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Defqon.1 Festival 2015

Noise Impact Assessment and Management Plan

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Q-Dance Australia Pty Ltd
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SYDNEY NSW 2000

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Defqon.1 Festival 2015

Noise Impact Assessment

and Management Plan

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Table of Contents

Table of Contents

TABLES

FIGURES

APPENDICIES

1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Q-Dance Australia Pty Ltd (Q-Dance) to undertake a Noise Impact Assessment and Management Plan for the noise impacts associated with the Defqon.1 Music Festival to be held at the Sydney International Regatta Centre on Friday 18 and Saturday 19 September 2015.

The primary objective of this Noise Impact Assessment and management plan is to develop appropriate noise limits at the surrounding residential locations, develop a computer model to predict the likely noise emissions at the surrounding residential locations and to detail procedures and strategies for minimising, managing and monitoring the noise impact produced by the sound reinforcement systems and various other noise sources related to the festival.

A glossary of the acoustical terminology used throughout this report is contained within **Appendix A**.

2 PROJECT DESCRIPTION

2.1 Sydney International Regatta Centre

The Sydney International Regatta Centre (SIRC) is located in Penrith, NSW. The venue was developed to cater for the rowing and Kayak events during the 2000 Sydney Olympic Games. The Defqon.1 Festival is the largest event held at SIRC each year, with other smaller events, such as the council's Australia Day Celebrations and various rowing regattas such as the GPS Head of the River rowing regatta.

Figure 1 provides an overview of the site location and the existing localised surroundings. **Figure 2** shows only the festival and associated camping area located across the lake.

Figure 1 Site Overview

Figure 2 Festival and Camping Area

2.2 Defqon.1 Festival

The Defqon.1 Festival has been held at SIRC since the inaugural event in 2009. Since then, the annual event has attracted more than 20,000 patrons, and growing each year.

The 2015 festival is proposed to feature 8 stages including a camping stage to occur on the Friday and Saturday on the opposite side of the lake as indicated in **Figure 2**.

Based on the site layout and expected sound system size, the following grouping of stages is made. The hours of operation are as provided by Q-Dance and presented in **Table 1**.

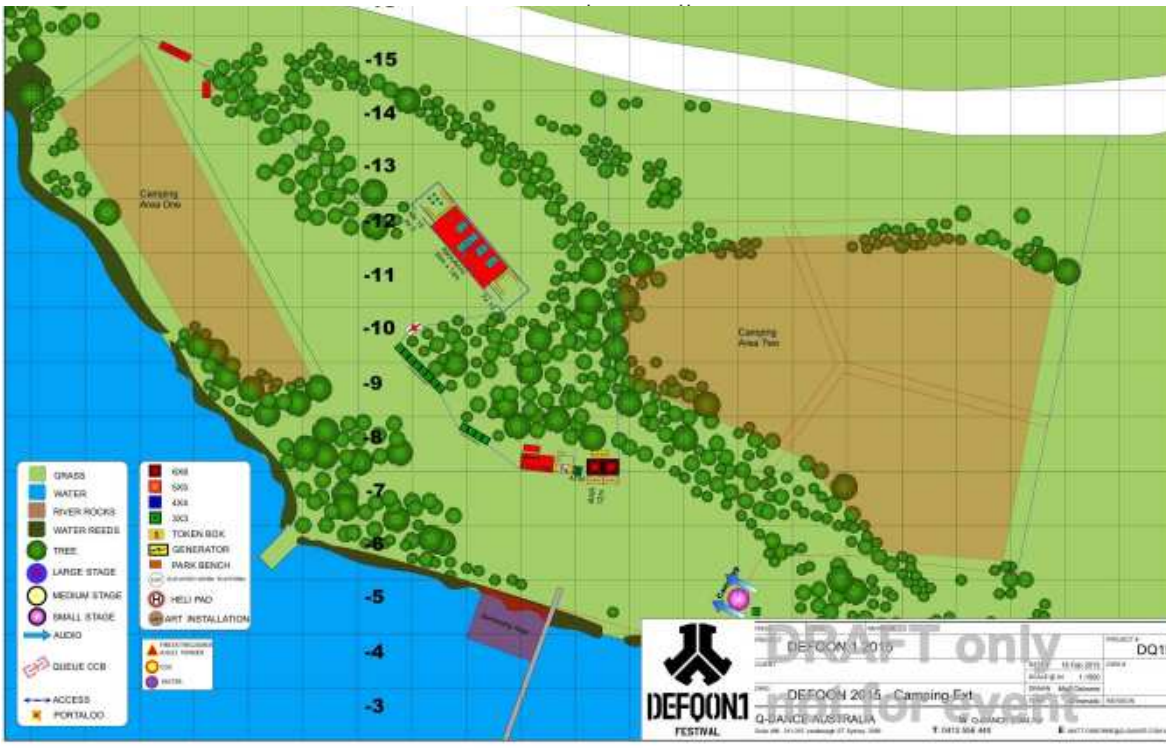
Table 1 Stage Description and Operation Times

Stage Type	Stage Colour	Hours of Operation
Main Stage	Red	Saturday: 11:00 am to 10:00 pm
Grandstand Stage	Magenta	Saturday: 11:00 am to 9:00 pm
Medium Stage	Blue	Saturday: 11:00 am to 10:00 pm
	Black	Saturday: 11:00 am to 11:00 pm
	White	Saturday: 11:00 am to 11:00 pm
	Green	Saturday: 11:00 am to 11:00 pm
	Purple	Saturday: 11:00 am to 10:00 pm
Camping Stage	Camping	Friday: 6:00 pm to 11:00 pm Saturday: 11:00 am to 7:00 pm

Figure 3 and **Figure 4** provide an overview of the proposed site layout and stage locations and provide an indication of the size of the stage and associated sound system.

