommend that the music noise limiting is properly designed with the sound system designers who will be able to advise the best options. At completion they can be set up, not by modelling and prediction, but by live testing and can be adjusted as the venue “settles in”. This can be tied into the planning condition and we recommend that Officers are invited to witness the setting up.

Operators will want as much flexibility to maximise perceived music levels within the venue, while staying within the criteria. We cannot recommend strongly enough that a reputable sound system designer is appointed for this purpose. It is likely that a well distributed and zoned system will be required such that speakers are always close to customers in areas where louder levels are required, and such that edge-of-room levels and the entrance area are minimised. Speakers will also need to be on properly specified acoustic mounts and hangers. It is unlikely that sub woofers will be worthwhile as sub-bass frequencies are likely to require some curtailment. This essentially does not need to concern planners if a good quality limiting design is adopted, but it can make a huge difference to how operators can work.

7.0 CONCLUSIONS/RECOMMENDATIONS

Music noise, with some sub-bass curtailment, should have minimal impact up to around 23:00 at nearby building facades which we are assuming are residential in the absence of any confirmation that they are not. Beyond this time, some additional mitigation and/or curtailment of bass frequencies may be required.

The impact of customers on the roof terrace has been modelled with 60 customers. With reasonable management control and some relatively minor mitigation, acceptable levels should be achieved at nearby residential properties.

Other issues such as mechanical equipment, customers arriving and leaving, design development, sound system design etc. are discussed in outline as details are not yet available. However, they should be easily controllable by conditions for details to be submitted and approved, testing at completion and a management plan.

The recommendations are general in nature and are subject to detailing. It is strongly recommended that an acoustic consultant is involved as necessary through this process, ie, beyond planning through to testing at completion.

We recommend that you issue this report to Planners and invite Officers to contact us with any queries.

Appendix 1

Definition of Acoustic Terms

The Decibel

The decibel is the basic unit of noise measurement and is denoted dB. Technically, it is a means of expressing the difference in noise level between the measured noise and a standard level of noise. Most often the threshold of human hearing is used as the standard reference but is really should be stated. The threshold of human hearing is a sound pressure of 20μPa or a sound power of 1pW.

A sound pressure level or SPL should be expressed in dB(re. 20μPa). A sound power level or SWL should be expressed in dB(re. 1pW). If the reference levels are omitted, it will often (but not always) be safe to assume that they are referenced to the threshold of human hearing.

A-Weighting and dB(A)

The human hearing system responds differently to different frequencies. The A-weighting system takes account of this by emphasising mid and high frequencies more than low frequencies to given an overall level. An A-Weighted noise level, therefore, reflects the way normal, healthy hearing would perceive the overall level of the noise. The basic unit is dB(A), although other systems of expressing an A-weighted level are discussed below.

Other weighting systems, such as C-Weighting, denoted dB(C), reflect the human hearing system's response at higher noise levels.

Equivalent Continuous Sound Level, L_{eq}

This is a kind of mean noise level.

The unit is dB L_{eq}. For A-weighted levels the unit is dB(A) L_{eq} or, in more modern units, dB L_{Aeq}. The Noise at Work Regulations use $L_{eq(s)}$ which refers to a sample level.

Maximum Level, L_{max}

This is the maximum level reached (usually for a fraction of a second) in the measurement period.

The unit is dB L_{max}. For A-weighted levels the unit is dB(A) L_{max} or, in more modern units, dB L_{Amax}.

Statistical (Percentile) Levels, L_n

During a measurement of fluctuating noise, it is often useful to establish the levels exceed for a percentage of the time. L_n is the index representing the level exceeded for n% of the measurement period.

The unit is dB L_n. For A-weighted levels, the unit is dB(A) L_n or, in more modern units, dB L_{An}.

Common examples are as follows :-

dB L_{A90} is the A-weighted level exceeded for 90% of the time and is often used to describe the underlying background noise.

dB L_{A50} is the A-weighted level exceed for 50% of the time. Mathematically, it is the median, another kind of average.

dB L_{A10} is the A-weighted level exceeded for 10% of the time and has traditionally been used to describe the intermittent highs in the noise climate such as passing cars or aircraft.

Frequency Analysis

Here the audible frequency range is divided up into bands and the noise level is expressed in each frequency band form low pitches to high pitches.

Octave Band analysis is where the frequency range is divided into 8 bands from 63 Hz to 8kHz, or sometimes into 10 bands from 31.5 Hz to 16kHz.

1/3 Octave Band analysis provides more detailed subdivision into 24 bands from 50 Hz to 10kHz, or sometimes into 30 bands from 20Hz to 20kHz.

Narrow Band analysis takes this further with the possibility of many thousands of bands, possibly only 1Hz wide, or even less.

In all types of frequency analysis, the level in each band can be expressed in terms of L_{eq}, L_{max}, L_n, etc. as defined above.