
VANGUARDIA

A BURO HAPPOLD COMPANY

Badminton Estate Concerts 2023

Noise Management Plan

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Glossary

| Term | Definition |
|-------------------------------------|--|
| A-weighting | The human ear is not equally sensitive to all frequencies of sound. It is relatively much less sensitive to very low frequencies such as 'mains hum', and to very high frequencies such as the call of a bat, than to the 'mid-frequencies' important for human voice communication. In order to make sound level meters, which would otherwise be indiscriminate in registering sound pressures, respond in a way which reflects human perception of sound, they usually are fitted with a set of filters to progressively filter out the high and low frequency energy. The filters are made to an internationally standardised specification and the filtered noise level is said to be 'A-weighted'. Sometimes A-weighted decibel levels are denoted 'dB(A)', but the correct, internationally standardised format for reporting requires the 'A' to be appended to the noise descriptor, e.g. $L_{Aeq,T}$, L_{Amax} , etc. |
| Ambient Noise | This is the totally encompassing sound at the measurement position over a specified time interval and usually comprises sound from many different sources both near and far. |
| Attenuation | A general term used to indicate the reduction of noise, or the amount (in decibels) by which it is reduced. |
| Averaging | In the absence of a dominant steady source, the sound level at a point, indoors or outdoors, varies continuously. For example, the variation may be over a few dB about an average value in a quiet room, or over 10 dB or more in a noisy outdoor environment. In order to define a level to represent the relative level of noise in the space it is necessary to define that average value. The most common averaging methods are energy averaging (L_{Aeq}) and statistical averaging (L_{AN} where N is a percentage between 1 and 100). The $L_{A10,T}$, the noise level exceeded for 10% of the measurement time interval T, is commonly used in the UK for the assessment of road traffic noise. |
| Background Noise Level, $L_{A90,T}$ | Background noise level is a term used to describe that level to which the noise falls during quiet spells, when there is lull in passing traffic for example. It is quantified by the $L_{A90,T}$ which is the noise level that is exceeded for 90% of the measurement time interval, T. |
| Decibels | Noise conventionally is measured in decibels (dB). The decibel is a logarithmic unit and decibel levels do not add and subtract arithmetically. An increase or decrease of 3 dB in the level of a steady noise is about the smallest that is noticeable. It represents a doubling or halving of noise energy. An increase or decrease of 10 dB represents a ten-fold change in noise energy, and is perceived as a doubling or halving of loudness. The threshold of hearing for a typical young, healthy adult is 0 dB A-weighted sound pressure level. A noise level of 140 dB(A) can cause physical pain. Most people listen to their televisions at about 60 to 65 dB(A). Alongside a busy main road the ambient noise level may be in the 70 to 80 dB(A) range; on a quiet day in the country it might be as low as 30 dB, in town 40 to 50 dB(A). |
| Decibel Addition | If two similar noise sources operate together their combined noise level at an observer's position some distance away is 3 dB higher than the noise level generated by just one of them. If two further machines are switched on the noise level generated by all four at the observer's position is 3 dB higher than the level generated by the two. If the number of machines is again doubled, to eight, the noise level increases by another 3 dB, and so on. |
| L_{Aeq} | The 'equivalent continuous A-weighted sound pressure level' is an average of the fluctuating sound energy in a space. It is the value of the A-weighted sound pressure level of a continuous, steady sound that, over the specified time period, T seconds, has the same root mean square sound pressure as the varying sound. It can be likened to the mean petrol consumption of a car over a specific journey during which the instantaneous consumption peaked during periods of acceleration and fell during periods of coasting or braking. |
| Façade level | Road and railway traffic noise levels often are specified in terms of the sound level at a position 1 m in front of the most exposed façade of potentially noise sensitive premises. Such levels are assumed to be 3 dB(A) higher than sound levels measured at an equivalent position away from the noise reflected off the building façade and any other surfaces (excluding the ground). |
| Music Noise Level (MNL) | The L_{Aeq} of the music noise measured at a particular location without interference from extraneous ambient noise. |

1 Introduction

1.1 Preface

Vanguardia Limited has been instructed by Robomagic Live Limited to conduct pre-event acoustic work and undertake the noise management during the proposed Badminton Estate Concerts to be held at Worcester Lodge, Didmarton, GL9 1AH on Saturday 2nd and Saturday 16th July 2023.