Figure 3 Defqon.1 2015 - Festival Site Map

Figure 4 Defqon.1 2015 - Camping Map



3 ESTABLISHING A NOISE CRITERION

The existing noise management plan does not define a criterion at the residential receiver locations to determine measureable exceedances. However, Noise Guidelines in New South Wales do not define the assessment procedures for open-air concerts and are left for local councils to be developed and implemented. A number of case studies have been reviewed in order to assign an appropriate criterion to be implemented for the residential receivers surrounding SIRC during the Defqon.1 Festival and associated camping event.

3.1 Case Studies

These case studies have been summarised and are presented below. All noise limits are specified at the residential boundary.

Centennial Parklands

Category 3 Event:
Maximum of 8 event days per year.

Hours – Main Event
A main event must not commence prior to 10:00 or after 22:30

Noise Limits – Main Event
L_{Amax} must not exceed 65 dBA.
L_{Cmax} must not exceed 85 dBC.

Sydney Cricket and Sports Ground Trust

Event Type:
Maximum of 4 event days per year.

Hours – Main Event
A main event must not commence prior to 10:00 or after 22:30 and not be greater than 3 hours duration.

Noise Limits – Cricket Ground
L_{Amax} must not exceed 70 dBA.
L_{Cmax} must not exceed 90 dBC.

Noise Limits – Football Stadium
L_{Amax} must not exceed 80 dBA.
L_{Cmax} must not exceed 100 dBC.

Royal Botanic Gardens & Domain Trust

Event Type:
Category 3 - Events with >10,000 pax

Hours – Main Event
A main event must not be greater than 12 hour duration.

Noise Limits – at Sydney Hospital
L_{Amax} must not exceed 80 dBA.
L_{Cmax} must not exceed 100 dBC.

Noise Limits – at other locations
L_{Amax} must not exceed 70 dBA.
L_{Cmax} must not exceed 90 dBC.

Eveent Type:
Category 2 – Events with 2,000 to 10,000 patrons

Hours – Main Event
A main event must not commence prior to 10:00 am or finish after 11:00 pm.

Noise Limits – at all locations
L_{Amax} must not exceed 55 dBA.
L_{Cmax} must not exceed 70 dBC.

3.2 Discussion and Justification

3.2.1 Residential Monitoring Locations

The audience size provides an indication of the likely amplification required to provide an enjoyable experience for the crowd. As the Defqon.1 Festival is expected to attract close to 25,000 patrons, and this level of event to only occur once each year, a higher tiered noise level is applicable similar to that currently implemented at other major event venues such as those presented above.

Based on the preceding case studies outlined above, and taking into account the frequency of the type of event and the number of patrons, the below noise levels are proposed as the target levels.

L_{Amax} must not exceed 70 dBA.
L_{Cmax} must not exceed 90 dBC.

Furthermore, in establishing appropriate noise limits for the camping component, the criteria implemented for the Royal Botanic Gardens and Domain Trust established for events with less than 10,000 patrons has been adopted. Furthermore the target levels proposed at the existing residential locations during this period is:

L_{Amax} must not exceed 55 dBA.
L_{Cmax} must not exceed 70 dBC.

3.2.2 Boundary Monitoring Locations

SLR will adopt the previous methodology used by Auditoria Pty Ltd to conduct real-time noise monitoring at the boundary, as this provides real-time data regarding the sound emissions from the venue. The criterion currently implemented at the boundary locations will be reviewed after predicting the likely noise impact at the surrounding residential locations compared against the established criteria.

4 NOISE IMPACT ASSESSMENT

A computer noise model was used to predict the noise emissions from the operation of the sound reinforcement systems and noise generated from helicopter activity to provide Q-Dance Australia with noise contour plots detailing the expected noise impact on the surrounding areas. Furthermore, this allows SLR to focus on specific areas where the predicted levels are higher. The noise modelling was undertaken using SoundPLAN v7.1 software, developed by Braunstein and Berndt in Germany. The model used terrain data surrounding the venue (sourced from SLR's database), together with noise source data, ground cover, shielding by barriers and/or adjacent buildings and atmosphere information to predict noise levels at the surrounding residential locations.

4.1 Music Noise

The noise predictions have been based on the noise measurements conducted by Auditoria Pty Ltd during previous years and calibrated to the overall L_{eq} noise levels measured at the boundary locations. This enables SLR to construct an accurate noise model to predict the likely L_{eq} noise emissions at the residential locations. Every effort has been undertaken to predict the Lmax noise levels, however, it should be noted that it is difficult to assess as it is highly dependent on the music, performers and sound system operators.

4.1.1 Camping

The camping stage is expected to operate between 6.00 pm and 11.00 pm on Friday evening, whilst a 'mobile DJ' will be touring the camping area between 12 midday and 6.00 pm on Friday afternoon and additionally on Saturday morning from 8.00 am till 11.00 am.

