Air Noise Environment
Environmental Monitoring and Assessment

North Byron Parklands Acoustic Assessment for Permanent Approval

Billinudgel Property Pty Ltd

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Prepared by:
Air Noise Environment

ABN: 13 081 834 513



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Brisbane Office

A: Unit 3, 4 Tombo Street,

Capalaba, QLD 4157

T: +61 7 3245 7808

E: qld@ane.com.au

Sydney Office

A: Level 6, 69 Reservoir Street

Surry Hills, NSW 2010

T: +61 2 8217 0706

E: nsw@ane.com.au

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Executive Summary

The North Byron Parklands Cultural Events site (Parklands) has successfully operated a series of nine medium to large events since a temporary approval was granted in 2012. Extensive noise monitoring and management has been completed during these events, and has proven to be highly effective in minimising community noise impacts. Analysis of the community noise outcomes for previous events demonstrates that there has been a significant reduction in noise related calls to the Community Hot Line during medium or large events at Parklands since July 2013. For the most recent event, Splendour in the Grass 2017, there were fewer than 10 noise related calls to the Community Hotline over the four day event.

An application for permanent approval of the existing venue, at the originally requested capacity of 50,000 is being sought. The development of additional site infrastructure and facilities is also proposed, including a conference centre and associated accommodation.

In order to assess the potential implications of the proposed permanent operations, a noise assessment has been completed. The primary risk of community impacts relates to amplified music from live entertainment events at the venue, hence this is the focus of the assessment. Ancillary activities are also considered from a noise and vibration perspective, as appropriate, in accordance with the requirements of the Secretary's Environmental Assessment Requirements for the application.

A review of acoustic criteria suitable for live entertainment events has been completed. This has concluded that adoption of the acoustic criteria included in the trial approval are consistent with the current legislative requirements, and appropriate for the nature of the proposed activity. Based on review of current policy guidelines, appropriate criteria have also been adopted for assessment of the potential noise and vibration impacts associated with fixed plant and construction of new infrastructure and facilities.

Detailed acoustic modelling of the changes to individual stages and venues necessary to accommodate the proposed increase in capacity of the venue has been completed. An initial acoustic model has been prepared and validated against the 2016 Splendour in the Grass event, including comparison to measured community noise levels during the event. The validated model has then been adjusted to account for the proposed changes, and the resultant community noise levels compared to the adopted acoustic criteria. The acoustic modelling has considered the potential for noise impacts under source to receptor wind conditions with all stages at the venue operating simultaneously, hence represents the worst case likely impact of future events. The modelling found that, without additional acoustic mitigation strategies, some non-compliance's are predicted at surrounding receivers under these worst case conditions.

Analysis of historic meteorological data demonstrates that worst case wind conditions may occur during events, hence development of an acoustic mitigation strategy to address the predicted non-compliances is necessary. Analysis of reasonable and feasible mitigation measures to reduce the predicted acoustic non-compliance has been completed. A noise management strategy has been *identified to address the non-compliances, and includes reduction of the operating volume of stages during periods with a potential for worst case meteorological conditions. The proposed reduced operating volumes are consistent with achieving audience satisfaction, although they are lower than the preferred operating levels. Revised modelling indicates that, with the mitigation measures, compliance is predicted at all surrounding receivers during worst case meteorological conditions, apart from 2 receivers which have negotiated noise agreements with Parklands. In addition, further reductions in operating volumes for specific stages can be implemented as required under worst case meteorological conditions in accordance with the procedures identified in the Parklands Noise Management Plan. The success of this approach in achieving compliance with the acoustic criteria has been demonstrated for previous Parklands events.*

The assessment of ancillary activities and proposed new facilities has also identified appropriate noise management strategies, and where appropriate mitigation measures are recommended.

Overall, it is concluded that the potential acoustic impacts of the proposed permanent development at Parklands can be managed to achieve the appropriate acoustic criteria, and to minimise adverse community impacts from an acoustic perspective.

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1 Introduction

1.1 Background to the Assessment

North Byron Parklands (Parklands) is a Cultural Events site located at 126 Tweed Valley Way in the Yelgun Valley, within the Byron Shire Council local government area. The site covers an area of approximately 229 hectares. The general site locality is identified on Figure 1.1, the existing site features are identified on Figure 1.2, and an illustrative Master Plan showing the proposed new facilities is presented on Figure 1.3.

Parklands commenced operation as a Cultural Events site in April 2012, following a 3 year development assessment process that culminated in approval of a Concept Plan and Project applications for the new venue. The Concept Plan approval (which provides the land use planning provisions and permissibility for the site) enabled the use of the site for cultural events for a 5 year trial period (up until 2017) capped at 70% of capacity - 35,000 patrons, instead of the 100% capacity (50,000 patrons) sought in the original Concept and Project applications.

The objective of the trial project approval was for Parklands to demonstrate that large outdoor events could be managed consistent with a range of key performance indicators (KPIs) to avoid unacceptable impacts on flora and fauna, residents, event goers and on the general community.

Consistent with the intent of the trial project approval, Parklands has now held a total of nine large and medium events and undertaken detailed performance monitoring and analysis, resulting in ongoing management improvements across each event.

The following modifications have been submitted to and approved in relation to the Concept approval and Project approval.

- On 3 December 2012, Modification 1 was approved for minor typographical amendments to Conditions B4 and E18 of the Project Approval;
- On 29 January 2013, Modification 2 was approved to modify a typographical error in Condition C32 of the Project Approval relating to a miss-description of Yelgun Creek; and
- On 22 April 2016, Modification 3 to the Project Approval was approved, relating to noise management measures, a request for small community events and various administrative amendments;
- On 27 July 2017, a further minor modification was approved. This provided for an extension of the temporary approval for an additional 20 months (4 additional medium and large events) and provided amended conditions relating to ecological receptors.

1.2 Current State Significant Development Application

Parklands is now seeking approval for ongoing use of the cultural events site following the trial period, including the continued use of existing site infrastructure and the development of additional infrastructure to support the cultural events site.

The proposal involves undertaking outdoor events on the site for up to 20 event days a year, comprising:

- 2 large events per year (ie. Splendour in the Grass and Falls Festival) over a maximum of 5 event days each, catering for up to 35,000 patrons per event day;
- 3 medium event days a year (for other music concerts or cultural events), catering for up to 25,000 patrons per event day;
- 5 small community event days, catering for up to 5,000 patrons per event day; and
- 2 minor community event days, catering for up to 1,500 patrons per event day.

Further, approval is sought for the progressive growth of one of the large events (ie. Splendour in the Grass) to 42,500 patrons and then 50,000 patrons a day, subject to meeting key performance indicators (KPIs) .

The proposal also involves:

- temporary camping associated with outdoor events, with capacity for up to 30,000 campers a day (ie. similar to existing);
- development of a conference centre and associated accommodation (as per the approved concept plan), with capacity for up to 180 attendees and accommodation for up to 120 guests a day;
- continued use of existing site infrastructure and facilities;
- development of additional site infrastructure and facilities, including:
  - an administration building;
  - event area facilities and works, including:
    - amphitheatre regrading works;
    - drainage improvements;
    - potable water infrastructure;
    - sewerage infrastructure and amenities;
    - security fencing;
  - on-site and off-site road and transport facilities and works; and
- continued habitat restoration and vegetation management works.

1.3 Environmental Assessment Requirements

On 16th January 2017 the NSW Office of Environment and Heritage issued Secretary’s Environmental Assessment Requirements (SEARs) for preparation of an Environmental Impact Assessment (EIS) for the application for permanent approval of the Cultural Events site at North Byron Parkland. The

SEARs specify the following assessment requirements:

- Noise and Vibration – including:
  - a quantitative noise and vibration impact assessment undertaken by a suitably qualified person in accordance with the relevant Environmental Protection Authority guidelines that is to include:
    - assessment of all noise and vibration sources and impacts, including impacts on nearby sensitive receivers, utilising data obtained from the trial events to date;
    - cumulative impacts of other developments upon noise impacts at sensitive receivers; and details of the proposed noise management and monitoring measures.

Appended to the SEARs are details of submissions made by regulatory agencies in respect of developing SEARs for the proposal. Of these submission, those provided by Tweed Shire Council and Byron Shire Council identify noise management as an area to be addressed:

- Tweed Shire Council:

  Council has previously provided comment on MP09_0028 Mod 3 in relation to acoustic matters. The proponent will need to demonstrate that the proposed development will comply with the provisions of the NSW Industrial Noise Policy. An acoustic management plan will need to be prepared, which addresses all aspects of the proposed development, including low frequency noise and sleep disturbance upon surrounding properties.

- Byron Shire Council:

  Acoustic

  Plan 4.4 (Example Event Layout B) depicts the relocation of the event area to the north eastern corner of the premises. An acoustic assessment report based on past evaluations is unlikely to be helpful to Plan 4.4 (Example Event Layout B). This proposal is a major deviation from the existing site layout and therefore a fresh acoustic assessment is required.

  Any other changes to or expansion of the site layout must be subject to a new acoustic assessment.

1.4 Proposed Changes and Potential Noise Impacts

It is noted that the existing site currently holds two medium to large scale music events each year: Splendour in the Grass (Winter), and Falls Festival (Summer). The application for permanency includes additional activities to those which have thus far been shown to be manageable, including:

- Operation of two additional stages during a large scale event (e.g. Splendour in the Grass).
- Potential to increase the number of patrons.
- Additional on and off-site traffic.
- Addition of a conference centre, which may operate year round, including;
  - Accommodation units,
  - Conference and meeting room facilities,

- Car Parking.

It is noted that one of the proposed stages (Forest Stage) exists currently during the Falls Festival event, however is proposed to be included as part of a larger Splendour in the Grass style event. Details relating to the existing and proposed stages are provided in Section 4.

In order to better review the potential impacts operating under the proposed increase in activity, an acoustic assessment has been completed.

1.5 Scope of the Acoustic Assessment

This report presents the methodology, results and findings of the acoustic assessment completed for the application for Permanent Approval for the Parklands Cultural Venue. The information presented in this report includes analysis of the following:

- acoustic performance of the venue for previous trial events;
- the predicted change in community noise impacts as a result of the proposed development;
- operation of all existing stages (SiTG and Falls Festival) in a single event, as well as a proposed additional/new ‘main’ stage;
- provision of a new conference centre facility;
- details of the proposed noise management measures; and
- review of vibration impacts associated with previous trial events, and any changes in the potential for vibration impacts expected as a result of the proposed modifications.

This scope addresses the specific requirements of the SEARs and the comments from Tweed Shire Council and Byron Shire Council relating to potential noise and vibration impacts.

An acoustic glossary is provided in Appendix A to assist the reader.