The purpose of this Noise Management Plan is to support the Premises Licence application for the above events by providing entertainment noise level predictions, recommending appropriate limits, and outlining the noise monitoring and management scheme that will be put into place to manage the music noise levels at nearby residential properties. Recommended limits relating to entertainment noise are presented in Section 4 and the practical measures that will be adopted to achieve compliance with noise conditions are described in Section 5.

It is intended that this is considered a 'live' document which may evolve further with ongoing liaison between Vanguardia, the event promoter and the local authorities.

1.2 Consultant's Experience

Vanguardia Limited is a specialist consulting company dealing in the field of sound, noise, and acoustics in the entertainment industry. The company has been involved with noise management issues for thousands of concert and festival events in the UK and overseas since the 1970s.

1.3 Event Summary

The event site will consist of a single stage supported by a number of concessions. The following information has been provided by the event organisers:

Table 1 - Event date summary

| Date | Act | Soundcheck | Doors | Curfew |
|------------------------------|-------------|------------|-------|--------|
| Sunday 2 nd July | Rod Stewart | TBC | 16:30 | 23:00 |
| Sunday 16 th July | The Who | TBC | 16:30 | 23:00 |

A site plan is presented in Appendix A.

2 Statutory Guidance

2.1 Licensing Act 2003

The Licensing Act 2003¹ and the statutory guidance approved under section 182 of the Act is relevant as it specifically covers emissions from events such as those that have been held and are proposed to be held at Great Lines Heritage Park.

The Guidance issued under Section 182 of the Licensing Act 2003 is provided to licensing authorities in relation to the carrying out of their functions under the 2003 Act in the promotion of the four licensing objectives. The guidance states that:

'It is a key medium for promoting best practice, ensuring consistent application of licensing powers across England and Wales and for promoting fairness, equal treatment and proportionality'.

In addition to the four licensing objectives of

- The prevention of crime and disorder
- Public safety
- The prevention of public nuisance [emphasis added as relevant to noise]
- The protection of children from harm

The guidance also supports a number of other key aims and objectives including:

'Recognising the important role which pubs and other licensed premises play in our local communities by minimising the regulatory burden on business, encouraging innovation and supporting responsible premises'.

'Encouraging greater community involvement in licensing decisions and giving local residents the opportunity to have their say regarding licensing decisions that may affect them'.

'the introduction of better and more proportionate regulation to give business greater freedom and flexibility to meet their customers' expectations;'

'the further development within communities of our rich culture of live music, dancing and theatre, both in rural areas and in our towns and cities;'

The Guidance offers general principles in setting parameters within which premises can lawfully operate, stating that Licence conditions:

'must be tailored to the individual type, location and characteristics of the premises and events concerned'.

'should be proportionate, justifiable and capable of being met'.

Further support of this guidance is found in paragraphs 2.17 and 10.10 which state that:

¹ The Licensing Act 2003 <https://www.legislation.gov.uk/ukpga/2003/17/contents>

'Licensing authorities should avoid inappropriate or disproportionate measures that could deter events that are valuable to the community, such as live music.'

'The 2003 Act requires that licensing conditions should be tailored to the size, type, location and characteristics and activities taking place at the premises concerned. Conditions should be determined on a case-by case basis and standardised conditions which ignore these individual aspects should be avoided..... Licensing authorities and other responsible authorities should be alive to the indirect costs that can arise because of conditions. These could be a deterrent to holding events that are valuable to the community or for the funding of good and important causes.'