The camping stage has been predicted to exceed the established criteria using the same output as a medium sized stage by up to 4 dB. Furthermore, it is recommended that the operation of the camping stage be limited to 110 L_{Cmax} measured at 10 metres. Furthermore the resultant noise levels achieve the criteria established in **Section 3.2**. The predicted noise levels are presented in **Table 2**.

Table 2 Camping Predicted Noise Levels

Receiver Area	Weather Conditions	LCeq	LAmax	LCmax
Waterside Estate	Calm	60	35	68
	Adverse	62	38	70
Emu Heights	Calm	58	35	66
	Adverse	60	39	68
Mount Riverview	Calm	54	32	62
	Adverse	56	35	64
Yellow Rock	Calm	51	31	59
	Adverse	54	36	62

The L_{Cmax} noise contours for the camping event are presented in **Appendix B**.

4.1.2 Main Event

The main event will start at 11:00 am and conclude at 11:00 pm on Saturday. However, some stages will start to cease from 9:00 pm, with only Stage 3 and Stage 7 operating during the soft finish from 10:00 pm and 11:00 pm. The noise predictions results shown in **Table 3** are with all stages operating.

Table 3 Main Event Predict Noise Levels

Receiver Area	Weather Conditions	LCeq	LAmax	LCmax
Waterside Estate	Calm	77	60	85
	Adverse	79	63	87
Emu Heights	Calm	76	59	84
	Adverse	78	62	86
Mount Riverview	Calm	71	54	78
	Adverse	74	57	81
Yellow Rock	Calm	68	51	75
	Adverse	70	55	78

Based on the prediction results above, the noise impact is not expected to exceed the noise limits established in **Section 3.2**.

As part of the Crowd control measures discussed in **Section 7.2**, Q-Dance has implemented a soft finish to minimise the noise during egress. The soft finish is designed to allow patrons to slowly egress from the venue, by operating three stages longer at a quieter level. These noise levels will decrease below the levels predicted in **Table 3**.

Additionally, no MC's will be allowed to use the microphones during the soft finish between 10.00 pm and 11.00pm to minimise any potential disturbance during this period.

The L_{Cmax} noise contours for the main event are presented in **Appendix C**.

4.2 Helicopter Noise

Q-dance have contracted a supplier to provide helicopter joy rides for paying customers. The helicopters are proposed to consist of two AS350 Squirrels and 1 EC120 Calibri. The noise generated from helicopter activity has been predicted based on the proposed flight path provided, elevations and an average of 6 flights per hour per helicopter.

The proposed helicopter activity will only take place between 11:00 am and 6:00 pm on Saturday.

The maximum sound power levels provided in **Table 4** have been used throughout the modelling.

Table 4 Helicopter Sound Power Levels

Operation	Sound Power Level (dBA)
Ground Idle	109
Departure	121
Level Flying	127
Arrival	132

The resultant worst case predicted noise level are presented in **Table 5** and is presented graphically in **Appendix D**.

Table 5 Helicopter Noise Predictions

Receiver Area	LAeq(1hour)	LAmax
Mount Riverview	47 dBA	52 dBA
Emu Heights	52 dBA	58 dBA
Emu Plains	58 dBA	66 dBA
Penrith	58 dBA	65 dBA
Waterside Estate	52 dBA	58 dBA
Leonay	56 dBA	65 dBA
Yellow Rock	42 dBA	47 dBA

The predicted noise levels are expected to be appropriate considering the limited duration of the helicopter activity over a single day.

5 PROJECT NOISE LIMITS

Based on the predicted noise levels associated with the camping and main event, the existing boundaries limits have been determined to be consistent with the residential criterion defined in **Section 3.2.1** and are proposed to remain unchanged except at location E. Additionally, noise limits at the boundary locations during the camping event have been established. Boundary limits are summarised in **Table 6**.

5.1.1 Summary of Noise Limits

Table 6 Boundary Noise Limits

Location	Camping Event	Main Event
Location A	70 LAmax /90 LCmax	90 LAmax /110 LCmax
Location B	70 LAmax /90 LCmax	90 LAmax /110 LCmax
Location C	70 LAmax /90 LCmax	90 LAmax /110 LCmax
Location D	70 LAmax /90 LCmax	90 LAmax /110 LCmax
Location E	60 LAmax /80 LCmax	75 LAmax /95 LCmax

The aforementioned noise limits provide a detailed approach to monitoring the noise emitted from the festival site based on the predicted levels and compliance at the residential locations.

The noise levels recorded at the boundary will be the primary measure to control the noise emissions from the venue.

It should be noted that these limits have been derived for music noise only, and not noise generated from other activity such as the helicopter activity.

All noise limits have been selected given the successful management in previous years, limited number of complaints and the location of the current receiver locations. If additional receivers are proposed within the potentially affected area, new levels should be derived for these locations.

5.1.2 Target Levels at Residential Location

To recapitulate, the target levels used to derive the boundary levels are included in this section. These levels might be used to resolve complaints at receiving locations. **Table 7** details the target levels at the existing residential areas.