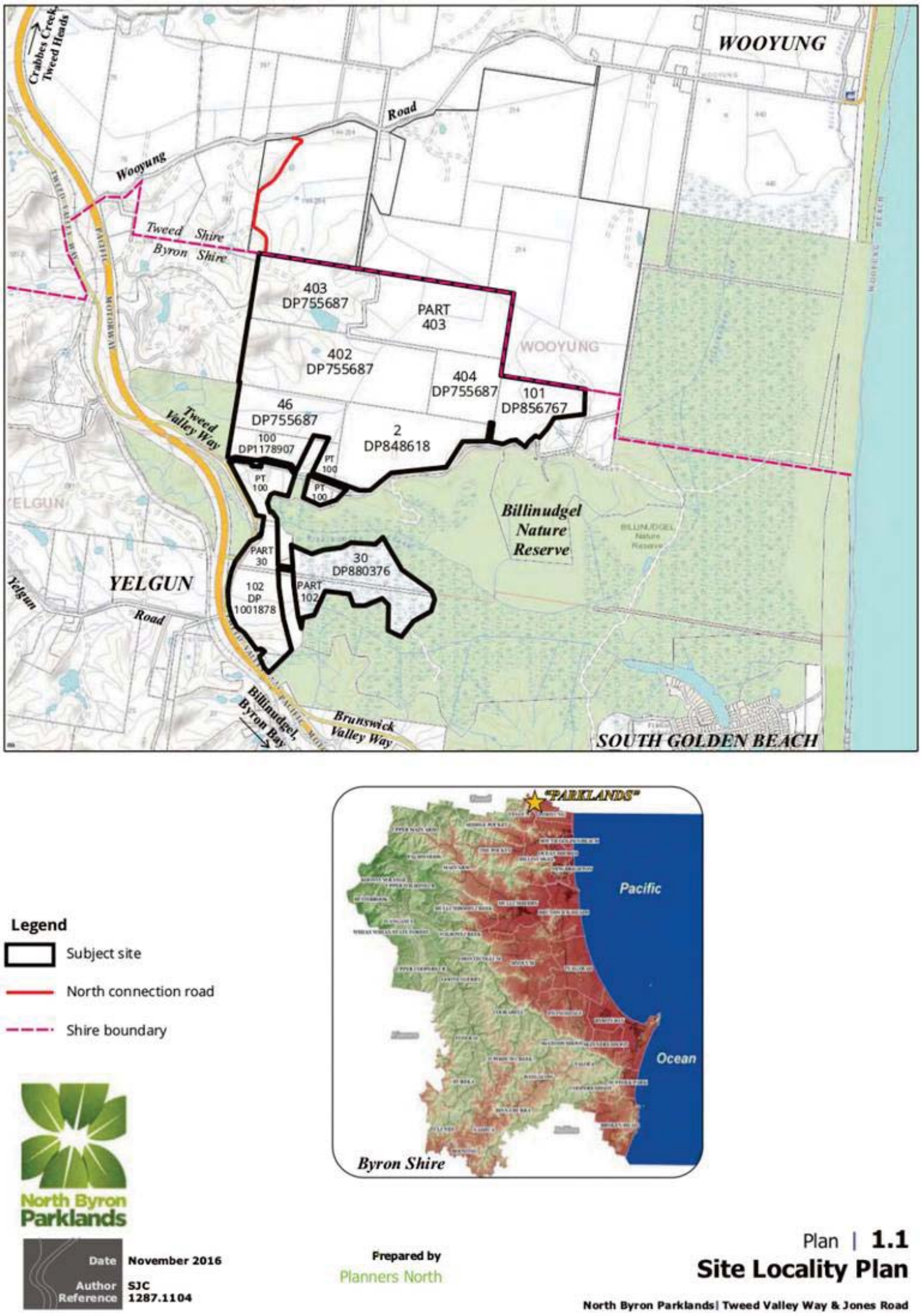


Figure 1.1: General Site Locality - Parklands

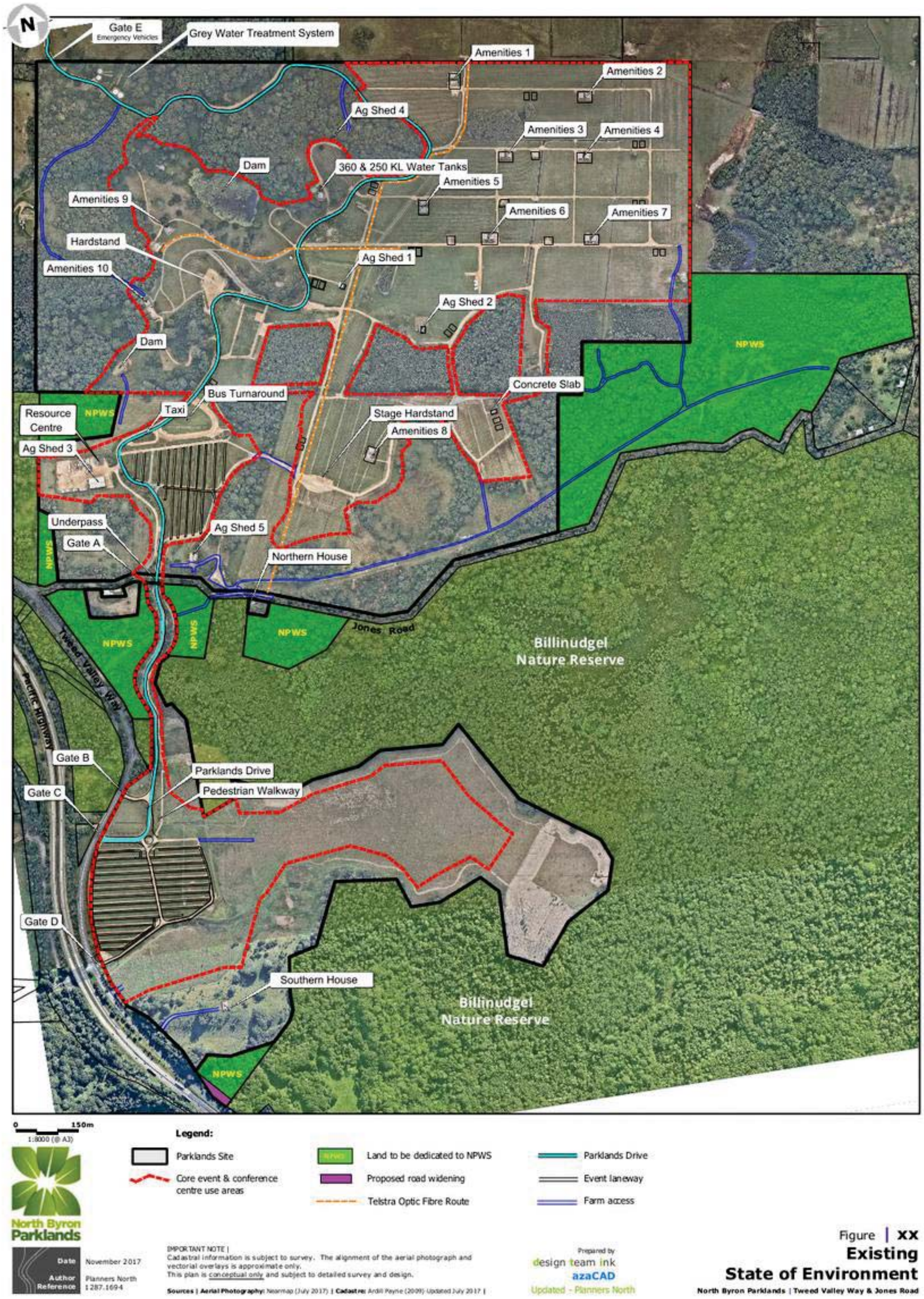


Figure 1.2: Existing Site Features

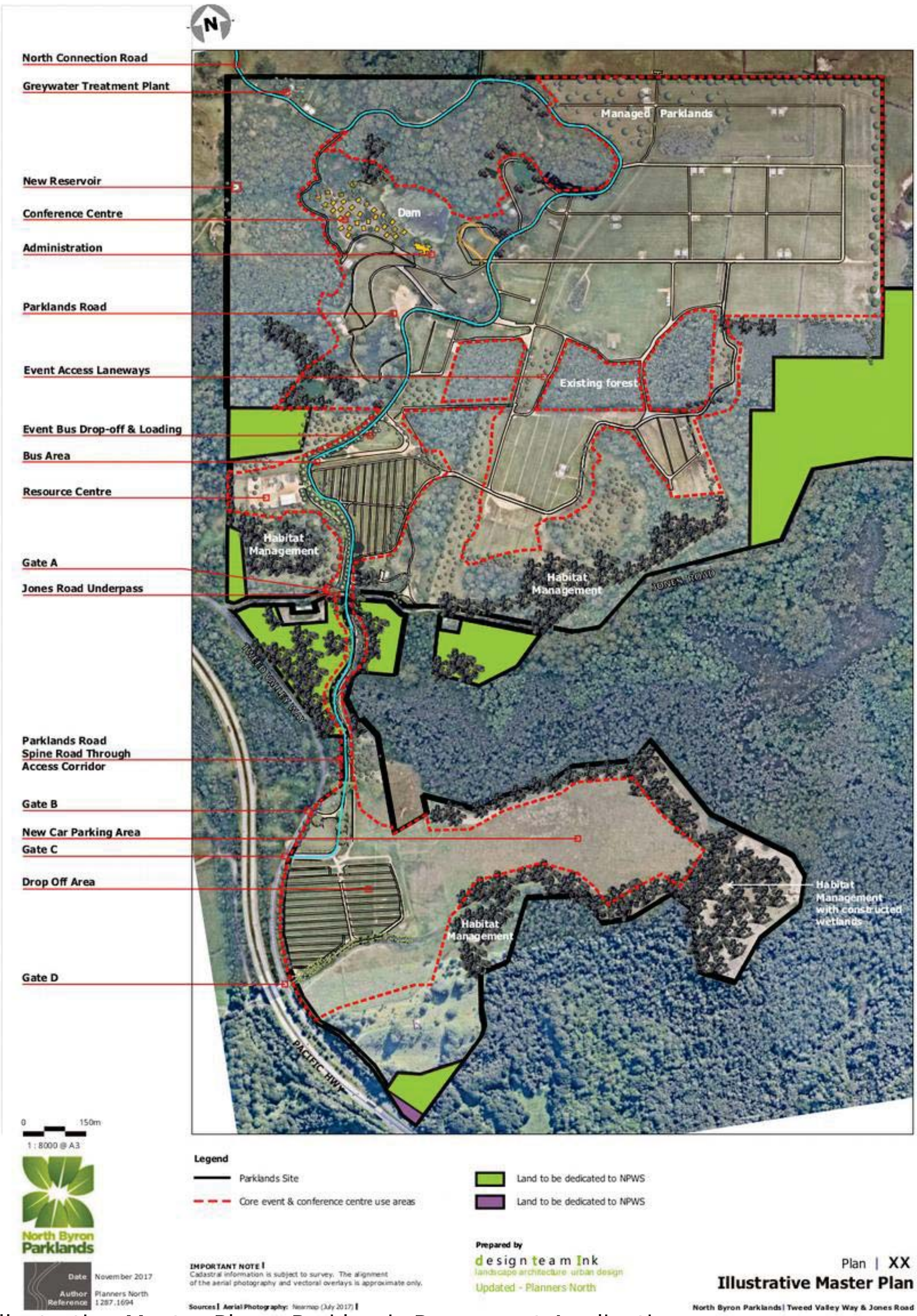


Figure 1.3: Illustrative Master Plan – Parklands Permanent Application

2 Assessment Criteria

2.1 Introduction

The key potential noise impacts associated with the proposed development relate to amplified music, hence this is the main focus of the acoustic assessment report. In addition, the SEARs identify that associated noise and vibration impacts must also be considered for both the construction and operational phases, hence the potential for noise impacts from activities at the proposed conference centre, fixed plant and construction noise and vibration are also considered. The following sections discuss the appropriate criteria for the various noise sources considered in the assessment.

The existing approval for Parklands incorporates acoustic criteria, and these are also discussed in the context of the proposed future development. Analysis of the performance of the event relative to the existing criteria is also relevant, and is considered in Section 3.

2.2 Amplified Music Criteria

2.2.1 NSW Industrial Noise Policy

The Industrial Noise Policy (INP) 2000[1] provides the overall noise framework for the assessment and management of the potential effects of noise on communities throughout NSW. The overall objective of the policy is:

> *'...to allow the need for industrial activity to be balanced with the desire for quiet in the community.'*

The purpose of the policy, then, is not to achieve inaudibility for noise sources in the community, but to provide a basis for making decisions about the appropriateness of noise emissions. The framework in which these decisions are made includes consideration of appropriate criteria, examination of feasible and reasonable mitigation, and consideration of community preferences.

The INP identifies that, as part of the decision making process, where project noise levels are predicted to exceed the identified project specific noise levels, then the regulatory authority may accept the resultant levels or negotiate a better outcome if control is thought to be achievable. In making this determination, consideration is given to the following:

- degree of exceedance of adopted criteria;
- number of people affected;
- likely impacts of the predicted noise levels on the affected community;

1 It is noted that the Industrial Noise Policy 2000 was replaced with the Noise Policy for Industry on 27 October 2017. Under transitional provisions, where SEARs have been prepared for a development application prior to 27 October 2017, the Industrial Noise Policy 2000 applies for a period of up to two years from the introduction of the Noise Policy for Industry. Therefore, for the Parklands development application, the 2000 Industrial Noise Policy provides the relevant guideline for the acoustic assessment.

- percentage of time the impact occurs;
- the economic and social benefits of the proposed development.

In terms of defining criteria, the INP is intended for application to large and complex industrial noise sources. The policy specifically identifies that it is not intended for application to:

- transportation corridors;
- motor sport facilities;
- construction activities;
- noise sources covered by other regulations (eg, domestic/neighbourhood).

The INP also notes that in particular instances, specific noise criteria may be defined for sources where the standard approach is not appropriate. The application of the amenity and intrusiveness criteria defined in the INP is not specifically identified as appropriate for temporary events such as those held at Parklands. Rather, the identification of the policy being inapplicable to motor sport activities and temporary activities such as construction, tends to suggest that the policy criteria are not suitable. For example, motor sport venues are typically restricted as to the number of events that may be held per year, as well as the timing and duration of these events. This is similar to the holding of Large Events at the Parklands venue, with the exception that the proposal for Parklands is to hold events significantly less frequently than would typically be the case for motor sport facilities.