The guidance also states that:

'Each application must be considered on its own merits Conditions attached to licences and certificates must be tailored to the individual type, location and characteristics of the premises and events concerned. This is essential to avoid the imposition of disproportionate and overly burdensome conditions on premises where there is no need for such conditions.'

It is generally accepted that properties in the vicinity of a large-scale music event will be able to hear music noise. It is a matter of balancing the needs of the local community who may be inconvenienced, with the enjoyment of the audience and any wider economic and social benefits.

3 Entertainment Noise Criteria

Guidelines for noise from outdoor music events were published in the Noise Council's Code of Practice on Environmental Noise Control at Concerts² ('The Code') in 1995. These guidelines were based on experience of a limited number of outdoor concerts in the late 1980s and early 1990s when the number, scale and variety of events was very much smaller and more restricted than currently, and they were held mainly in urban areas and stadia, with very few in rural areas.

The recommended Music Noise Level (MNL, expressed in dB $L_{Aeq,15\text{ min}}$) guidelines contained within the Code of Practice for events held between the hours of 09:00 and 23:00 are summarised in Table 2.

Table 2 - Code of practice MNL guidelines – for events held between 09.00 and 23.00

| Concert days per calendar year, per venue | Venue Category | Guideline MNL |
|---|------------------------------|--|
| 1 to 3 | Urban Stadia or Arenas | The MNL should not exceed 75 dB(A) over a 15-minute period |
| 1 to 3 | Other Urban and Rural Venues | The MNL should not exceed 65 dB(A) over a 15-minute period |
| 4 to 12 | All Venues | The MNL should not exceed the background noise level by more than 15 dB(A) over a 15-minute period |

Since its publication in 1995, there have been several recommended modifications to the Code and as a result it has been under review for some time. The modifications are being considered because of changes in the live entertainment industry, dramatically increased demand for outdoor events over the past 20 years, changes to the licensing regime with the implementation of the Licensing Act 2003 and shifts in cultural experience and expectation.

Although for more than 3 events days per year the Code suggests referencing the permitted MNL to the typical $L_{A90,T}$ background noise level, there is no underlying research or studies that provide a robust justification of this approach. This means the approach is an arbitrary means of deriving an MNL in a consistent manner, but it is not supported by any evidence correlated to community response.

It is important to recognise that the introduction to the Code of Practice explicitly states it is designed to provide guidance on "keeping to a minimum the disturbance [from noise in relation to] large music events involving high powered amplification". Consequently, unacceptable impacts or even significant adverse effects, as defined by the

² Code of Practice on Environmental Noise Control at Concerts, The Noise Council, 1995
<https://moderngov.lambeth.gov.uk/documents/s117890/Annex%20B%20-%20Code%20of%20Practice%20on%20Environmental%20Noise%20Control%20at%20Concerts.pdf>

Planning guidance in the NPPG³ are unlikely until the guideline Music Noise Levels (MNLs) the Code suggests are exceeded substantially.

3.1 Low Frequency (Bass) Noise

Most forms of popular music over the last 80 years have had an element of low frequency content. In the last 30 years the prominence of the low frequency bass and drum beats and rhythms have increased in some music genres. This has led to concerns about the low frequency bass content of music noise from outdoor concerts.

The Code of Practice does not offer any low frequency MNL guidelines, but references a study of concerts at Wembley Stadium which did address the issues of low frequency noise from concerts. This research was completed by Vanguardia Director Jim Griffiths. The study shows that at a distance of 2 km from the venue, a MNL of 80 dB in the 1/1 octave frequency bands at 63 Hz and 125 Hz results in an increased probability of receiving complaints relating to low frequency noise. The study goes on to suggest that, at the same distance, a MNL of 70 dB in these 1/1 octave bands is satisfactory.

While this broadly addresses the issue of low frequency noise, it only considers MNLs measured at a distance of 2 km and does not suggest thresholds for noise sensitive premises within this radius.

