



Project No: 232260R

Noise Assessment

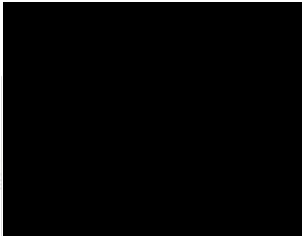
Zenith Gathering – Outdoor Entertainment

Mudgee, NSW

Prepared for:

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1.0 - INTRODUCTION

Zenith Gathering (Zenith) is a cultural, arts, music and lifestyle gathering which has an approved D.A. to host an event at the Australian Rural Education Centre (AREC) grounds in Mudgee, N.S.W.

The existing D.A. allows for the event to operate until 10pm over three days from Friday 28 the Sunday 30th of April 2023. The current acoustic assessment is to allow for the extended hours of operation at the venue up until up to 2am.

The entire Zenith event is proposed to open 12pm to 2am Friday, and 8am to 2am Saturday and Sunday.

Zenith combines live music with arts and visual displays as well as running workshops, educational speakers and other forms of entertainment. It is proposed that there may be up to 1,500 people in attendance, most of whom will camp on the site.

From an acoustic point of view the most significant potential for any adverse noise impacts in the current assessment may come from the operation of the live entertainment in the period from 10pm to 2am.

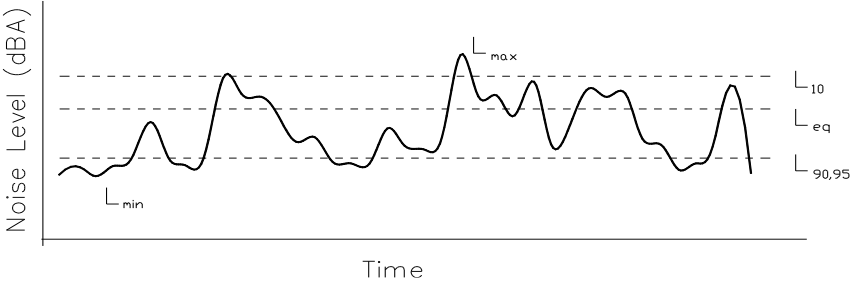
The scope of this assessment is to ensure that noise emissions from Zenith would generally be in compliance with the typical requirements of the Environment and Heritage Group (EHG) and Mid Western Regional Council (MWRC).

This assessment has been developed in relation to the setup and performance of Zenith. It is designed to ensure noise emissions from the venue are maintained to minimise potential impacts to the surrounding local community.

The assessment covers the specifics of noise control and management of events. Allied to this and integral to compliance with any adopted noise criteria will be the selection of sound amplification equipment, stage location and layout, security and crowd control.

Table 1 contains a glossary of commonly used acoustic terms and is presented as an aid in understanding this report. More detailed definitions of some relevant terms are included in **Appendix I** to this report.

TABLE 1 DEFINITION OF ACOUSTICAL TERMS	
Term	Definition
dB(A)	The quantitative measure of sound heard by the human ear, measured by the A-Scale Weighting Network of a sound level meter expressed in decibels (dB).
SPL	Sound Pressure Level. The incremental variation of sound pressure above and below atmospheric pressure and expressed in decibels. The human ear responds to pressure fluctuations, resulting in sound being heard.
STL	Sound Transmission Loss. The ability of a partition to attenuate sound, in dB.
L _w	Sound Power Level radiated by a noise source per unit time re 1pW.
L _{eq}	Equivalent Continuous Noise Level - taking into account the fluctuations of noise over time. The time-varying level is computed to give an equivalent dB(A) level that is equal to the energy content and time period.
L _{max}	The maximum A weighted sound level (fast response) occurring during a noise event or over a specified time period.
L ₁₀	Average Maximum Noise Level - the level exceeded for 10% of the monitoring period.
L ₉₀	Average Minimum Noise Level - the level exceeded for 90% of the monitoring period and recognised as the Background Noise Level. In this instance, the L ₉₀ percentile level is representative of the noise level generated by the surrounds of the residential area.



2.0 SITE DESCRIPTION

The AREC is an open air venue with a large camping ground located adjacent to it as shown in **Figure 1**. The site is alongside Mudgee Airport.

It is envisaged that a temporary stage will be set up at the approximate location indicated with a star on Figure 1.



Figure 1 – AREC Grounds (North to top of page – Approximate stage location as a star)

3.0 PURPOSE

Zenith has developed an Event Management Plan for the operation of the entire event. This plan has full details of the day to day logistics, including movement of patrons to and from the venue and facilities for those staying on site.