Table 7 Residential Noise Limits

Event Tier	Residential Locations
Camping Event	55 LAmax/ 70 LCmax
Main Event	70 LAmax / 90 LCmax

6 NOISE MANAGEMENT

The management of noise impacting on sensitive receivers surrounding the event will be controlled by:

- Developing strategies and procedures for reducing the noise impact at the surrounding residences.
- Ensuring compliance with the developed noise criteria at each of the surrounding residences through the development of an effective noise monitoring program incorporating real-time noise monitoring at the existing boundary locations and attended noise monitoring at residential locations.

7 NOISE MANAGEMENT STRATEGIES

SLR has been engaged to ensure that proper sound system design practices are carried out. Careful planning should be incorporated in the design of the different sound systems in order to provide appropriate audience coverage and sound levels whilst minimising the spill received at the surrounding residential locations and operated by suitably qualified personnel.

7.1 Control of Sound Reinforcement Systems

SLR will be required to be in communication with Q-Dance organisers for the duration of the event. This ensures that any recorded exceedance of the noise limits caused from the amplified music to be reported immediately to Q-Dance and appropriate action taken to ensure compliance can be achieved again.

Additionally, it is advised that all stages incorporate independent level control for the music and MC's microphone. This enables Q-Dance to have ultimate control on the levels independently as required.

7.2 Crowd Control

Q-Dance has established an effective crowd management strategy which will be implemented again in 2015. As part of this plan, a soft finish is proposed to continue this year. This soft finish enables patrons to slowly egress from the venue and as such reduce the number of patrons congregating at the venue.

7.3 Stage Discussion

7.3.1 Main Stage (Red)

The main stage was reported to be very successful during previous years and is proposed to remain unchanged in terms of layout, orientation and audio system. Based on the modelling data and previous measurements conducted by Auditoria, this stage is expected to have the biggest impact on the monitoring locations.

7.3.2 All Other Stages

Based on the modelling performed, the maximum noise levels presented in **Table 8** at 10 metres is to be set before the start of the festival on the event day.

Table 8 Maximum Noise Levels

Stage Type	Colour	Noise Limit
Grandstand Stage	Magenta	116 LCmax / 106 LAmax
Medium Stage	Blue	116 LCmax / 106 LAmax
	Black	116 LCmax / 106 LAmax
	White	116 LCmax / 106 LAmax
	Green	116 LCmax / 106 LAmax
	Purple	116 LCmax / 106 LAmax
Camping Stage	Camping	110 LCmax / 100 LAmax

Based on these maximum noise levels, the noise levels experienced at the boundary and residential locations are predicted to comply with the established noise limits.

7.3.3 Sound System Certification

The sound systems will be certified by a qualified acoustic consultant to ensure that the stages are suitable for the size of the audience area and achieves the maximum noise limits set out in **Table 8**. SLR will issue a certification certificate to Penrith City Council prior to the event.

7.4 Helicopter Noise

The helicopter activity is expected to occur only between 11:00 am and 6:00 pm on Saturday. All appropriate measures have been implemented to minimise the noise emissions by engaging a contractor to provide only modern aircrafts.

SLR has predicted the noise generated from the helicopter activity to be at an acceptable level for such a short duration of time and have provided noise contour plots of the predicted noise levels in **Appendix D**.

7.5 Control of Other Noise Sources

Whilst the sound reinforcement system will be the primary noise contributor at each residential location, other noise sources such as crowd noise and mechanical services need to be effectively controlled.

7.6 Annual Review of Management Plan

SLR will review the management plan and modelling results each year based on the findings and measurement results from the previous year in addition to the new proposed layout and orientation of stages.

8 NOISE MONITORING PROGRAM

8.1 Instrumentation and Measurement Parameters

All acoustic instrumentation employed through the monitoring programme should be designed to comply with the requirements of AS 1259.2 2000, “Sound Level Meters” and carry current NATA or manufacturers calibrations certificates. All instrumentation should be programmed to record continuously statistical noise level indices in 15 minute intervals which may include L_{Amax}, L_{A1}, L_{A10}, L_{A90}, L_{Aeq} and L_{Cmax}.

The statistical noise exceedance levels (L_{AN}) are the levels exceeded for N% of the 15 minute interval. The L_{A90} represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level. The L_{Aeq} is the equivalent continuous sound pressure level and represents the steady sound level which is equal in energy to the fluctuating level over the interval period. The L_{Amax} and L_{Cmax} is the maximum weighted noise level recorded over the interval.

Instrument calibration should be checked before and after each measurement survey, with the variation in calibration levels not exceeding ±0.5 dB (A).