A recent IOA conference paper⁴ reports that from a sample of 71 events during 2019 it was found that:

- only 10 events had low frequency limits, comprising only 14% of all the venues;
- Five events had low frequency constraints in the 63 Hz and 125 Hz octave bands at a distance of 2 km;
- Three events had low frequency restrictions in the 63 Hz and 125 Hz octave bands at the closest noise sensitive receiver; and
- two events had a C-weighted guidelines at the closest noise sensitive receiver of 90 dB $L_{Ceq,15mins}$.

Vanguardia's experience is that low frequency music noise thresholds should be either set in the 63 Hz and 125 Hz 1/1/ Octave bands at a distance of 2 km from the venue or, if applied at the nearest noise sensitive receptors, should be couched in terms of an overall $L_{Ceq,T}$ value between 15 and 20 dB above the equivalent A-weighted MNL for that location. A MNL of 75 dB $L_{Aeq,15 min}$ is often adopted for urban events and in this case a maximum overall 'C' weighted level should not exceed 90 dB $L_{Ceq,15 mins}$.

³ NPPG – National Planning Practice Guidance – Noise – 2019 <https://www.gov.uk/guidance/noise--2>

⁴ An Evaluation of UK and International Guidance for the Control of Noise at Outdoor Events. Reproduced Sound 2020, Volume 42, Part 3. <https://www.ioa.org.uk/file/4199/download?token=bjPnDxRB>

4 Noise Predictions

There is no Premises Licence in force for Worcester Lodge, so predictions have been undertaken to determine likely entertainment noise levels from the proposed event.

Detailed noise predictions have been carried out in terms of both the L_{Aeq} and L_{Ceq} so that both the overall 'A' weighted broadband sound levels and low frequency 'C' weighted sound levels can be assessed.

The noise predictions have been carried out using industry standard software (IMMI) which has been modified to take account of large-scale concert sound systems. The results are provided both as spot levels at representative locations and as noise contours, so that the noise impact can be assessed in all community areas around the site. Specific noise levels have been predicted for locations to the north, south, east and west of the site which have been identified as representative of the most sensitive residences, as follows:

1. Beech Lane Farmhouse
2. 57 The Street
3. Wiltshire Path Cottage
4. Holly Bush Cottage

A map of these prediction locations is presented in Appendix B. It is proposed that these also be used as the primary monitoring locations on each axis to the event.

Predictions have been based on a Front of House (FOH) level of 96 dB(A).

The following assumptions were made as part of the predictions:

- MNLs are predicted at a height of 1.5 m above local ground level;
- Steelshield to the rear of the stage is modelled at a height of 2.4 m (delineated in blue on the figures overleaf);
- Distance attenuation is based on the ISO 9613-2 calculation methodology under downwind propagation conditions.

The predicted music noise levels at each of the identified receptors are presented in Table 3 - Predicted MNLs at the closest receptors and in graphical contour maps indicating the system orientation at Figure 1 and Figure 2.

Table 3 - Predicted MNLs at the closest receptors

| Receptor | dB(A) | dB(C) |
|---------------------------|-------|-------|
| 1. Beech Lane Farmhouse | 48 | 70 |
| 2. 57 The Street | 65 | 79 |
| 3. Wiltshire Path Cottage | 53 | 72 |
| 4. Holly Bush Cottage | 59 | 79 |

The C-weighted levels are included to give an indication of the predicted low frequency content of the entertainment noise and will depend on the actual sub array configuration deployed.