The purpose of the current assessment is to manage noise emissions from the event after 10pm to minimise impacts on the acoustic amenity of surrounding land uses. Further, the assessment will ensure all monitoring of noise emissions is carried out at appropriate locations and times to enable the management of and response to any complaints that may arise.

The results of the assessment will assist the event managers and contract employees to recognise the potential for noise impacts and to allow for the ongoing control of noise at the source to protect surrounding residential receivers.

The objectives of the assessment are to:

- Exhibit compliance with adopted noise goals as per typical statutory and mandatory requirements, and

- Ensure positive relations with local communities and council.

Given the anticipated noise emissions from the proposed entertainment it is envisaged that elevated noise levels would be experienced at residential receivers in the vicinity of the sites.

The focus of this assessment is to provide a framework for the managers of the event and contractors involved in the performance to minimise noise impacts on the acoustic amenity of surrounding land uses.

4.0 NOISE MANAGEMENT PROCEDURES

4.1 Noise Goal

This assessment is to support a D.A. for the extended hours of operation (between 10.00pm and 2.00 am) of Zenith which is to be submitted to MWRC.

In assessing the noise from irregular, short term events, such as those proposed for Zenith, direction may be taken from the OEH publication “*Noise Guide for Local Government (NGLG)*.”

The NGLG has recently been updated and now contains a series of generic discussion points in relation to noise from outdoor events such as Zenith (as shown in extract below).

- *It may not be possible or appropriate to manage noise through a general noise limit for outdoor entertainment events in all circumstances. The appropriate noise limit (if indeed a noise limit is necessary) will depend on the particular circumstances of the venue and the type of entertainment event. Unless the venue is very remote, it is unlikely that a noise limits to prevent annoyance at every neighbouring residence is possible. However, setting a noise limit can prevent the noise levels emitted from an event from being any higher than necessary. Noise limits will need to be site-specific and reflect what is achievable in practice, without overly restricting the ability of an event to proceed. These considerations have to be balanced against the reasonable expectations of residents not to be subjected to ‘offensive noise’.*
- *Audience satisfaction with performances at large outdoor music events often depends on the achievement of sustained high volumes throughout the performance. A balance needs to be struck between a level that is fit for purpose at the venue and the noise*

impacts on the surrounding community. This should be considered at the planning stage for the event.

- *Low frequency sound—commonly associated with bass noise emissions—is known to be particularly intrusive, to fluctuate widely, and to be difficult to measure accurately. However, limits on low-frequency noise are desirable.*
- *Topographical features and weather conditions can result in residents further away from the venue being more exposed to music noise than those located closer to the source. This needs to be considered in designing requirements for compliance monitoring.*

The previous version of the NGLG contains a more comprehensive analysis of potential noise issues arising from outdoor concerts. That document details a number of factors that, for example, a council may need to consider in developing a guideline or policy for a specific noisy activity. These include:

- How the noise should be measured to capture annoying characteristics, for example measuring Lmax or Leq noise levels,
- The number of events,
- Operating times (day, evening or night),
- Complaint management procedures for the operator,
- A noise monitoring plan for the operator,
- Best management practises for the activity,
- Community views, and
- Socio-economic benefits.

The NGLG also contained a number of hypothetical case studies in relation to specific noise generating events or conditions. One such case study relates to noise from an open air concert. This study specified an Lmax noise level of 75 dB(A) at the nearest residential boundary as being a management measure to minimise noise during the day and evening.

For the purposes of this assessment noise levels of up to 75 dB(A) Lmax are considered acceptable up until 10.00pm. After 10.00pm it is

considered reasonable that the acceptable level be set at 70 dB(A) Lmax.

4.2 Noise Management and Control Measures

The location of the Zenith site in relation to the nearest residential receivers in each direction is shown on **Figure 2**, as is the approximate distance between the stage and the receivers. The distances have been scaled from Google Earth and have not been surveyed. The figure shows that the Zenith site is relatively remote from any residential receivers.



Figure 2 – Residential Locations and Distance to the Stage

It is generally accepted that there are two reasonable and feasible methods for noise control for a concert.

The first measure is to limit the noise level at the source (speakers) to ensure compliance with an adopted criterion. The second involves incorporating practises for noise mitigation into the planning and management of the event.

Both forms of noise control can be applied here and their effectiveness will be dependent upon each other.