The INP policy identifies that, within the community, there is a large range of human reaction to noise. There are members of the community that are very sensitive, and have an expectation of very low environmental noise levels. More broadly, the policy identifies that the bulk of the community is not affected by low levels of noise, and is prepared to accept levels of noise that are commensurate with living in an urban industrialised society. In this context, the INP criteria were developed on the basis of protection at least 90 % of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90 % of the time. The policy further notes that where the appropriate criteria cannot be met, then it does not automatically follow that the affected members of the community will find the noise unacceptable.

The criteria defined in the INP for industrial noise sources relate to both amenity and intrusiveness. The intrusive criteria are defined in terms of an allowable increment of 5 dB(A) relative to pre-existing rating background noise levels. The amenity criteria are defined on the basis of acceptable noise levels, defined on the basis of existing land use, time of day and type of receiver.

The Industrial Noise Policy and Application Notes identify that consideration must be given to the potential for adverse meteorological conditions to arise at the proposed development site and surrounding area. In particular, the influence of wind speed, direction and temperature inversion conditions can result in enhanced sound propagation from source to receiver.

Due to the potential influence of meteorological conditions, the INP recommends that noise levels from the proposed activity are considered under calm conditions, as well as any significant weather conditions that may result in enhanced sound propagation.

Where appropriate, reference has been made to the INP in the assessment completed for the proposed permanent venue at Parklands.

Where appropriate the acoustic assessments have been completed in accordance with the procedures identified in the NSW Industrial Noise Policy (INP). The policy sets two separate noise criteria to meet environmental noise objectives: one to account for intrusive noise and the other to protect the amenity of particular land uses. The derivation of the two sets of criteria in accordance with the INP are presented below.

2.2.1.1 Intrusiveness Noise Criteria

According to the INP, intrusive noise refers to noise that exceeds background noise levels (as defined by the Rating Background Level) by more than 5 dB. The intrusive noise criteria is summarised as follows:

$L_{Aeq,15minute}$ is less than or equal to rating background level + 5

The intrusiveness criteria for residential areas is summarised in Table 2.2. Intrusiveness criteria does not apply to recreational, commercial and industrial areas.

Assessment against the lowest RBL level has been considered (30 dB(A)).

2.2.1.2 Amenity Noise Criteria

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels (ANL) specified in Section 2.2 of the INP. The ANL is dependent on the type of area being considered. Table 2.1 presents ANL values for industrial, commercial premises and residential receivers in Rural, Suburban and Urban amenity areas.

Table 2.1: INP Acceptable Noise Levels for Adjacent Receivers

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level dB(A)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45

When the difference between the existing industrial noise levels and ANL is minus 6 dB or higher (i.e. Existing – ANL ≥ minus 6 dB), then the noise level from a new source must be controlled to preserve the amenity of the area. The control of the new source is achieved by applying an amenity criteria derived in accordance with Table 2.2 of the INP. Table 2.2 of the INP specifies adjustments to the existing noise level or ANL to derive an amenity criteria. For example, if existing noise levels are 2 dB or more higher than the ANL, then the maximum L_{Aeq} noise level from a new source must be 10 dB below the existing noise level. Table 2.2 presents the required adjustments for deriving the amenity criteria.

Table 2.2: Modifications to the ANL for deriving the Amenity Criteria (NSW INP Table 2.2)

Total existing L_{Aeq} noise level from industrial sources dB(A)	Maximum L_{Aeq} noise level for noise from new sources alone dB(A)
≥ Acceptable noise level plus 2	If existing noise level is likely to decrease in future: ANL minus 10 If existing noise level is unlikely to decrease in future: Existing level minus 10
Acceptable noise level plus 1	Acceptable noise level minus 8
Acceptable noise level	Acceptable noise level minus 8
Acceptable noise level minus 1	Acceptable noise level minus 6
Acceptable noise level minus 2	Acceptable noise level minus 4
Acceptable noise level minus 3	Acceptable noise level minus 3
Acceptable noise level minus 4	Acceptable noise level minus 2
Acceptable noise level minus 5	Acceptable noise level minus 2
Acceptable noise level minus 6	Acceptable noise level minus 1
< Acceptable noise level minus 6	Acceptable noise level

The residential area has been identified as rural residential. The calculated amenity criteria is shown in Table 2.3.

Table 2.3: Derived Amenity Criteria for Rural Residential Area

Period	Existing Levels L_{Aeq} dB(A)	Acceptable Noise Level dB(A)	Applicable Amenity Modification	Adopted Criteria dB(A)
Day	30	50	Existing level minus	50
Evening	30	45		45
Night	30	40		40

2.2.1.3 *Summary Of INP Noise Criteria*

As required by the NSW INP, the lower of the intrusiveness and amenity criteria is to be adopted for an assessment. The relevant criteria for the assessment are summarised in Table 2.4, based on the intrusive criteria which is the most stringent for Parklands due to the low existing background noise levels.

Table 2.4: Assessment Noise Criteria - dB(A)

Period	Residential
Day	35 $L_{Aeq,period}$
Evening	35 $L_{Aeq,period}$
Night	35 $L_{Aeq,period}$

The noise criteria applies at the most-affected point (ie. highest noise level) on or within the residential property boundary. If the actual property boundary is more than 30 metres from the house, then the criteria applies at the most-affected point within 30 m of the house.

2.2.1.4 Sleep Disturbance Criteria

In addition, reference has been made to the following criteria for sleep disturbance:

Sleep Disturbance Criteria ($L_{A1,1\text{-minute}}$ or L_{AMax}) = $L_{A90,15\text{-minute}}$ + 15 dB

The above criteria is referred to in the NSW INP Application Notes[2]. The NSW EPA recognises that this criteria is not ideal however, in the absence of additional research and evidence to replace it, the EPA will to continue to use it as a guide for the likelihood of sleep disturbance. Where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis can be undertaken.

Table 2.5 details the calculated sleep criteria.

Table 2.5: Sleep Disturbance Criteria (Residential Only)

Period	RBL dB(A)	Sleep Disturbance Criteria dB(A)
Night	30	45

2.2.2 NSW Independent Liquor & Gaming Authority

For the purposes of operating the conference centre, a Liquor Licence will be sought from the NSW Independent Liquor & Gaming Authority, the responsible agency for enforcing the **Gaming and Liquor Administration Act 2007.**

The Liquor and Gaming Authority imposes specific noise requirements on licensed venues, such as the proposed conference centre. The noise limits require that:

> *The L_{A10}* noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) by more than 5dB between 07:00am and 12:00 midnight at the boundary of any affected residence.*
>
> *The L_{A10}* noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) between 12:00 midnight and 07:00am at the boundary of any affected residence.*
>
> ** Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 07:00am.*

The liquor licensing requirements are relevant to the proposed conference centre activities, as a permanent liquor licence will be applied for. Temporary licenses are obtained for large events at

2 Application notes – NSW industrial noise policy, http://www.epa.nsw.gov.au/noise/applicnotesindustnoise.htm, Accessed 2 July 2013.

Parklands, and the acoustic requirements for permanent activities do not apply to the temporary licenses.

2.2.3 Noise Guideline for Local Councils

Figure is arbitrary in guideline. Unsure of whether the case study is real or fictitious. SCGT noise limit examples for highly urbanized Sydney are lower than the 75 value.

The NSW Noise Guide for Local Government provides guidance relating [illegible] from activities that are not specifically the responsibility of the NSW EPA. Table [illegible] ghts clearly that the Local Council has responsibility for managing noise from [illegible] nues such as Parklands, except where such premises are specifically listed [illegible] s in Schedule 1 of the Protection of Environment Operations (POEO) Act. Large [illegible] s are included in Schedule 1 of the POEO Act, however this currently does not in[illegible] date the approval has been temporary.

Examples are provided in the Noise Guideline for Local Councils relating to the appropriate management of noise from live open air venues. These include adoption of a 75 dB(A) L_{Aeq} noise limit in Case Study 1 presented in the guide.

2.2.4 Overseas Criteria and Guidelines

The issue of noise from outdoor concerts and festivals is also addressed internationally, and reference to overseas practices is useful in informing approaches that can be adopted in Australia.

The United Kingdom (UK) has developed a specific Noise Code[3] for management of environmental noise at Concerts. The noise limits defined in the Noise Code are presented in Table 2.6. These noise limits are widely adopted for the management of outdoor concerts and festivals in the UK and, for example, have been adopted in outdoor concert Codes of Practice by local Councils eg Bath and North East Somerset Council[4] and City of York Council[5].

Table 2.6: UK Noise Code (1995) $L_{Aeq,15\ min}$ Noise Limits at Sensitive Receivers

Concert Days per Calendar Year	Type of Venue	Noise Limits – 09.00 – 23.00	Noise Limits – 23.00 – 09.00
1 - 3	Urban stadia or arena's	75 dB(A)	Inaudible inside dwelling
1 - 3	Other urban and rural venues	65 dB(A)	
4 - 12	All venues	Background +15 dB(A)	

In the United States, the adopted criteria for large outdoor concerts and festivals varies between States. An example of noise criteria that have recently been applied for a proposed new major music

3 The United Kingdom Noise Council – Code of Practice on Environmental Noise Control at Concerts.

4 Bath and North-East Somerset Council – Code of Practice and Guidance Notes on Noise Control for Concerts and Outdoor Events, 2012.

5 City of York Council - Code of Practice and Guidance Notes on Noise Control for Concerts and Outdoor Events, 2014.

festival are the City of Pasadena Guidelines for Noise[6]. These define a noise limit of 70 dB(A) as acceptable for auditoria, concert halls and amphitheatres, and a higher level of 75 dB(A) for sports arenas and outdoor spectator sports.

Hong Kong is one of the most highly urbanised cities

In Hong Kong, noise limits for outdoor concerts a … se Code, as summarised in Table 2.7.

Table 2.7: Hong Kong Typical Noise Limits $L_{Aeq,30\ min}$ Noise Limits at Sensitive Receivers[7]

Type of Receiver Environment	Noise Limits – 09.00 – 23.00	Noise Limits – 23.00 – 09.00
Urban	70 dB(A)	60
Low Density Residential	65 dB(A)	55
Rural	60 dB(A)	50

These examples of overseas criteria for outdoor events are consistent in identifying more stringent limits for residential receptors or venues in more rural areas, and for lower noise limits after 11 pm at night. The most stringent noise criteria of those reviewed (prior to 11 pm at night, and for 4 events or less per year) is 60 dB(A) for rural areas in Hong Kong.

2.2.5 Existing Approved Noise Limits

2.2.5.1 Overview

The existing Parklands approval provides a noise management framework, as well as imposing specific acoustic criteria for large events for sensitive community receptors. The specific requirements of the Modified Approval, and the basis for the adopted criteria, are presented in the following sections.

2.2.5.2 Modified Approval

Noise limits for sensitive receivers in the area surrounding Parklands are provided in Condition B3 of the modified PAC Approval as follows:

- For Zone 1 (as shown in Schedule 4 of this approval)

i. between 11am and midnight amplified entertainment noise from the event at sensitive receivers must not exceed 60dB(A) $L_{Aeq,10\text{-}minutes}$ AND 70dB(lin) $L_{eq,10\text{-}minutes}$ in the 63 hertz 1/1 octave band; and

ii. between midnight and 2am, amplified entertainment noise from the event at sensitive receivers must not exceed 45dB(A) $L_{Aeq,10\text{-}minutes}$ AND 60dB(lin) $L_{eq,10\text{-}minutes}$ in the 63 hertz 1/1 octave band.

- For Zone 2 (as shown in Schedule 4 of this approval

i. between 11am and midnight amplified entertainment noise from the event at sensitive receivers

6 City of Pasadena, Guidelines for Noise Compatibility Land Use, 2002.

7 Control of Noise from Public Entertainment Activities in Hong Kong, Kwin Ting Kwok and Kin Wui Cheng, Internoise 2014.

must not exceed 55dB(A) $L_{Aeq,10\text{-}minutes}$ AND 65dB(lin) $L_{eq,10\text{-}minutes}$ in the 63 hertz 1/1 octave band; and

ii. between midnight and 2am, amplified entertainment noise from the event at sensitive receivers must not exceed 45dB(A) $L_{Aeq,10\text{-}minutes}$ AND 55dB(lin) $L_{eq,10\text{-}minutes}$ in the 63 hertz 1/1 octave band.

In accordance with Condition C40 of the PAC approval, noise levels in the camping area between midnight and 8:00 am of each event day shall support peaceful rest for overnight patrons during events.

2.2.6 Parklands Noise Management Plan (NMP)

2.2.6.1 Overview

In accordance with the Modified Approval, Parklands has developed a Noise Management Plan (NMP) for large events held at the venue. The Noise Management Plan has been approved by the NSW Department of Planning and Environment, and is updated on an as-needs basis in response to improvements in the noise management practices adopted for the venue. The current NMP, updated on 29 June 2017, incorporates the following noise management procedures and processes.