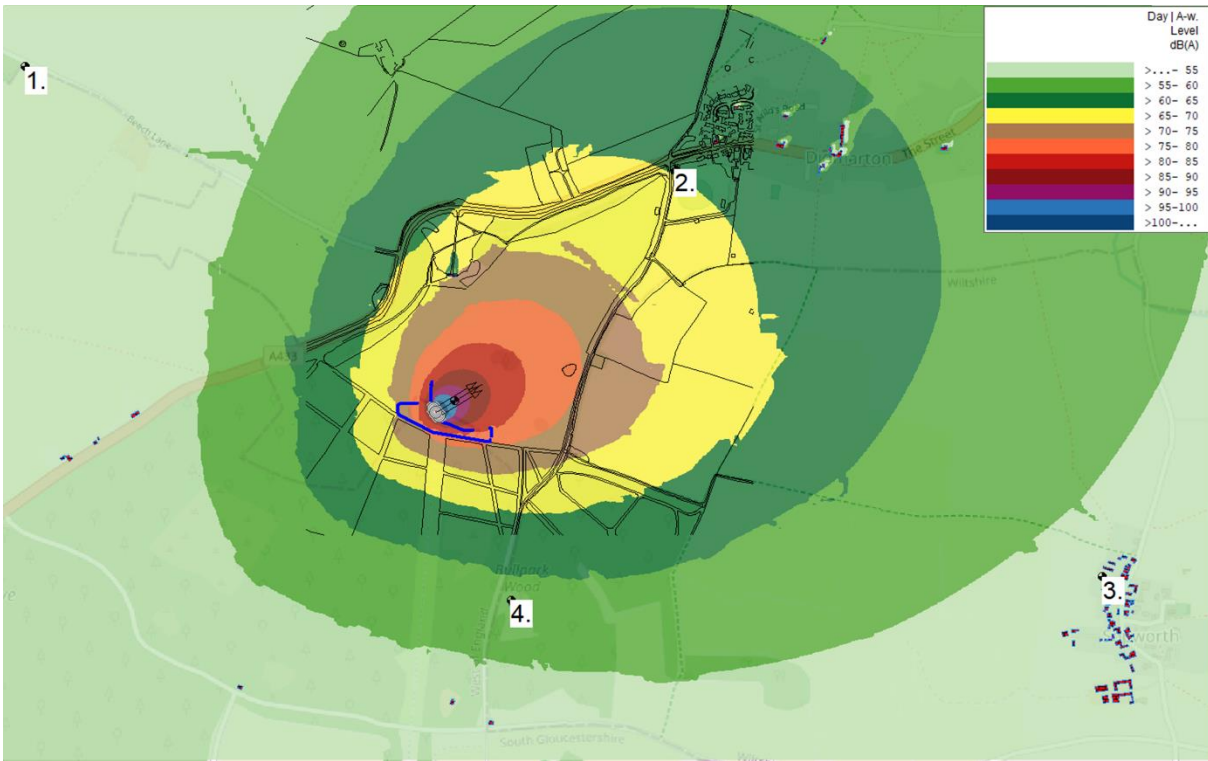


Figure 1 - Noise contours (A-weighted)