In relation to the first point, Zenith have an accepted Event Management Plan in which Section 12 is a Sound Management Plan

(SMP) (which is reproduced in extract in **Appendix II** – noting the comments below in relation to combined Lw of speakers and timing of noise output reductions).

In summary, the SMP details that sound checks will be carried out prior to the event taking place (starting on Thursday 27th and Friday 28th April). The sound checks will be done during the day time and will start at a sound level that is approximately 50% of maximum and increase to 100% amplification. This process will be overseen by a sound engineer on site.

The duration of the sound checks must be kept to the minimum required to enable valid measurements to be taken and the setup of the speakers to be calibrated.

The SMP indicates that, as per similar style events, the sound level, during the day and evening, will be kept to a maximum of 125 dB(A) Lmax when measured at the mixing desk. The SMP also indicates that, after 11pm, the sound level will be reduced to 115 dB(A) Lmax.

It is recommended that the reduction in sound level be undertaken at 10.00pm in keeping with the evening time cut off applicable to noise emissions assessed per procedures in the Noise Policy for Industry (NPI).

The location of the mixing table is not a defined distance from the speakers and, therefore, cannot be used to accurately determine an appropriate noise level for compliance with a criterion. Rather, this assessment has been based on a combined sound power level for the speakers of 135 dB(A) Lmax after 10pm. This equates to a sound pressure level of 101 dB(A) at a distance of 20m from the centre of the speakers.

A table showing calculated indicative theoretical received noise levels at various distances from the speakers is shown in **Table 2**.

It is recommended that the stage be oriented to face towards the east, with all speakers also facing in that direction. The closest receivers in this direction are furthest away from any residences near the site and they are also relatively isolated (hence there are fewer residences in that direction – See Figure 2).

Residences to the north (@ 540m) and south (@ 630m) of the stage will be partially shielded from the noise by the directivity of the noise source (i.e., those receivers will have an oblique view of the stage/speakers and will not have direct line of sight to the stage). A

nominal, and conservative, 5dB(A) reduction in the received noise has been included in the results shown in Table 2 to account for this.

Residences to the west of the stage (@ 800m) will be directly behind the stage/speakers and will be shielded from the noise by the structure of the stage and the directivity of the noise source. A nominal, and conservative, 10dB(A) reduction in the received noise has been included in the results shown in Table 2.

Residences to the east (@ 1400m and 1600m) have effective line of sight to the stage/speakers. The calculation of noise to these receivers is, therefore, based on a straight distance loss from the front of speakers. The results shown in the table for these residences are, however, for a simplistic calculation that takes into account only hemispherical spreading (distance loss) and makes no allowance for atmospheric or ground absorption or for any barrier effects created by topography or buildings.

TABLE 2									
CALCULATED SPL AT THEORETICAL RECEIVERS									
Item	Octave Band Centre Frequency, Hz								
	dB (A)	63	125	250	500	1k	2k	4k	8k
Source Lw Lmax	135	86	110	122	129	131	127	124	122
SPL at 500m ¹	68	19	43	55	62	65	60	57	55
SPL at 600m ¹	67	18	42	54	61	64	59	56	54
SPL at 800m ¹	59	10	34	46	53	57	51	48	46
SPL at 1400m	64	15	39	51	58	62	56	53	51
SPL at 1600m	63	14	38	50	57	61	55	52	50

¹ see text in regards to distance loss/directivity.

The results in Table 2 show that with a combined Lw for the speakers of 135 dB(A) Lmax, the noise level at the most potentially affected receivers will be below the adopted, post 10.00pm, criterion of 70 dB(A) Lmax.

In relation to the second point raised previously, the following planning/management procedures should be in place prior to the event proceeding:

- At the venue the stage and speakers should be oriented to face to the east. This will act to decrease noise in the direction of the closest receivers as shown in Table 2 and noted in the text associated with the table,
- Sound engineers working at the event must be instructed to keep the low frequency (bass noise < 160 Hz) component of the music down. This must form part of written instruction to

each person involved in this aspect of the event. This instruction must detail the implications of non-compliance,

- The local community should be directly informed of the Zenith event. This could include to notification on public notice boards in the neighbourhood, local media and local social media announcements, or a notification to residences within the near vicinity of the site by letterbox drop. Information included in these notifications should detail the timing of the event (including sound checks and testing of equipment), the noise monitoring programme, and noise control procedures in place. The information must contain the name and phone number of the person responsible (responsible person) for maintaining compliance with the noise criterion. This person must have authority to direct the control of the noise output and to reduce this if required. Any letterbox drop must include, as a minimum, the residential areas shown on the Google Earth image in **Appendix III**.
- The performances should commence at 10.00 am must cease no later than 2.00 am.
- Sufficient security personnel must be employed to ensure all patrons leaving the venue do so in a manner and time to minimise noise impacts.