2.2.6.2 Design Measures

The following design measures are adopted in the current Parklands NMP:

- where possible, public address speakers, event stages and speakers shall generally be directed away from sensitive receivers;
- where possible, speaker directivity shall be considered during design and selection of arrays to minimise spillage of noise beyond venue area;
- where possible, amplified noise is to be directed away from the Billinudgel Nature Reserve;
- where speakers are mounted on poles or otherwise elevated above ground, they are generally to be inclined downwards from the horizontal or otherwise designed to reduce noise spillage to the surrounding environment;
- event stages and speakers shall be positioned to utilise any noise attenuation to sensitive receivers provided by the natural topography of the site and surrounding area;
- use fixed or portable barriers (e.g. shipping containers, hay bales) to construct acoustic barriers where necessary to limit noise emissions from event activities (e.g. behind stages);
- if available, use double tent wall sheets to contain noise emissions;
- where space and logistics allow, place trucks between and trailers behind stages to act as an acoustic barrier;
- work with stage and production staff to install optimised sub-arrays and optimised speaker arrays;
- if suitable, employ delay tower speaker systems;

- undertake an audit of all on-site mitigation measures by a suitably qualified acoustic engineer.

Details of specific acoustic management techniques incorporated to reduce noise emissions from events (including speaker directivity and setup, stage placement acoustic barriers) are to be provided in the event acoustic monitoring program for each individual event.

Prior to commencement of the event, the implementation of on-site noise management measures outlined in the event's AMP are audited and signed off by an accredited acoustic consultant. Any further modifications to the noise attenuation measures are identified by the noise consultants prior to the event are to be implemented subject to consultation with event organisers as necessary to ensure that the implications for the security and safety (of event staff, performers and patrons), emergency personnel access, fire and traffic have been effectively considered.

2.2.6.3 Operational Controls

In addition to implementation of design controls, the NMP incorporates provision of a Noise Control Co-ordination Centre (NCCC) at the Parklands venue office. The objectives of the NCCC are to provide:

- continuous monitoring of live noise levels from the main stages to allow pro-active management of noise levels and provision of rapid communication to Parkland Management and Event Managers where noise level adjustments were considered appropriate; and
- a closer interaction with Parklands Management and Event Managers and the personnel responding to calls made to the Community Hotline.

The following acoustic resources are provided at the NCCC:

- live noise feed (instantaneous noise levels) from sound level meters installed at the main stages;
- 1 minute L_{Aeq} noise feed from a separate 10EaZy monitoring system installed by the production team for the main stages;
- access to the log of community hotline calls requesting noise monitoring, as well as other event related data; and
- web access to Bureau of Meteorology monitoring data.

Throughout the event, stage noise levels are reviewed to confirm that the measured noise levels are within the pre-agreed target noise levels for the event. Where the Acoustic Manager identifies that noise levels are approaching, or exceeding target noise levels based on the observed instantaneous noise levels, the event production team are notified and, if considered necessary, the Acoustic Manager requests a specific reduction in noise levels.

In determining whether a request to reduce stage noise levels is appropriate, the Acoustic Manager considers the following key factors:

- noise levels currently occurring from each of the stages, particularly whether noise levels from an individual stage or more than one stage are approaching pre-agreed target noise limits;
- prevailing weather conditions, and whether the current wind direction has potential to propagate

noise toward key groups of receptors;

- measured community noise levels, as reported by noise monitoring personnel;
- type of performance occurring on each stage, and the expected duration of each performance; and
- information provided by the Community Hotline relating to calls received from the community.

2.2.6.4 Responding To Adverse Meteorology

Under specific adverse meteorological conditions, the NMP acknowledges that enhanced propagation of noise from the venue may arise. To address this issue, live weather data is monitored at the NCCC. When changes in meteorological conditions arise that have the potential to adversely affect sound propagation, the event production team are notified.

In addition, at the commencement of each day of the event the weather forecast for the day is reviewed by the Acoustic Manager, and the production team and acoustic monitoring personnel briefed in relation to:

- expected weather conditions for the day, for morning, evening and night;
- the receptor groups most likely to be affected for each period, hence the locations to be the focus of attended compliance monitoring;
- any potentially adverse conditions that are expected to result in enhanced sound propagation;
- recommended changes in stage sound levels that are expected to be applicable where adverse meteorological conditions are anticipated.

2.2.7 Event Specific Acoustic Monitoring Programme

Condition C17 of the Planning Assessment Commission (PAC) modified approval[8] requires that an Acoustic Monitoring Programme is developed for each large event at Parklands. Specifically, Condition 17 requires:

> '***C17 Acoustic Monitoring Program***
>
> *Prior to the commencement of any event where amplified noise is a feature, a qualified acoustic consultant must prepare and implement an Acoustic Monitoring Program (AMP) to monitor and assess the impact of noise generated by the event on the amenity of the area. The AMP must be prepared in consultation with the RWG and be consistent with the provisions and limits within the NMP and required under Condition B3, consistent with Condition C16 and consistent with the proponent's Environmental Health and Safety Management Manual (Standard 008). The AMP shall include, but not be limited to:*
>
> *(a) locations (identified on a map) at which monitoring will be undertaken. As a minimum monitoring locations must include the most sensitive noise receivers (where no noise agreement is in place between the proponent and the receiver) and the adjoining nature*

8 Planning and Assessment Commission Modification of Minister's Approval reference MP09_0028 MOD 3 dated 22 April 2016

reserve as identified in the Noise Management Plan;

(b) procedures and protocols in accordance with OEH's Noise Guide for Local Government 2010 and Australian Standard AS1055 Acoustics - Description of measurement of environmental noise (or any subsequent versions thereof);

(c) a program for periodic attended and unattended monitoring of noise at each of the set monitoring locations, including:

(1) Unattended monitoring must be undertaken at a minimum of eight monitoring locations (to be determined in consultation with the RWG) before, during and after each event;

(2) Attended monitoring must occur on at least one (1) occasion prior to the commencement (including during sound check) and during the operation of each event; and,

(d) procedures for the reporting of monitoring results to enable an assessment of the noise performance of the event.

The AMP must be submitted for the approval of the Secretary at least 60 days prior to the commencement of the event.'

Condition 16(d) requires that acoustic design measures are implemented for events at Parklands as follows:

(d) identification and implementation of best practice management techniques for the minimisation of noise from the site. For example, appropriate siting and orientation of performance stages and speakers, acoustic barriers, insulation/double glazing of sensitive receivers, etc.;

An event specific AMP has been developed and implemented for each of the nine large live music events held at Parklands to date.

2.2.8 Background to Existing Approval Criteria

In formulating the appropriate noise criteria to adopt for the Modified Approval for Parklands, consideration was given to the range of criteria currently adopted for music entertainment events in Australia. These are summarised in Table 2.8.

Table 2.8: Summary of Noise Limits for Australian Entertainment venues

State Instrument/Guideline	Noise Limit
New South Wales: Noise Guide for Local Government	65 dB(A) $L_{AMax,15\text{-}minute}$ for non-suburban areas, and 75 dB(A) $L_{Amax,\ 15\text{-}minute}$ for suburban (traffic affected) areas recommended for control of concert noise impacts
Australian Capital Territory: Outdoor Concert Noise Environment Protection Policy 2001	Minimum criteria L_{A10} 50 dB(A) with an upper limit of $L_{A10,15\ mintues}$ 65dB(A). Concerts required to finish by 11pm.
Western Australia: Guidelines for concerts, events and organised gatherings	To comply with E[illegible]lations 1997, Guideline [illegible]sk is suitable, measur[illegible]
Queensland: Environmental Protection Act 1994, Section 440X	An occupier of p[illegible]use of, the premises for [illegible] (a) before 7a.m., [illegible] (b) from 7a.m. t[illegible]f more than 70dB(A); or (c) from 10p.m. to midnight, if the use causes noise of more than the lesser of the following— (i) 50dB(A); (ii) 10dB(A) above the background level. Section 73 (2) of the Environmental Protection Regulation 2008 notes that source noise for open-air events may be measured as $L_{Aeq,T}$.

These limits are not specified as a fundamental requirement in the guideline. They appear to be taken from examples of existing noise limits for concerts in highly urbanized areas such as SCGT

Review of the criteria adopted presented in Table 2.8 confirms that noise limits derived from background noise levels are not applied. Noise limits derived from existing background levels are typically applied for permanent noise sources in order to control the audibility of the noise for nearby noise sensitive receptors (e.g. permanent music venues such as pubs and clubs).

Yes they are. Refer to Figure 3.2 Summary Prevention Notice No.1 third row

On this basis, the application for the Modified Approval identified that outdoor music events at Parklands are occasional events which a[illegible] value to the broader community, and there is an expectation that the music w[illegible] defined event. The event is defined in terms of the start and finish hours and nu[illegible]r on which it may occur. This has been recognised by state authorities and resu[illegible]se limits in a number of states which provide set noise limits for outdoor entertainment events and concerts as summarised in Table 2.8.

Given that events at Parklands are typically held over multiple days with entertainment noise extended until 12 am for main stages and 2 am for bars, numeric noise limits consistent with those adopted elsewhere in Australia and overseas were recommended for the Parklands Modified Approval. In addition, an innovative criteria designed to improve the management of low frequency bass noise from the music events was recommended. This defined a noise limit for the 63 Hz noise band. Analysis of the frequency spectra from a range of music genres and previous events at Parklands identified the 63 Hz band as a suitable octave band to represent the maximum low frequency content from low frequency (< 250 Hz) amplified music.

The subsequent Modified Approval granted by Planning NSW included specific numeric noise limits

Note: NGLG examples treat each day of an event as a concert. i.e. 3 consecutive days = 3 concert events for L_{Aeq} and 63 Hz amplified music. The approval was consistent with the approach adopted elsewhere in Australia, and overseas, in that a 'background plus' type criteria as recommended in the INP for permanent noise sources was not imposed. Rather, the duration and nature of the event was considered, and noise limits consistent with other similar events were adopted for the venue. The adopted noise limits were presented earlier in Section 2.2.5 of this report.

2.3 Fixed Plant Noise

For the purposes of assessing fixed plant noise, the Intrusive Noise Criteria as defined in the Industrial Noise Policy (2000) has been adopted. Intrusive noise refers to noise that exceeds background noise levels (as defined by the Rating Background Level) by more than 5 dB. The intrusive noise criteria is summarised as follows:

$L_{Aeq,15minute}$ is less than or equal to rating background level + 5

2.4 Construction Noise and Vibration

2.4.1 Interim Construction Guideline

The NSW Interim Construction Noise Guideline identifies approaches to dealing with the impacts of construction noise on sensitive land uses.

The guideline provides assessment approaches, and defines appropriate criteria for different project durations. In particular, the guideline takes account of the fact that construction noise has only temporary impacts. The criteria recommended in the guideline for construction projects of more than 3 weeks, are background plus 10 dB(A) and a an upper threshold of 75 dB(A) from 7 am – 6 pm Monday to Friday and 8 am – 1 pm Saturdays. For work outside the standard hours, the criteria of background plus 5 dB(A) is adopted.

For the Permanent application, these criteria would be relevant where construction works occur for 3 weeks or more. Examples may include construction of the conference centre and other permanent facilities.

2.4.2 Assessing Vibration – A Technical Guide

The NSW Guideline Assessing Vibration – A Technical Guide provides methods and criteria for assessing the effects on amenity of vibration emissions from industry, transportation and machinery. The guideline is particularly relevant to projects where construction work is to be completed.

In the case of the Parklands application, the potential for vibration impacts is largely limited to construction works associated with the proposed new infrastructure and facilities such as the conference centre. Figure 1.3 identifies the location of the proposed facilities in the context of the surrounding landuses. Given the significant separation distance between the proposed development and the surrounding landuses, the likelihood of off-site vibration impacts during any associated construction works is considered to be negligible.

In relation to the operational phase of the Parklands venue, the only aspect identified as having potential for causing vibration is the use of large vehicles for deliveries. As all such deliveries will be made using licensed vehicles on public roads, the risk of vibration impacts from this activity is also considered negligible.

On this basis, assessment of vibration impacts in accordance with the NSW Technical Guideline is not necessary for this application.

2.5 Summary of Criteria Adopted for Assessment

There are a range of noise sources associated with operation of a venue such as Parklands. The primary risk of noise impacts, is amplified music associated with Large Events.

Based on consideration of the range of criteria adopted currently in Australia and overseas for live entertainment events, it is neither relevant nor feasible for temporary events of the type held at Parklands to comply with a background plus 5 dB(A) criteria of the type defined in the Industrial Noise Policy for a permanent, continuous industrial operation. This issue was considered in detail for the modified approval application, and Planning NSW determined that it was appropriate to adopt criteria more suited to a temporary operation. This is the approach adopted for other temporary works in NSW (such as other amplified music concerts and festivals, motor sport facilities, construction works and temporary activities).