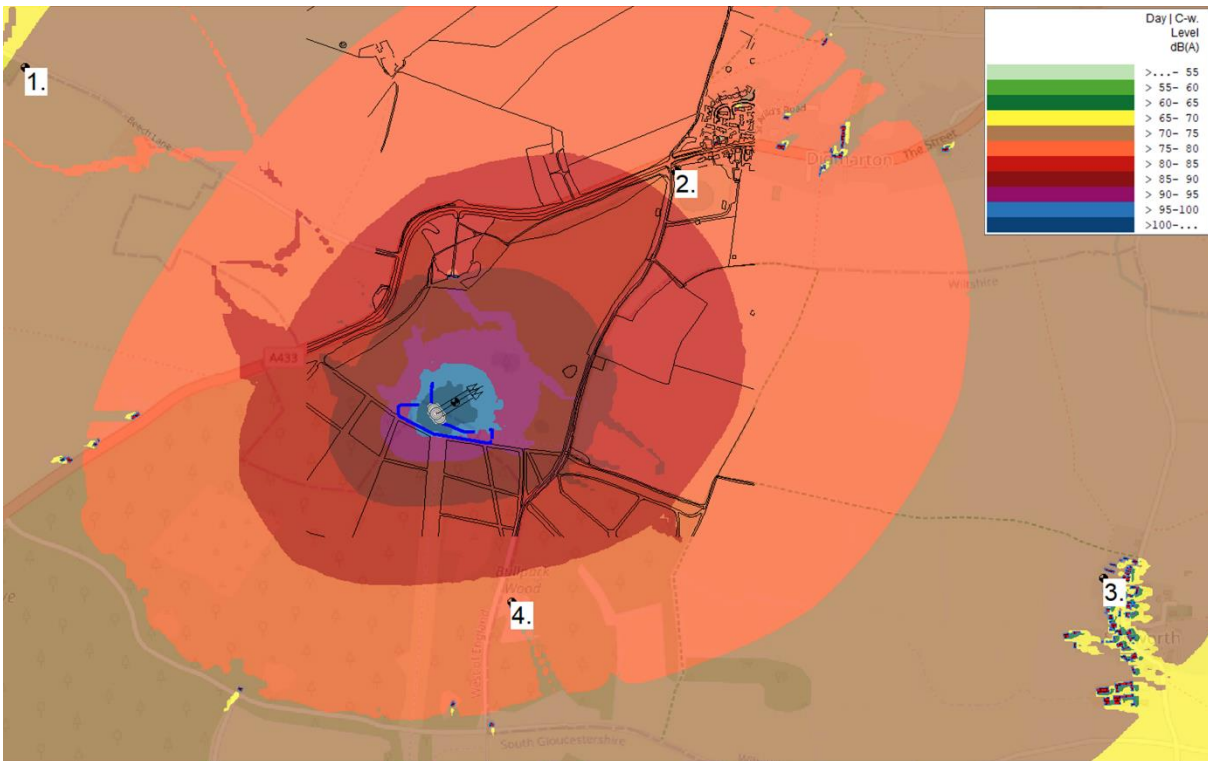


Figure 2 - Noise contours (C-weighted)

4.1 Limitations Of Noise Predictions

Whilst noise predictions provide a relatively accurate indication of the noise impact at noise sensitive properties, it can in no way guarantee the actual operational noise levels at an event. Meteorological conditions such as temperature inversions and wind direction may have a significant effect (typically 10 - 15 dB) on noise levels at noise sensitive properties during an event, the effect of which cannot be predicted accurately.

4.2 Recommended Noise Limits

Based on the above modelling results, the proposed operating hours and Vanguardia's experience managing noise from events, a MNL limit of 65 dB(A) measured under free-field conditions is recommended for the two proposed event days.

As previously discussed, with the advent of professional sound systems that can generate very high levels of low frequency sounds, low frequency 'bass' has become an increasing form of disturbance for local residents. From experience, it is recommended that there should be a low frequency limit in addition to the 65 dB L_{Aeq} level to provide further protection for the local community. As with many other venues that specify a C-weighted limit, it is recommended that the MNL should not exceed 80 dB $L_{Ceq,15min}$ at any residential property, measured under free-field conditions.

5 Sound Management Plan

Vanguardia will provide an acoustic consultant to conduct the noise management function throughout the series of concerts. All acoustic measurements will be undertaken with Class 1 precision grade instrumentation.

This sound management programme fundamentally follows the procedures that have been successfully adopted at outdoor concerts and festivals over the past 20 years throughout the UK, as detailed below.

5.1 Sound Propagation

Prior to the commencement of the event, the production team will be carrying out soundchecks and as part of this process, Vanguardia staff will undertake sound propagation tests to correlate the music noise levels at the mixing desk with those observed at the most sensitive sound control position. The results of these tests will be used to set an appropriate sound limit at the mixer position.