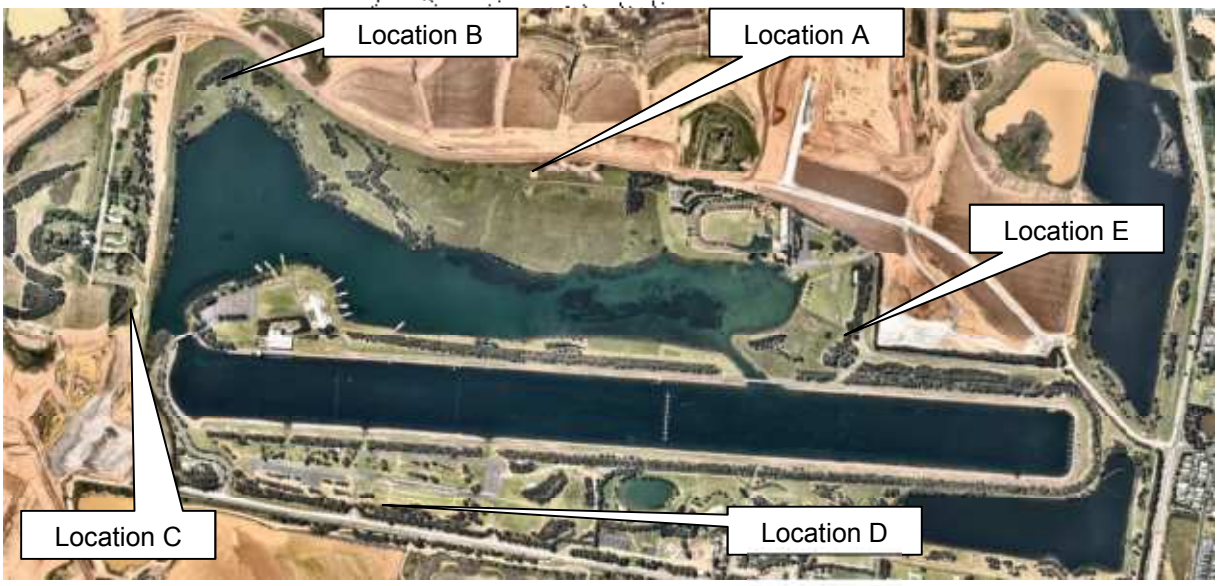
8.2 Boundary Noise Monitoring

Boundary monitoring is proposed to be established at up to five (5) suitable locations which have been redefined based on the noise predictions performed. This monitoring arrangement will provide real-time noise levels to SLR of the noise levels currently experienced at the selected boundary locations. Based on these levels, it will enable SLR to assess whether any exceedances may be experienced at residential locations based on the results of the noise modelling.

Although this will not solely be relied upon, positioning the monitors within a clearly audible range of the source enables SLR to clearly identify if the source of noise is from the event or other extraneous noise sources, which is likely if the monitors are positioned off-site.

The proposed monitoring locations are presented in **Figure 5**.

Figure 5 Real-time Noise Monitoring Locations



8.2.1 Description

Each of the locations have been confirmed or adjusted from the previous year based on the predicted results and considering the direction of potentially affected receiver's and potential areas where noise levels may be influenced by external noise sources.

8.2.2 The Real-time monitoring System

The real-time monitoring system proposed in this sound management plan is a system comprised of monitoring stations located at each of the noise monitoring positions. Each station will consist of:

- A Class 1 01 dB Duo noise logger with the ability to transmit A-weighted and C weighted SPL levels as well as 1/3 octave band data simultaneously.
- Weather data will be recorded in at least one position.
- Rechargeable battery system.

SLR will be able to login to each of the units remotely to view and monitor the noise levels at each of the boundary locations.

8.3 Attended Noise Monitoring

In addition to the real-time noise monitoring system proposed, a Type 1 sound level meter will be used at residential locations surrounding the site, particularly if any complaints are received through the complaints hotline established. These measurements will enable SLR to quantify the noise contribution at the residential locations and compare to the established noise criteria at these residential locations during the event.

These measurements will be performed without extraneous noise sources such as traffic where possible.

8.4 Noise Management Measures

SLR will provide notice to Q-Dance organisers by issuing warnings when the levels are within 5 dB of the established noise limits at the boundary locations. These alerts will also be sent as an SMS to nominated Q-Dance representatives.

8.5 Reporting

A report detailing the results of the noise monitoring conducted during the event will be submitted to Q-Dance within two (2) weeks of the event taking place.

9 EVENT NOTIFICATION

Potentially affected residents should receive an event notification from Q-Dance Australia. The information provided in the letter box drop will include:

- The name of the event.
- The location and date of the event.
- The expected operation times.
- A complaints/information hotline telephone number.
- An email address providing residents with the ability to request further information and to register a complaint before, during and after the event.

The event notification should be distributed as a minimum to areas of Cranbrook, Mt Riverview, Emu Heights, Penrith and Castlecrag as indicated in **Figure 6**.

Figure 6 Event Notification Area

10 COMMUNITY INFORMATION AND COMPLAINTS HANDLING

In order to effectively manage any requests for information or respond to any public concerns in relation to the music event, the following systems will be established by Q-Dance for the event:

- An Information and Complaints Hotline Telephone Number (TBA).
- An Information and Complaints Email Address (community@Q-Dance.com.au)

10.1 Information and Complaints Hotline

The information and complaints hotline will be established and operated by Q-Dance staff before, during and after the event. The operator is responsible for recording the required information in a complaints handling system as detailed in **Section 10.3**.

10.2 Information and Complaints Email

The information and complaints email account will be established and detailed in the letterbox drop and the local newspaper. This will enable the residents to contact Q-Dance and voice their concerns and ask questions prior to the event. Q-Dance will be responsible for recording the required information in a complaints handling system as detailed in **Section 10.3**.

10.3 Complaints Handling System

Information to be collected by Q-Dance as part of the complaint handling system will include, but not restricted to the following:

- Source of complaint.
- Date and time of the complaint.
- Complainants name and contact details.
- Complainant's location.
- Nature and source of the complaint.
- Action taken.
- Follow up with complainant.

The operator is further required to contact SLR and notify them of the noise complaint location for further assessment.

Q-Dance will endeavour to respond to any complaint or request for information within one (1) working day before and after the event, and within one (1) hour during the event.