Adoption of project specific criteria for a large event is also consistent with approaches in other Australian States and overseas. On this basis, the noise criteria approved by Planning NSW for the Modified Approval for amplified music from large live events are adopted for the assessment of live entertainment music for large events. These are as follows:

- *For Zone 1 (as shown in Schedule 4 of the approval and Figure 4.2):*

(i) between 11 am and midnight amplified entertainment noise from the event at sensitive receivers must not exceed 60 dB(A) $L_{Aeq,10\text{-}minutes}$ AND 70 dB(lin) $L_{eq,10\text{-}minutes}$ in the 63 hertz 1/1 octave band; and

(ii) between midnight and 2 am, amplified entertainment noise from the event at sensitive receivers must not exceed 45 dB(A) $L_{Aeq,10\text{-}minutes}$ AND 60 dB(lin) $L_{eq,10\text{-}minutes}$ in the 63 hertz 1/1 octave band.

- *For Zone 2 (as shown in Schedule 4 of the approval and Figure 4.2):*

(i) between 11 am and midnight amplified entertainment noise from the event at sensitive receivers must not exceed 55 dB(A) $L_{Aeq,10\text{-}minutes}$ AND 65 dB(lin) $L_{eq,10\text{-}minutes}$ in the 63 hertz 1/1 octave band; and

(ii) between midnight and 2 am, amplified entertainment noise from the event at sensitive receivers must not exceed 45 dB(A) $L_{Aeq,10\text{-}minutes}$ AND 55 dB(lin) $L_{eq,10\text{-}minutes}$ in the 63 hertz 1/1 octave band.

Figure 2.1: Compliance Criteria Zones

For ancillary activities associated with the new use, Table 2.9 summarises the adopted criteria.

Table 2.9: Adopted Criteria – Other Sources

Source/Activity	Adopted Limits	Source of Criteria
Fixed Plant Noise – Conference Centre, Temporary Lighting Towers/Generators	Background plus 5 dB(A)	Industrial Noise Policy
Conference Centre Activities, including amplified music, vehicles, and patrons	Background plus 5 dB(A)	Industrial Noise Policy & NSW Independent Liquor & Gaming Authority
	Inaudibility (12 midnight – 7am)	NSW Independent Liquor & Gaming Authority
Construction Noise	Daytime (7 am – 6 pm weekdays and 8 am – 1 pm Saturdays): Background plus 10 dB(A) Background plus 5 dB outside daytime hours Maximum limit of 75 dB(A) at all times	Interim Construction Noise Guideline

3 Past Performance

3.1 Previous Events

Previous medium and large events, as defined in the approval for Parklands, are shown in Table 3.1 along with the date of the events (including lead in days with minor activity and rehearsals) and the approximate number of patrons.

Table 3.1 - Previous Medium and Large Events

Event	Dates[a]	Patrons
Splendour in the Grass	25/07/2013 – 28/07/2013	25,000
	24/07/2014 – 27/07/2014	27,500
	23/07/2015 – 26/07/2015	30,000
	21/07/2016 – 24/07/2016	32,500
	20/07/2017 – 23/07/2017	32,500
Falls Festival	31/12/2013 – 03/01/2014	15,000
	30/12/2014 – 02/01/2015	17,500
	30/12/2015 – 02/01/2016	20,000
	30/12/2016 – 02/01/2017	22,500
[a] *Include lead in days when campers arrive, installations are finalised and rehearsal and sound checks completed.*		

For each of these events, information relating to community calls to the Parklands Hotline and acoustic monitoring data is available. The following sections present analysis of the data relating to previous events, to provide an indication of the effectiveness of noise management over time for medium and large events held at Parklands.

3.2 Calls to the Community Hotline

3.2.1 Introduction

Parklands maintains a Community Hotline throughout each Large and Medium Event held at the venue, to provide a means of responding to information and concerns raised by the local community and event patrons. Details of each call are documented by Parklands, including those where concerns about noise emissions from the venue occur.

Analysis of the number of noise related calls to the Community Hotline, and the location of the callers, allows consideration of:

- the number of calls per event;
- the location of the callers; and

- correlation of the frequency of calls per event with the prevailing weather conditions.

These analyses are presented in the following sections.

3.2.2 Number of Calls per Event

Based on analysis of all noise related calls to the Parklands Community Hotline, Figure 3.1 presents the total number of calls received for all events since commencement of the Trial Approval in 2013. The data demonstrates that the Splendour in the Grass (SITG) events have, historically, resulted in a higher number of noise related calls than Falls Festival. There are a number of reasons for this, including:

- SITG events are held during the winter period (usually mid to late July). During the winter months, background noise levels are typically lower than the summer months when insect and from noise at night can significantly increase background noise levels. As a result, increases in noise levels are likely to be more apparent above the lower background noise levels;
- SITG events have historically had a greater number of event stages than the Falls Festival events, and oriented in more directions, resulting in greater potential for off-site noise;
- Falls events are held over the New Year period, when public holidays occur. As this is a traditional period of celebration, noise associated with parties and other entertainment may also be present in the community, and it is possible that there is a greater tolerance of increases in audible noise during the period for these reasons.
- Different weather patterns during the summer (Falls) and winter (SITG) is likely to be a significant factor, and this is considered in more detail in Section 3.4.

In terms of the pattern of calls on a year by year basis, Figure 3.2 presents a breakdown of the number of calls by year and by year and event. This indicated that calls to Community Hotline were highest for the events held in 2014, and have reduced on a yearly basis since then. The same pattern is identified for SITG. In the case of Falls, Community Hotline calls were highest in 2014 and since then have remained low, and at relatively constant numbers.

Overall, the pattern of calls to the Community Hotline suggests an improvement over time, and this is consistent with the adoption of improved noise management measures since the initial events were held. The approaches adopted for each event are discussed in Section 2.2.6. Prevailing weather conditions at the time of each event may also be a significant factor, and this is discussed in Section 2.2.6.4. Equally, there are a range of other factors that may be relevant. These may include community attitudes to the event.

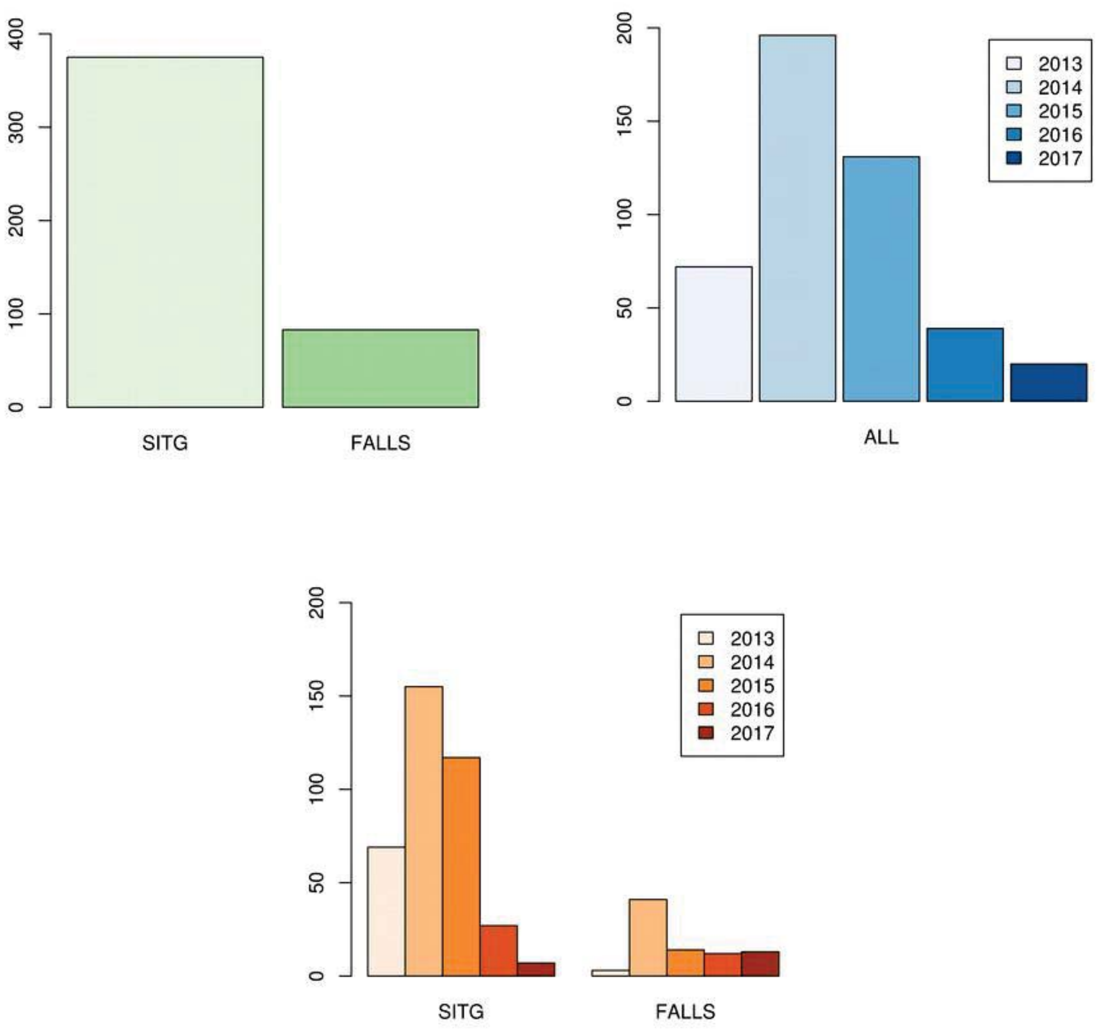


Figure 3.1 - Total Number of Noise Related Calls to the Community Hotline, All Medium and Large Events, 2013 to 2017

Indicates that residents are tired of banging their heads against the wall with respect to DILGP

3.3 Spatial Analysis

Analysis of the location of the noise related callers to the Community Hotline throughout previous events has been completed, to determine the spatial distribution of these callers. This analysis is presented in Figure 3.2. As would be expected, the largest number of calls have arisen historically from the more populated areas. South Golden Beach is the suburb with the greatest number of calls across all events, at 148. A further 34 calls arose from the adjoining suburb, North Ocean Shores. The next most significant suburbs for noise related calls are South Ocean Shores (55) and Yelgun (43). The spatial pattern for the remainder indicates that the calls are relatively widely distributed in the broader community.

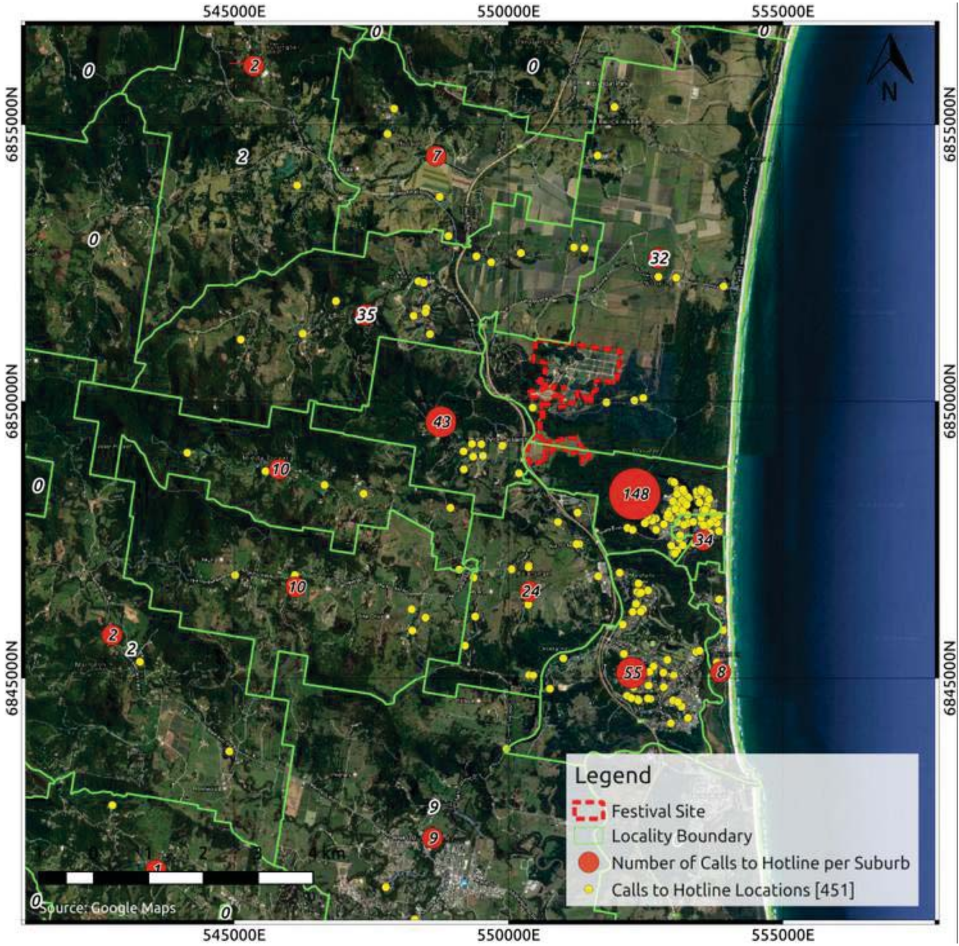


Figure 3.2 - Total Number of Noise Related Calls to the Community Hotline, By Suburb 2013 to 2017

3.4 Correlation with Meteorology

Meteorological conditions are a significant factor that influences both the direction of propagation of sound, as well as the degree of attenuation of sound that may occur with distance. Topography can also play a significant role, as this can result in localised changes in wind patterns within the broader pattern of meteorology observed in a region, and may shield a receptor from a noise source. Wind direction is described in terms of the direction from which the wind arises. Therefore, a northerly wind has the potential to propagate winds to the south of the venue. The nearest Bureau of Meteorology (BoM) station to the Parklands venue is located at Byron Bay. This station produces high quality data and weather measurements are completed at a height of 10 m above ground as is standard for BoM measurement stations. There is also a meteorological station located at Crabbes Creek, owned by Parklands and maintained by the Manly Hydraulics Laboratory. The location of these weather monitoring stations relative to Parklands is shown on Figure 3.3.