5.0 NOISE MONITORING

A responsible, and suitably competent, person must be appointed to monitor noise levels during the concert and maintain a register of the measured noise levels. This register must be available for review by any regulatory authority throughout the duration of the entire event.

Measurements must be carried out in accordance with AS 1055 Acoustics – Description and Measurement of Environmental Noise.

All instrumentation utilised must comply with the requirements of AS 1259.2 Sound Level Meters and carry current NATA or manufacturer certificates, with certification at intervals not exceeding two years.

Noise levels should be measured at the boundary of a minimum of six residential receivers in representative receiver areas around the site. The measurements should be made for a reasonable period of sufficient duration to ensure a valid L_{max} reading can be taken from typical song(s) during the performance. The locations should be

chosen to represent the worst affected receivers in each direction from the concert.

Monitoring should be carried out in surveys commencing approximately 30 minutes after the beginning of the concert and thereafter at regular intervals to be determined based on the duration of the concert and the style/type of proposed performance. It is expected that the intervals between monitoring events would be two to three hours during the day (i.e., before 6pm) and one to two hours during the evening.

All complaints or communication must be answered. The procedure must be that the responsible person monitors noise levels at the complainant's residence to check compliance. Should non-compliance be confirmed by valid measurement, the acoustic consultant must direct the responsible person must direct the on-site sound engineers to reduce the noise level until compliance is achieved.

6.0 ADMINISTRATIVE PROCEDURES

6.1 Subcontractor Management

Zenith Gathering must accept responsibility for ensuring all performers are aware of the potential noise issues affecting the venue and are aware of the noise limits permissible. They must be aware the noise level has been set at its maximum and cannot be altered without the approval of the responsible person. All parties must be aware of and accept the consequences of non-compliance, that being, the possible cessation of the event.

No subcontractor should be allowed on site without being able to provide adherence to the noise control measures detailed in this assessment that are relevant to their respective operations.

APPENDIX I

DEFINITION OF ACOUSTIC TERMS

Sound Power Level

The amount of acoustic energy (per second) emitted by a noise source. Usually written as “Lw” or “SWL”, the Sound Power Level is expressed in decibels (dB) and cannot be directly measured. Lw is usually calculated from a measured sound pressure level.

Sound pressure Level

The “Noise Level”, in decibels (dB), heard by our ears and/or measured with a sound level meter. Written as “SPL”, the sound pressure level generally decreases with increasing distance from a source. Noise levels are often written as dB(A) rather than dB. The “A-weighting” is a correction applied to the measured noise signal to account for the ear’s ability to hear sound differently at different frequencies. For example, 40dB at 500Hz (speech frequency) is clearly audible but 40dB at 50Hz (very low bass) would be far less audible.

Noise Level Percentiles

A noise level percentile (Ln) is the noise level (SPL) in decibels which is exceeded for “n” % of a given monitoring period. Several important Ln percentiles will be explained by considering the hypothetical time signal in **Figure A1**.

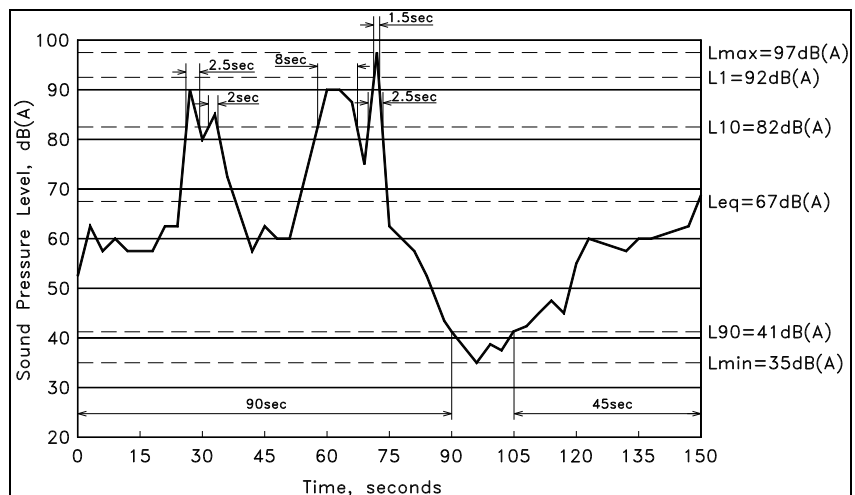


Figure A1 – Hypothetical Time Trace

The signal in Figure A1 has a duration of 2.5 minutes (ie 150 seconds) with noises occurring as follows;