5.2 Sound Management

The music sound levels at the mixing desk position will be continuously monitored in terms of 15-minute and 1-minute L_{Aeq} and L_{Ceq} values. The noise limit is set in 15-minute intervals, but the 1-minute values provide Vanguardia staff with immediate information to help maintain the level within the agreed limit.

As part of the managerial process, all sound engineers at the event will be informed prior to arriving at the mixer of the need to adhere to the sound limits and instructions issued to them in relation to this. Sound engineers will be kept informed of the offsite MNL and immediate instructions will be issued to them if it appears that there is a risk that the limit may be exceeded at any point.

Engineers at the FOH positions will be in direct contact with Vanguardia staff monitoring off-site. Noise levels outside of the site will be monitored regularly at the monitoring positions, or from the location of any noise complaint that may be received. On receipt of a local noise complaint the area will be visited subject to staff availability and the offsite levels checked for compliance. Any communications with the sound engineers necessary to reduce sound levels will be made by Vanguardia staff.

5.3 People Noise

The promoter will install signs and notices detailing that guests are to respect those living in the area and requesting customers to leave quietly and remain mindful of neighbours.

5.4 Telephone Complaints Line

A dedicated telephone complaints line number will be advertised to local residents. A schematic of the control communication protocol is provided in Figure 3.

Details of all complaints received via the telephone complaints line will be recorded and an efficient process for distributing this information to the relevant persons will be agreed. It is essential that accurate and timely information is provided to the Vanguardia consultant.

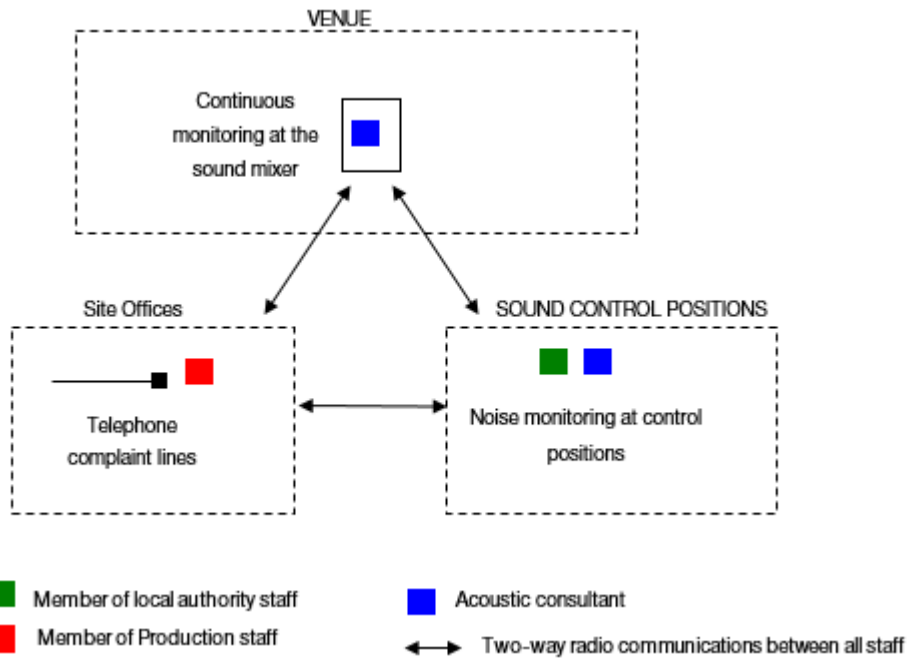


Figure 3 - Control communication protocol schematic

6 Summary Reporting

6.1 Post-Concert Report

If required, a post event report including the results of on- and off-site measurements, details of any complaints, and actions taken (as appropriate) will be issued to the local authority within 14 days of the completion of the final event.