The BoM station at Byron Bay is located some 21 km to the South of the Parklands venue. While monitoring data from this station is likely to be representative of the broader regional patterns, wind speeds in particular are likely to be higher than experienced at Parklands as the BoM station is located close to the coast (100 m). The monitoring data for the Crabbes Creek monitoring station, which is positioned just to the north of the northern boundary of Parklands, is likely to be more representative of the venue.

Figure 3.3 - Location of Meteorological Monitoring Stations

For the Parklands venue, the most populated areas (Ocean Shores, New Brighton and South Golden Beach) are located to the south-east and south-south-east, hence winds from the north-west and north-north-west would be the most likely to result in audible noise from the venue. Figures 3.4 and 3.5 present the pattern of wind speed and direction typically experienced in the local area during the summer and winter, in the form of wind roses. The bars on the wind rose represent the direction from which the wind has arisen, with the segments or width of the bars showing the % wind speed in that direction. The summer wind roses represent the wind patterns most likely to arise during Falls Festival, and similarly the winter wind roses represent the patterns most likely to occur during Splendour in the Grass.

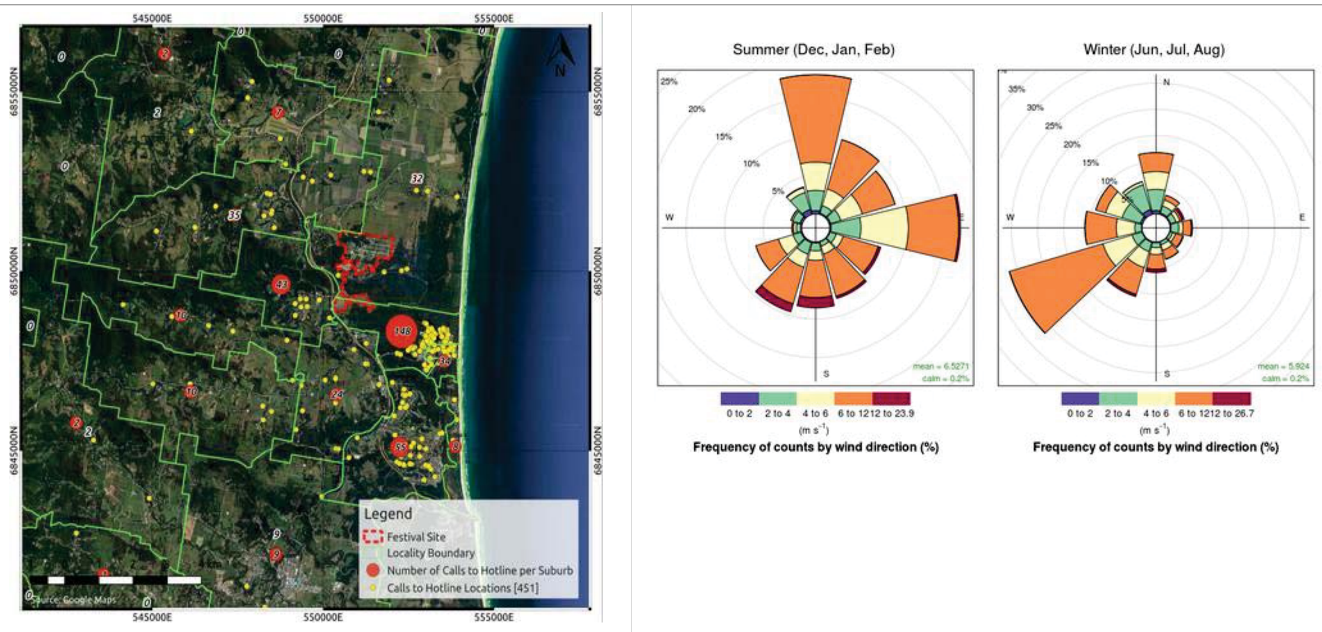


Figure 3.4 - Summer and Winter Wind Roses: Byron Bay

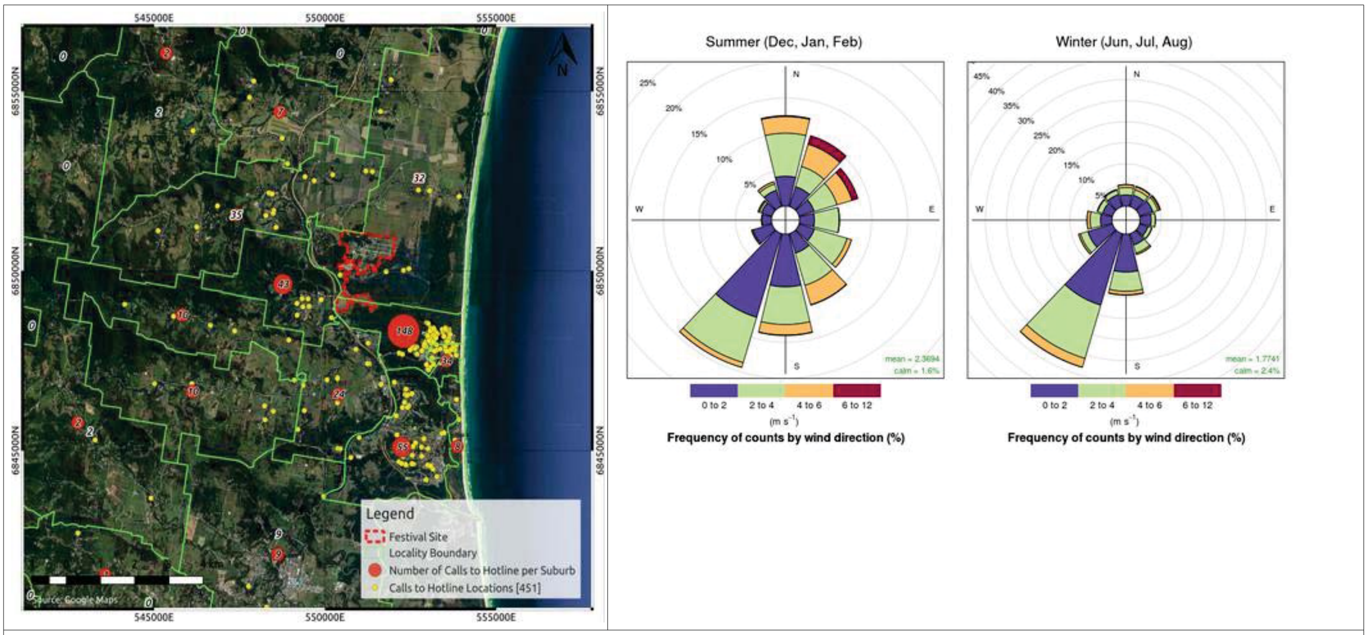


Figure 3.5 - Summer and Winter Wind Roses: Crabbes Creek

Analysis of the wind roses indicates some consistency between the winter wind directions for the Byron Bay and Crabbes Creek stations. The Crabbes Creek wind rose indicates that the most frequently occurring wind direction (commonly termed the ‘prevailing’ wind) is from the south-south-west. The wind direction patterns for the summer period are very different between the two weather stations. The Byron Bay station indicates prevailing northerlies (approximately 18 %) and Easterlies (approximately 17 %); the Crabbes Creek data indicates prevailing west-south-westerlies at a frequency of approximately 27 % of the time.

To further examine the relationship between the prevailing wind directions and the pattern of calls to the Community Hotline for past events, the wind direction recorded at the time of calls occurring has been analysed for each wind dataset. Figures 3.6 and 3.7 present plots that shows the correlation of the number of complaints and the wind direction that was occurring at the time of the complaint. The figures also show the map of complaints by suburb, and the wind rose for the relevant meteorological station.

Based on review of these plots, the following conclusions can be drawn:

Byron Bay meteorology:

- Falls Festival: for Falls, the pattern of calls is strongly directional. The majority of calls arise under northerly and north-north easterly winds, which is consistent with the prevailing winds during the summer. The next most frequent wind direction is south-south-east, and there is a small group of calls that arise under a direct Easterly wind. Generally the calls occur under moderate wind speeds greater than 5 m/s.
- SITG: for SITG the pattern of calls is very varied, however the most frequent wind directions

under which calls arise is the west-north-westerly sector and the north-north-easterly sector. The calls occur under a wide range of wind speeds.

Crabbes Creek meteorology:

- Falls Festival: for Falls, as with the Byron Bay dataset, the pattern of calls is strongly directional. The majority of calls arise under northerly and north-easterly winds winds, which is not consistent with the prevailing winds south-south-easterly winds during summer. The next most frequent wind direction is south-south-east, and there is a small group of calls that arise under a direct Easterly wind. Generally the calls occur under lighter wind speeds than are evident from the Byron Bay dataset, with all calls occurring at wind speeds of less than 5 m/s.
- SITG: as with the Byron Bay dataset, for SITG the pattern of calls is very varied. The most frequent wind directions under which calls arise is the northerly sector and the southerly sector, under very light wind conditions.

Overall, there is a greater degree of correlation with the wind directions from both meteorological stations for the Falls Festival dataset than SITG, and neither dataset provides a clear correlation with both events. For Falls, noise related calls are more likely to occur under northerly and south-easterly winds. For SITG, there is a very diverse pattern, however the frequency of calls is highest when winds arise from the north-westerly and northern sectors.

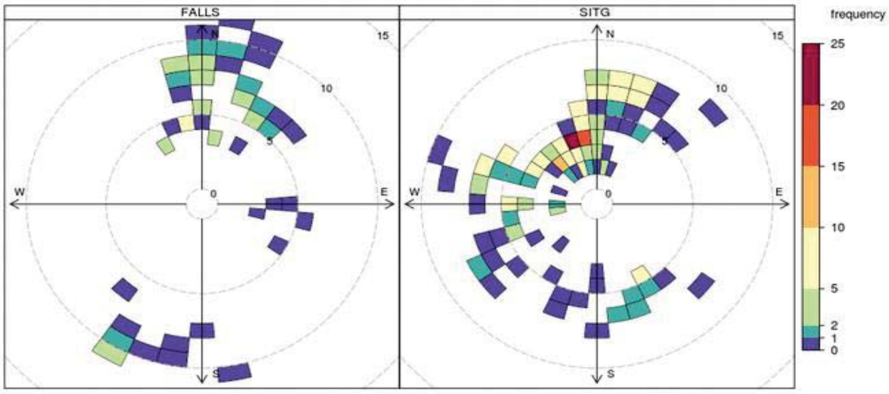
The analysis of the Hotline Caller history in the context of the prevailing meteorological conditions also provides information about the conditions that are most favourable for the venue. These are the wind directions under which no Calls to the Hotline have been made for previous events:

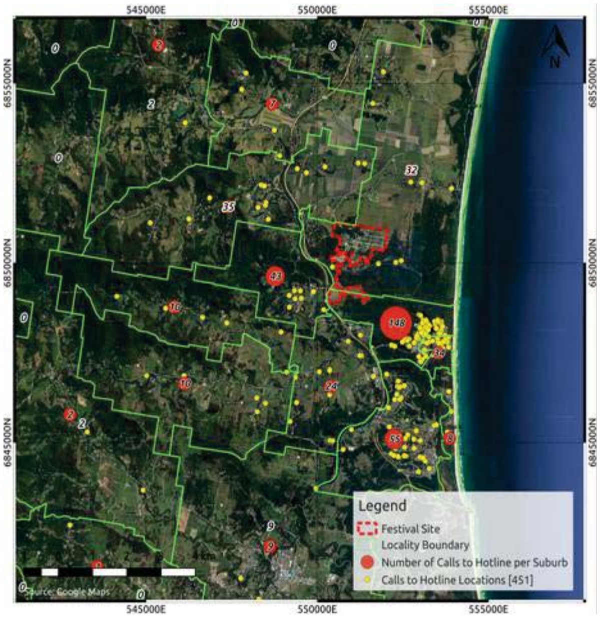
Byron Bay meteorology:

- Falls Festival: west, south-west, north-west, east-north-east, south-south-east, south-east;
- SITG: east.