The information collected by Q-Dance will be provided to SLR for inclusion in the post-event report.

An example of the proposed community hotline log and notification record is contained within **Appendix E** and **Appendix F** respectively.

10.4 Liaison with Local Police and Penrith Council

Q-Dance personnel will ensure that Local Police Station officers and Penrith Council are aware of the community hotline telephone number established. They will be requested to give this telephone number to any persons complaining about noise from the music event to ensure that all complaints are captured by the complaints handling system. This will guarantee a robust record of community impact from the event.

10.5 Management Response Strategy

Response measures, which will be adopted following noise complaints or exceedance, would include:

- Identify the cause of the complaint. This will be done by conducting an operator attended noise survey at the complainant's residence to quantify the noise emissions and determine if an exceedance of the noise criteria has occurred.
- If an exceedance is measured, reassess the mitigation techniques employed.
- If a management strategy is unsuccessful, re-evaluate the mitigation strategies being used.
- Following the adoption of the noise mitigation, a further noise survey would be conducted at the complainant's residence to ensure the success of the mitigation strategy.

11 CONCLUSION

SLR has undertaken an assessment of potential noise impacts associated with the music festival located at the Sydney International Regatta Centre. Noise emissions from the music festival have been predicted at residential receivers surrounding the venue and are expected to comply with the noise limits established for these receivers. Based on the noise modelling performed, boundary noise limits aligned with the limits at the residential locations have been established for the purpose of conducting real-time compliance monitoring.

Noise generated from helicopter activity associated with the festival has also been predicted on a worst case scenario and is not considered to have a significant impact on the surrounding residents primarily due to the duration of this activity.

Acoustic Terminology

1 Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that in common usage 'noise' is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or L_P are commonly used to represent Sound Pressure Level. The symbol L_A represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3 Sound Power Level

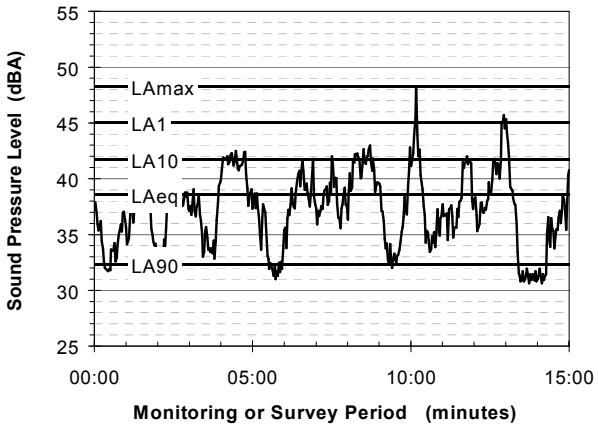
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or L_W, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} The noise level exceed for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

L_{A90} The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

L_{Aeq} The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the 'repeatable minimum' L_{A90} noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or 'average' levels representative of the other descriptors (L_{Aeq}, L_{A10}, etc).

5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than 'broad band' noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

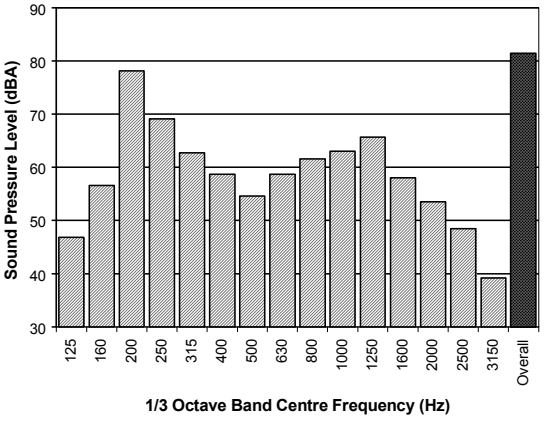
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/V_o), where V_o is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organizations.

9 Human Perception of Vibration

People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

10 Over-Pressure

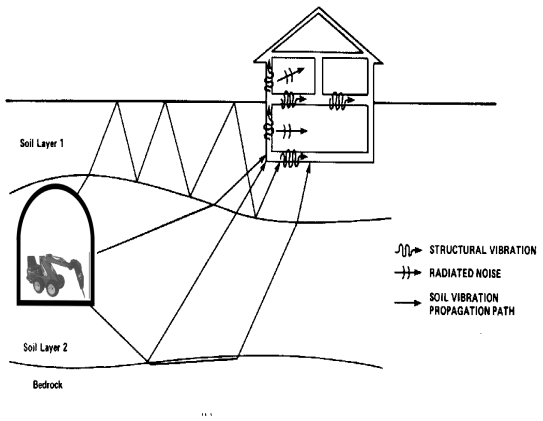
The term 'over-pressure' is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