- The person holding the instrument is standing beside a road and hears crickets in nearby grass at a level of around 60 dB (A).
- At about the 30 second mark a motorcycle passes on the road, followed by a car.
- At 60 seconds a truck passes.
- After the truck passes it sounds its air horn at the 73 second mark.
- The crickets are frightened into silence and the truck fades into the distance.
- All is quiet until 105 seconds when the crickets slowly start to make noise, reaching full pitch by 120 seconds.
- The measurement stops at 150 seconds, just when an approaching car starts to become audible.

L1 Noise Level

Near the top of Figure A1, there is a dashed line at 92dB(A). A small spike of 1.5 sec duration extends above this line at around 73 seconds. As 1.5 sec is 1% of the signal duration (150 seconds) we say that the L1 noise level of this sample is 92dB(A). The L1 percentile is often called the *average peak noise level* and is used as a measure of potential disturbance to sleep.

L10 Noise Level

The dashed line at 82 dB(A) is exceeded for four periods of duration 2.5 sec, 2 sec, 8 sec and 2.5 sec, respectively. The total of these is 15 sec, which is 10% of the total sample period. Therefore, the L10 noise level of this sample is 82 dB(A). The L10 percentile is called the *average maximum noise level* and has been widely used as an indicator of annoyance caused by noise.

L90 Noise Level

In similar fashion to L1 and L10, Figure A1 shows that the noise level of 41 dB(A) is exceeded for 135 seconds (90 + 45 =135). As this is 90% of the total sample period, the L90 noise level of this sample is 41dB(A). The L90 percentile is called the *background noise level*.

Leq Noise Level

Equivalent continuous noise level. As the name suggests, the Leq of a fluctuating signal is the continuous noise level which, if occurring for the duration of the signal, would deliver equivalent acoustic energy to the actual signal. Leq can be thought of as a kind of ‘average’ noise

level. Recent research suggests that L_{eq} is the best indicator of annoyance caused by industrial noise and the NPfI takes this into consideration.

L_{max} and L_{min} Noise Levels

These are the maximum and minimum SPL values occurring during the sample. Reference to Figure A1 shows these values to be 97dB(A) and 35dB(A), respectively.

APPENDIX II

EXTRACT FROM SOUND MANAGEMENT PLAN

12 SOUND MANAGEMENT PLAN

The full Sound Management Plan is attached as appendix D.

12.1 Sound Management Policy

Zenith Gathering is committed to reducing the sound impacts of the event on its nearest and sensitive receivers.

12.2 Acoustic Monitoring & Reporting

In accordance with the Zenith Gathering Sound Management Plan, we commit to the following:

- A sound engineer will set up and test all audio equipment to manufacturer's specifications.
- Sound levels at the mixing desk will be kept to 125dBA maximum.
- Sound levels at the mixing desk will be reduced to 115dBA at 11pm.
- Noise sensitive areas will be monitored and any issues communicated via two-way radio.
- Sound will be reduced at source if found to be excessive.

12.3 Resident Notification

Zenith Gathering, in collaboration with and oversight from Shoalhaven Council, will arrange the distribution of a Letter to Residents prior to the event date to the nearest and sensitive receivers as identified by the venue. The Letter to Residents will contain:

- Date, time and location of event
- Site occupation schedule
- Approved sound amplification schedule
- Event Hotline number to call for any sound, safety or other community concerns or feedback
- Details of changed traffic conditions, if applicable
- Details of any other significant changes that may impact the community

12.4 Event Hotline

Zenith Gathering will establish an Event Hotline during all hours of site occupation and event operation to enable the local community a direct line of contact to the Venue and Event organisers through which to voice any complaints or concerns. The hotline number is: 1800 001 080

12.5 Proposed Sound Amplification Schedule

The music programming schedule associated with the event is during the following periods:

12.5.1 Sound Check times:

Thursday 27 April 2023 (Production Day)

15:00-17:00 Sound Balance - All stages, 50-100% amplification, intermittent, FOH & Monitor systems.