Crabbes Creek meteorology:

- Falls Festival: west-north-west, north-north-west, west, north-west, west-south-west.





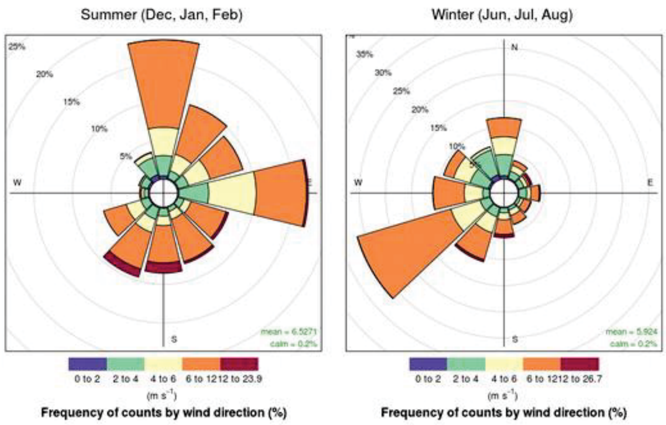


Figure 3.6 - Frequency Rose of Hotline Calls: Byron Bay Meteorology

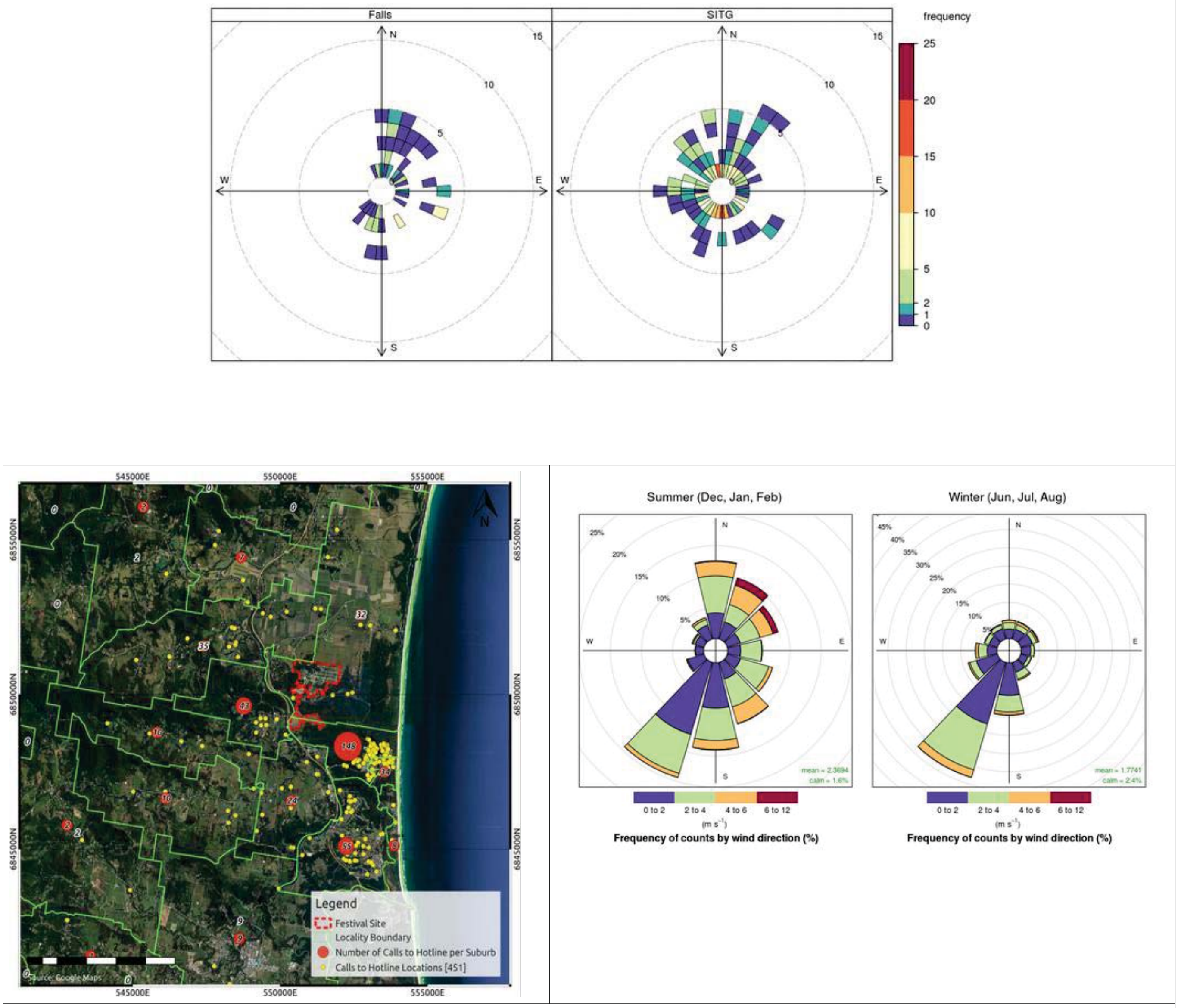


Figure 3.7 - Frequency Rose of Hotline Calls: Crabbes Creek Meteorology

3.5 Compliant Operating Levels

Event noise monitoring completed during recent large events at Parklands have resulted in compliance with the trial project conditions. This has been largely attributable to the management and monitoring measures included in the approved Parklands NMP. These have provided for live management of FOH noise levels, identification of areas impacted under specific meteorological conditions, and targeted volume control. In addition, the ongoing improvements to the stage and speaker layout design, event and system programming and communication strategies to improve response times with venue managers has been va

Complied with Modified Approval, would have been 8dBA above original approval

Event Noise monitoring reports for most recent la ughout the event, including the following:

Low frequency +4dB above criteria at R12

- Splendour in the Grass 2016[9],
- Falls Festival 2016[10],
- Splendour in the Grass 2017[11].

+3dBA above the Modified Approval at R12 after midnight

Therefore, these events provide a basis for determining a suitable operating volume for the main stages, under typical (as opposed to worst case) meteorological conditions. Table 3.2 presents a summary of the upper volumes achieved (averaged over a 10-minute period) for the main stages at the 2017 SITG event.

It is noted that positioning of the measurement microphone (eg, left or right of the stage, and slightly different distance to the FOH) can result in significant variations to the measured levels. This has been demonstrated by a comparison with the FOH noise levels from the mixing desk operators '10-EaZy' noise monitoring system, which often measure 2 – 5 dB louder. This highlights that the noise levels presented in Table 3.2 may be lower than the actual front of house levels that occurred during SITG 2017, which achieved compliance for off site noise levels.

Table 3.2 - Maximum Measured 10-Minute L_{eq} FOH values (ANE Logger) Splendour in the Grass 2017

Event Day	Amphitheatre		Mix Up		GW McLennan		Tiny Dancer	
	dB(A)	dB(C)	dB(A)	dB(C)	dB(A)	dB(C)	dB(A)	dB(C)
Day 1	102	111	97	109	99	109	96	111
Day 2	103	112	100	111	100	109	98	110
Day 3	101	113	101	112	98	109	99	109

9 Splendour in the Grass 2016 – Post Event Noise Impact Report, North Byron Parklands, prepared by Air Noise Environment (18 January 2017)

10 Falls Festival 2016 – Post Event Noise Impact Report, North Byron Parklands, prepared by Air Noise Environment (31 March 2017)

11 Splendour in the Grass – Post Event Noise Impact Report, North Byron Parklands, prepared by Air Noise Environment (7 September 2017)

4 Noise Modelling

4.1 Overview

From a potential noise impact perspective, the scope of the proposed future operations at Parklands is very similar to the activities operated since 2013. The proposed change that is of primary relevance from an acoustic perspective is the provision of an additional main stage for large events. Therefore, the focus of the noise modelling is a detailed analysis of the existing and predicted future community noise levels from large live entertainment events. This section of the report presents this analysis.

In addition, there are further changes associated with the proposed permanent application that may result in changes in community noise levels. These relate to the following issues:

- proposed conference centre;
- continuous noise emissions from fixed and temporary equipment such as lighting towers;
- construction noise impacts.

These potential noise sources are considered separately in Section 5. Where acoustic modelling is completed to assess the potential impacts, the modelling methodology adopted is as described in Section 4.2.

4.2 Methodology

4.2.1 Introduction

For the purposes of predicting impacts from large events held at Parklands, an environmental noise model of the sources and surrounding region was developed. The model package was developed using the proprietary software Cadna/A (Computer Aided Noise Abatement Model) developed by DataKustik. Cadna/A incorporates the influence of meteorology, terrain, ground type and air absorption in addition to source characteristics to predict noise impacts at receptor locations. This modelling approach provides for the following:

- calculations in accordance with the 'ISO 9613-2:1996 Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation' methodologies;
- prediction of impacts of all activities occurring simultaneously to each sensitive receiver;
- inclusion of screening effects, ground topography, attenuation and absorption;
- identification of partial contribution of each source or activity to each sensitive receiver, as well as identification of 1/1 Octave Band contributions (31.5 – 8000 Hz);
- iterative review of predictions to identify the required reductions to each noise source to achieve compliance;

- completion of an iterative review of suitable barrier heights; and
- confirmation of compliance to all sensitive areas.

All predictions have been undertaken in accordance with *ISO Standard 9613 (1996) Acoustics - Attenuation of sound during propagation outdoors,* which assumes source-to-receiver wind conditions (1 to 3 m/s) or a temperature inversion under calm conditions. It is important to recognise that this approach adopts a theoretic worst case meteorological scenario for each receptor. In reality, under more typical meteorology, compliance will be achieved for higher source noise levels than are considered in the modelling. This is discussed in Section 3.5 for previous events.

It is noted that modelling has been completed for a series of discrete receptors in the local community, and for gridded receptors calculated at 10 m grid intervals across a 10 km x 10 km area. The gridded receptors are utilised in the preparation of contour plots.

The following sections describe in detail the model inputs and assumptions.

4.2.2 Model Scenarios

As the Parklands venue has operated since 2013 under a trial approval, detailed information is available in relation to the expected noise sources for future events. Currently, two medium or large events are held each year at Parklands – Splendour in the Grass (SITG) and Falls Festival (Falls). Of these, SITG is the larger event in terms of numbers of stages and numbers of patrons. SITG is also held during the winter months, when worst case meteorology and lower background noise levels are most likely to occur. Therefore, the modelling exercise considers the potential noise impacts associated with SITG as this represents the event with the greatest potential for community noise impacts, and is also the event most likely to coincide with worst case meteorology.

The initial acoustic modelling has been completed for a typical SITG layout and typical source noise levels, based on the SITG 2016 event. Throughout the history of Parklands, noise management measures have been adopted to minimise community noise impacts, as documented in the Parklands Noise Management Plan and the Acoustic Monitoring Programmes developed for each event. Because noise management measures are already adopted for large events, the base case (existing SITG 2016) model includes the following noise management features:

- optimised sub arrays, including cardiod-arrays where possible;
- mitigation to the side and rear of stage to reduce bass emissions, including truck pans, proprietary sheeting, PVC, straw bales, etc;
- double-skinned wall tent sheets;
- delay towers;
- optimised and cutting edge technology in system design;
- stage monitors located within the lined stage area; and
- minimisation of use of sub-woofer speakers to smaller venues.

These management features have also been incorporated into the modelling of large events at the proposed permanent facility.

Based on the predicted noise impacts for the proposed permanent scenario, including the additional main stage, further mitigation scenarios have been considered. In summary, the following modelling scenarios that have been completed:

- Scenario 1: Base case – Splendour 2016 Layout (Existing operations to calibrate model)
- Scenario 2: Proposed permanent facility - All Proposed Stages
- Scenario 3: Mitigation investigations
- Scenario 4: Volume management scenario

4.2.3 Topography

To account for shielding influences, ground absorption, and relative height differences of sources and surrounding sensitive receivers, site topography has been included in the acoustic model. The topography has been considered for the venue and surrounding area (10 km square grid) at a resolution of 1 m sourced from satellite DEM data. Figure 4.1 presents the area included in the acoustic model.