11 Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

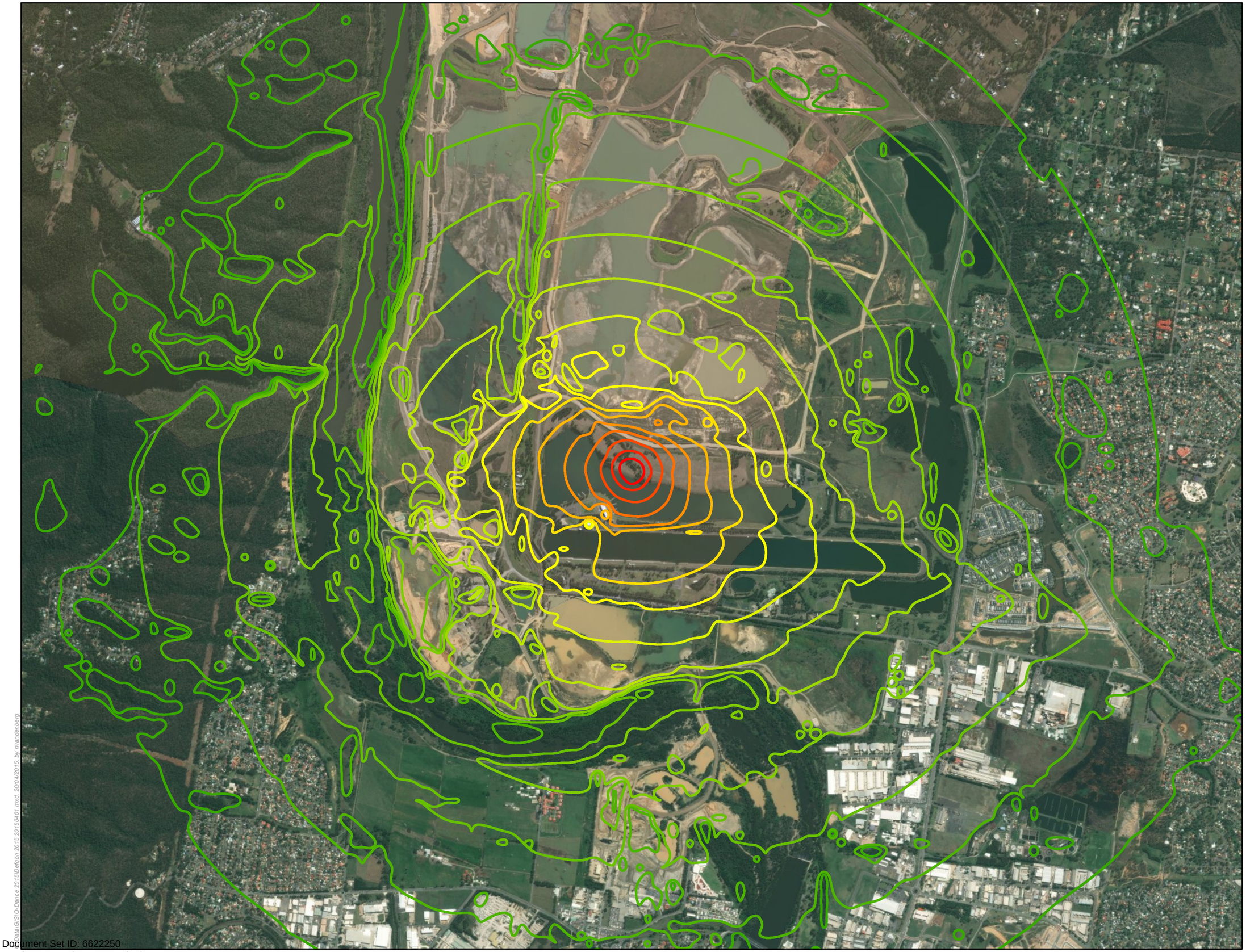
The following figure presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise

Appendix B

Site Location and Surrounding Recievers - Camping LCmax 3m/s



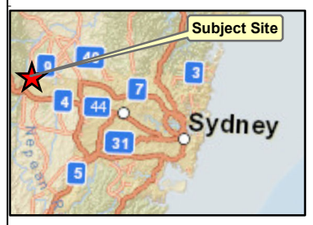
LEGEND

camping contours Lcmax

ISOVALUE

- 60.00
- 60.01 - 63.00
- 63.01 - 66.00
- 66.01 - 69.00
- 69.01 - 72.00
- 72.01 - 75.00
- 75.01 - 78.00
- 78.01 - 81.00
- 81.01 - 84.00
- 84.01 - 87.00
- 87.01 - 90.00
- 90.01 - 93.00
- 93.01 - 96.00
- 96.01 - 99.00
- 99.01 - 102.00

NOTES



0 125 250 500 750

Metres

N

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Project Name:
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Prepared for:
Q-Dance Australia

Project No: **610.14842**

Scale	Date
1:47,885	23/04/2015
Drafted	**Approved**
23/04/2015	-

Appendix C

Site Location and Surrounding Recievers - Festival LCmax 3m/s

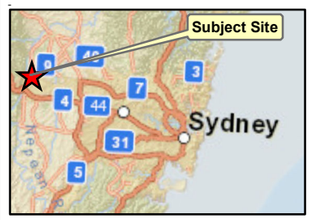
LEGEND

Festival LCmax 3ms

ISOVALUE

- 70.00
- 70.01 - 73.00
- 73.01 - 76.00
- 76.01 - 79.00
- 79.01 - 82.00
- 82.01 - 85.00
- 85.01 - 88.00
- 88.01 - 91.00
- 91.01 - 94.00
- 94.01 - 97.00
- 97.01 - 100.00
- 100.01 - 103.00
- 103.01 - 106.00
- 106.01 - 109.00
- 109.01 - 112.00