Friday 28 April 2023 (Event Day)

11:00-12:00 Headliner Sound Checks - All stages, 50-100% amplification, intermittent, FOH & Monitor systems.

14:00-03:00 Saturday 29 April 2023 Event Mode - All stages, 75-100% amplification, continuous, FOH & Monitor systems

Amplifiers wound down, no sound amplification beyond 03:00.

Saturday 29 April 10:00-04:00 Sunday 30 April 2023 (Event Day)

Event Mode - All stages, 75-100% amplification, continuous, FOH & Monitor systems

Amplifiers wound down, no sound amplification beyond 04:00.

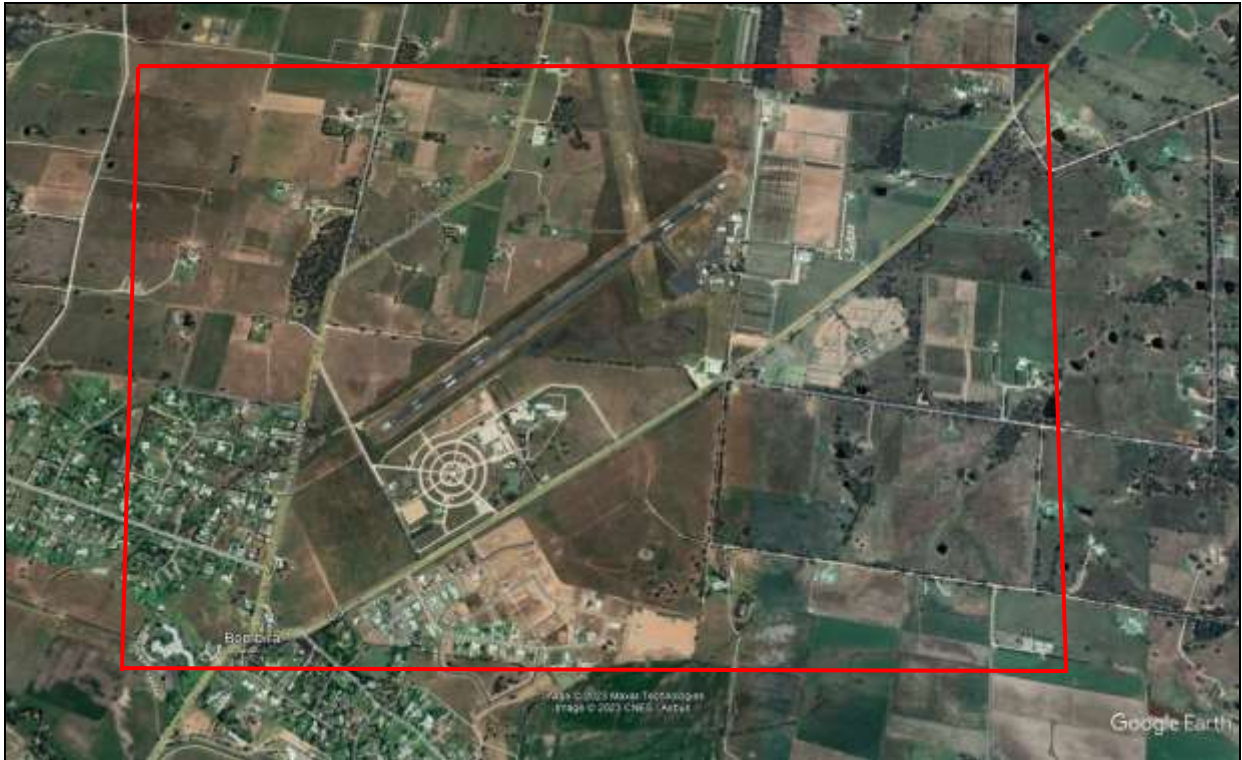
Sunday 30 April 2023 10:00-02:00 Monday 1 May 2023 (Event Day)

Event Mode - All stages, 75-100% amplification, continuous, FOH & Monitor systems

Amplifiers wound down, no sound amplification beyond 02:00.

APPENDIX III

LETTERBOX DROP LOCATION



All residences within in the zone bounded by the red lines should be notified of the event by letter;

The letter should include the;

- Date, time and location of event,
- Site occupation schedule,
- Approved sound amplification schedule,
- Event Hotline number to call for any sound, safety or other community concerns or feedback,
- Details of changed traffic conditions, if applicable, and
- Details of any other significant changes that may impact the community