Appendix A - Site Plan

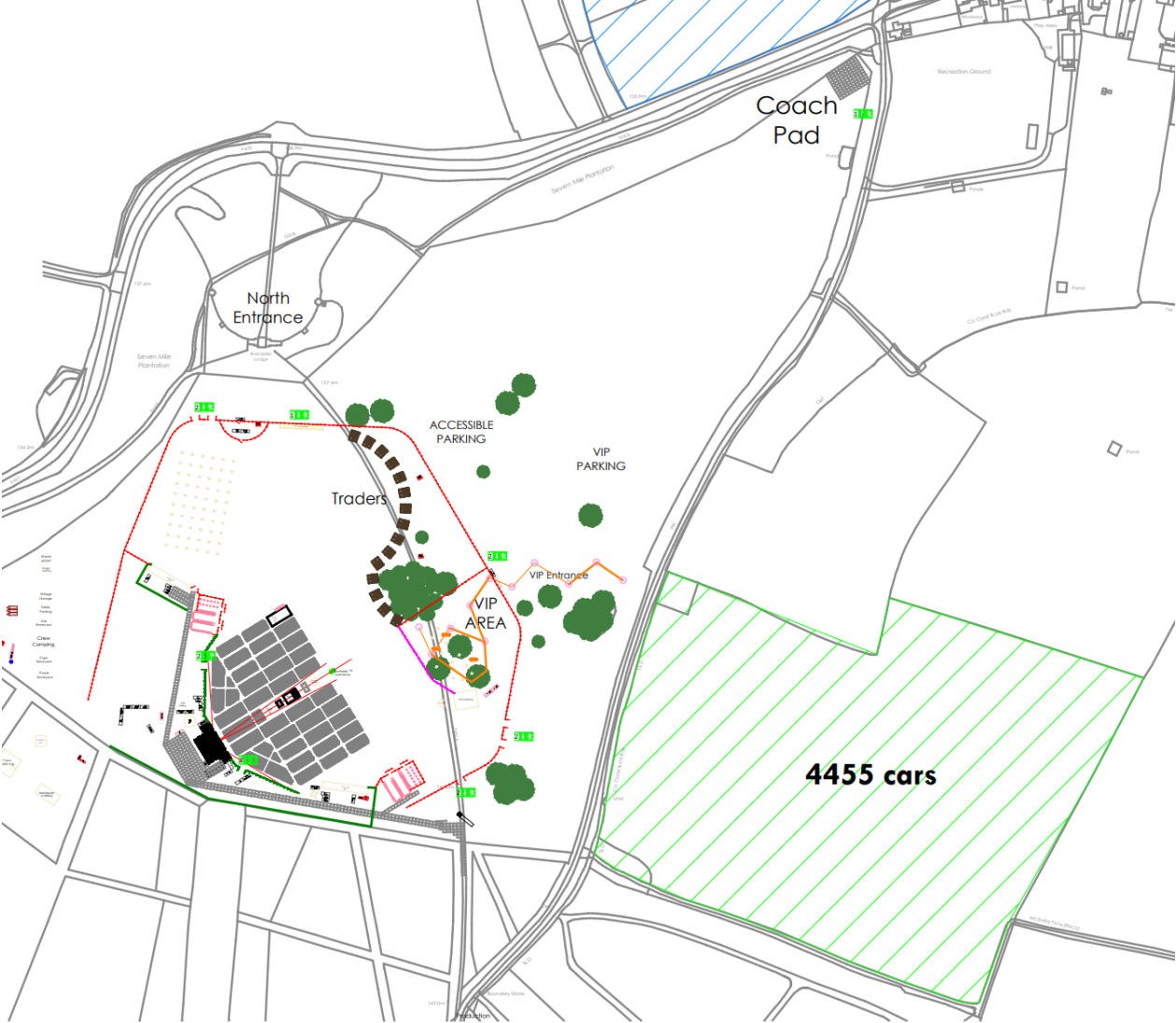


Figure 4 - Site Plan

Appendix B - Monitoring Control Point Locations



Figure 5 – Closest Noise Sensitive Receptor locations relative to event site redline

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