NOTES



0 125 250 500 750

Metres

N

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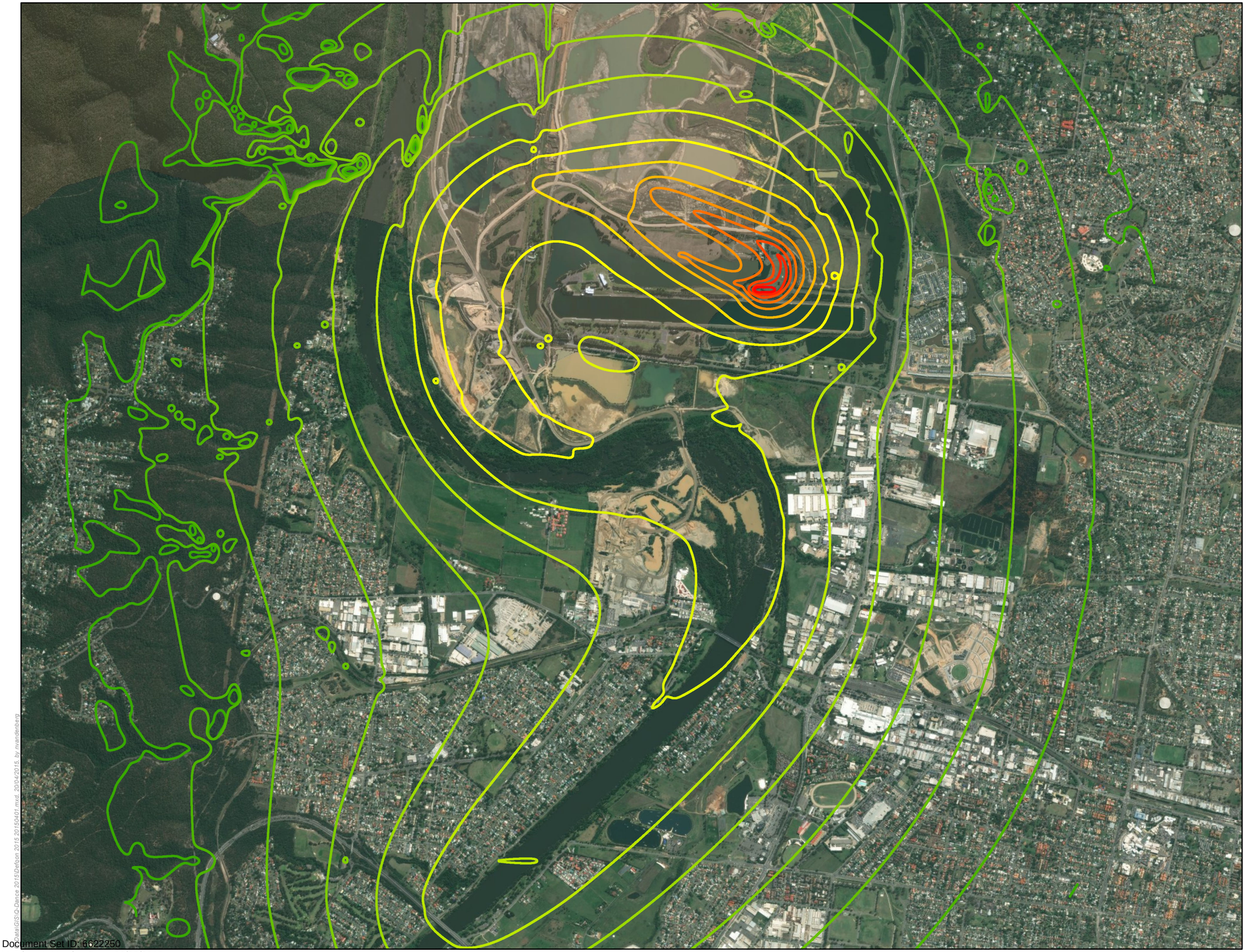
23/04/2015	-

Appendix D

Site Location and Surrounding Recievers - Helicopter LAeq(1hour)



LEGEND

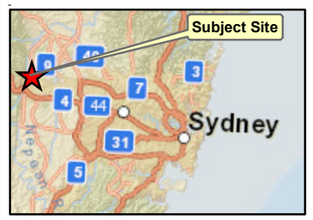
Helicopter LAeq 1hr

ISOVALUE

- 40.00
- 40.01 - 43.00
- 43.01 - 46.00
- 46.01 - 49.00
- 49.01 - 52.00
- 52.01 - 55.00
- 55.01 - 58.00
- 58.01 - 61.00
- 61.01 - 64.00
- 64.01 - 67.00
- 67.01 - 70.00
- 70.01 - 73.00
- 73.01 - 76.00
- 76.01 - 79.00
- 79.01 - 82.00

NOTES

-



0 125 250 500 750 1,000 Metres

N

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Prepared for:
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Project No: **610.14842**

Scale	Date
1:47,885	23/04/2015
Drafted	**Approved**
23/04/2015	-

DEFQON.1 COMMUNITY HOTLINE LOG

No	Date	Time	Name	Address	Nature of call	Details Y/N
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Defqon.1 Community Notification Record

Date		Time		Logged by (name)		Reference number	

Source of notification	Community	Police	Council

Received via	Community Hotline	Community email	Other:	

Caller Contact Details	Name:	
Address:		
Phone number/email:		
Details of complaint/enquiry		
Action taken		
Response given		