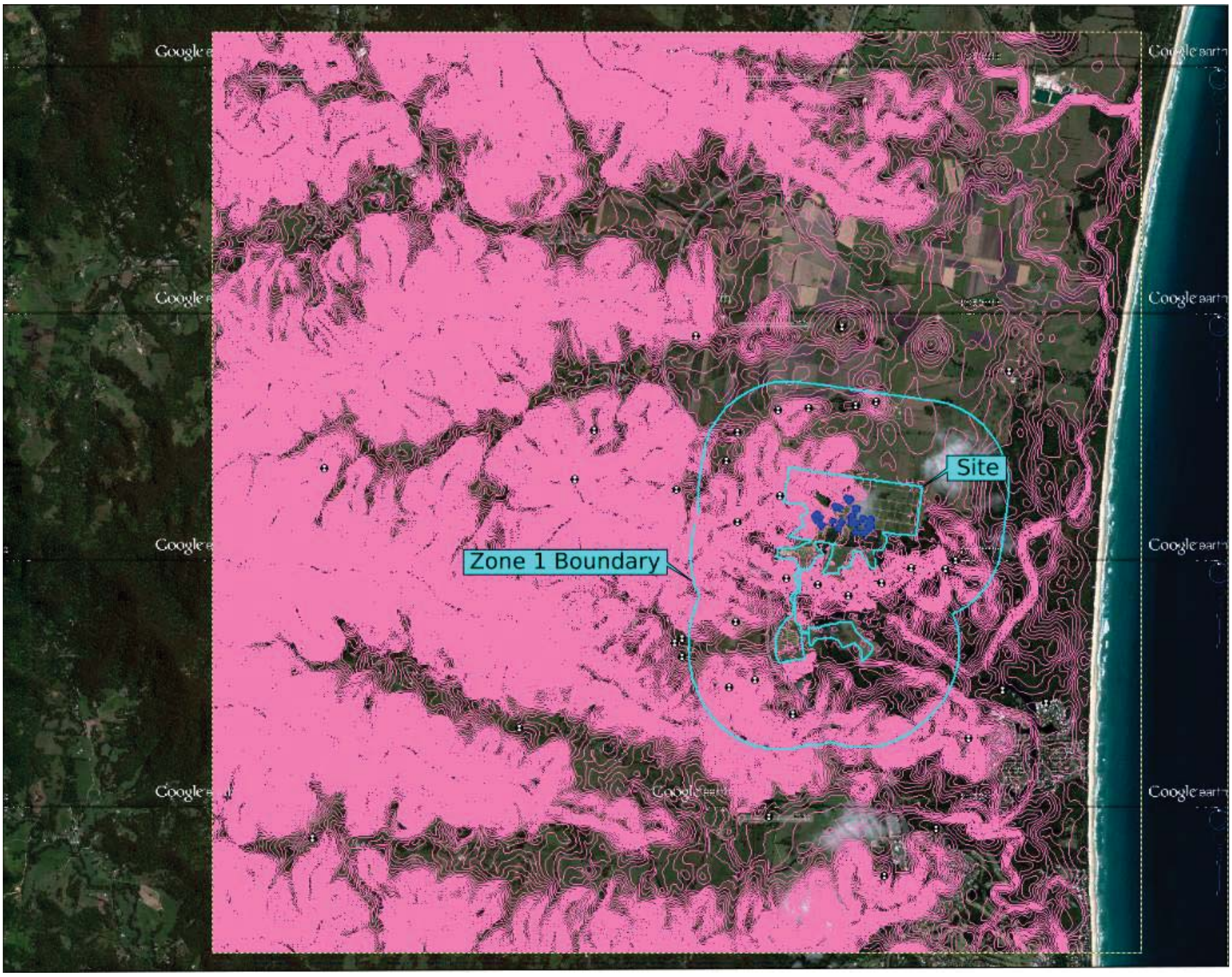


Figure 4.1 - Modelled Area and Topography

4.2.4 Meteorological Influences

The acoustic modelling has been completed in accordance with the ISO 9613-2:1996 methodologies. The base case scenario for the ISO method predicts the higher noise level of either a source-to-receiver wind condition (1 to 3 m/s) or a temperature inversion under calm conditions. Adoption of the ISO 9613-2 methodologies removes the consideration of a true calm stable scenario, and results in predictions at least 6 dB(A) higher than a calm scenario. The degree of over prediction also varies for different octave band frequencies.

Therefore the assessment is considered conservative as it assesses a 'typical worst-case' meteorological influence. However it is noted that under unique and very unusual meteorological conditions, slightly higher predicted noise levels may be expected.

It is noted that within the INP, there are screening conditions to identify whether review against these 'typical worst-case' meteorological effects is appropriate to adequately represent the local conditions. There are specific thresholds applied to determine whether extreme worst case conditions should be included in the assessment::

- *Industrial Noise Policy methodology for considering occurrence of wind and temperature inversions reviews whether the occurrence of inversions is greater than 30% of the time at night (1hr before sunset through 1 hour after sunrise, approximately 6pm - 7am) in winter, or if source to receiver winds occur greater than 30% of the time in any period and season.*

As the site is bounded by potentially affected sensitive receiver areas, the assessment has been completed on the basis that certain sensitive receiver areas could experience downwind inversion conditions more than 30% of the time. These meteorological effects typically increase noise levels by 5 to 10 dB during the occurrence of the condition. This has been considered in the modelling, resulting in a conservative assessment for the periods when these winds are not occurring.

As the site is close to the coastline strong inversions (generally occurring in arid and semi-arid areas) are unlikely to occur, and have not been considered.

4.2.5 Sensitive Receivers

Table 4.7 and Figure 4.2 identify the nearest sensitive receptors in the area surrounding Parklands. All existing sensitive residential receivers within Zone 1 have been identified, and a representative selection of residential receptors most likely to be affected by noise from large events at Parklands for the surrounding Zone 2. These receptor positions are identified in Table 4.7.

For the receivers identified in Table 4.1 as having agreements, Parklands have advised that an agreement has been entered into with the owner of each property relating to management of impacts from the event, and in some cases compensation has been agreed. On the basis of these agreements, the property owner has formally agreed not to lodge complaints relating to future events at Parklands. In some instances the potential for noise impacts have been part of the decision to enter into an agreement with certain properties, hence modelling results are presented for all properties as this can assist in identifying those properties where mitigation and management through agreements may be appropriate for the permanent site. The receptor agreements are discussed further in Section 4.3.6 in relation noise mitigation measures.

Table 4.1: Noise Sensitive Receptors Considered in Acoustic Modelling

Receptor Number	Address / Description	Zone	Agreement	Coordinates		Noise Limit 11pm - Midnight		Noise Limit Midnight - 2am	
				X	Y	dB(A)	dB(63Hz)	dB(A)	dB(63Hz)
1	Billinudgel Road, Billinudgel	1		56550466	6848271	60	70	45	60
2	Yelgun Road, Yelgun	1		56549841	6848737	60	70	45	60
3	Yelgun Road, Yelgun	2		56549272	6849152	55	65	45	55
4	Yelgun Road, Yelgun	1		56549890	6849356	60	70	45	60
5	Jones Road, Wooyung	1	Yes	56550475	6849851	60	70	45	60
6	Tweed Valley Way / Pacific Highway, Yelgun	2		56549278	6851074	55	65	45	55
7	Tweed Valley Way, Wooyung	1		56549782	6851201	60	70	45	60
8	Wooyung Road, Crabbes Creek	1		56549911	6851539	60	70	45	60
9	Wooyung Road, Wooyung	1		56550382	6851787	60	70	45	60
10	Wooyung Road, Wooyung	1	Yes	56550733	6851810	60	70	45	60
11	Wooyung Road, Wooyung	1	Yes	56551501	6851867	60	70	45	60
12	Jones Road, Wooyung	1		56552298	6849958	60	70	45	60
13	Jones Road, Wooyung	1	Yes	56552410	6850053	60	70	45	60
14	Mia Court, Ocean Shores	2		56553475	6848405	55	65	45	55
15	Flinders Way, Ocean Shores	2		56552578	6848002	55	65	45	55
16	Balemo Drive, Ocean Shores	2		56552197	6846959	55	65	45	55
17	Pacific Highway, Wooyung	1		56549897	6850497	60	70	45	60
18	Pacific Highway, Wooyung	1		56550212	6850739	60	70	45	60
19	Yelgun Road, Yelgun	1		56550103	6848687	60	70	45	60
20	Middle Pocker Road, Middle Pocket	2		56547389	6848120	55	65	45	55
21	The Pocket Road, The Pocket	2		56545003	6846851	55	65	45	55

Receptor Number	Address / Description	Zone	Agreement	Coordinates		Noise Limit 11pm - Midnight		Noise Limit Midnight - 2am	
				X	Y	dB(A)	dB(63Hz)	dB(A)	dB(63Hz)
22	Pimble Valley Road, Crabbes Creek	2		56545133	6851118	55	65	45	55
23	Bluegum Court, Crabbes Creek	2		56548244	6851563	55	65	45	55
24	Hulls Road, Crabbes Creek	2		56549443	6852637	55	65	45	55
25	Wooyung Road, Wooyung	1	Yes	56551275	6851844	60	70	45	60
26	Wooyung Road, Wooyung	2		56553046	6852236	55	65	45	55
27	Yelgun Road, Yelgun	2		56549266	6848944	55	65	45	55
28	Yelgun Road, Yelgun	2		56549179	6849099	55	65	45	55
29	The Pocket Road, Billinudgel	2		56550265	6847093	55	65	45	55
30	Hardy Avenue, Ocean Shores	2		56552970	6848562	55	65	45	55
31	The Tunnel Road, Billinudgel	2		56551603	6846410	55	65	45	55
32	Tweed Valley Way, Wooyung (Adjacent Venue Entry)	1		56550588	6848845	60	70	45	60
33	Brunswick Valley Way (Behind Yelgun Rest Stop)	1		56551204	6848092	60	70	45	60
34	Billinudgel Road, Billinudgel	1		56550380	6848394	60	70	45	60
35	Billinudgel Road, Billinudgel	1		56550324	6847879	60	70	45	60
36	Yelgun Road, Yelgun	1		56549445	6848764	60	70	45	60
37	Yelgun Road, Yelgun	1		56549366	6848979	60	70	45	60
38	Yelgun Road, Yelgun (Rental Unit fronting Yelgun Road)	1		56549387	6849021	60	70	45	60
39	Yelgun Road, Yelgun	1		56549516	6849087	60	70	45	60
40	Pacific Highway, Wooyung (Property before R17 on entry road)	1		56549736	6850583	60	70	45	60
41	Tweed Valley Way, Wooyung (Further up hill from R7)	1		56549752	6851142	60	70	45	60

Receptor Number	Address / Description	Zone	Agreement	Coordinates		Noise Limit 11pm - Midnight		Noise Limit Midnight - 2am	
				X	Y	dB(A)	dB(63Hz)	dB(A)	dB(63Hz)
42	Wooyung Road, Wooyung (Corner Wooyung / Pacific Motorway)	1		56549581	6851442	60	70	45	60
43	Jones Road, Wooyung	1	Yes	56552501	6850216	60	70	45	60
44	East of Jones Road, Wooyung (proposed development)	1		56552487	6849983	60	70	45	60
45	Tweed Valley Way, Yelgun	2		56549183	6851062	55	65	45	55
46	Yelgun Hill Road, Yelgun	2		56549200	6850879	55	65	45	55
47	Blue Gum Court, Crabbes Creek	2		56548030	6850988	55	65	45	55
48	Tweed Valley Way, Crabbes Creek	2		56548634	6852318	55	65	45	55
49	Hulls Road, Crabbes Creek	2		56549701	6852529	55	65	45	55
50	Hulls Road, Crabbes Creek	2		56549784	6852560	55	65	45	55
51	Hulls Road, Crabbes Creek	2		56550043	6852556	55	65	45	55
52	Hulls Road, Crabbes Creek	2		56550302	6852596	55	65	45	55
53	Hulls Road, Crabbes Creek	2		56550552	6852629	55	65	45	55
54	Hulls Road, Crabbes Creek	2		56550839	6852674	55	65	45	55
55	Hulls Road, Crabbes Creek (hill)	2		56551110	6852758	55	65	45	55
56	Hulls Road, Crabbes Creek (far end)	2		56551348	6852907	55	65	45	55
57	Wooyung Road, Wooyung	2		56552014	6852451	55	65	45	55
58	Wooyung Road, Wooyung	2		56552345	6852419	55	65	45	55
59	Wooyung Road, Wooyung	2		56552431	6852338	55	65	45	55
60	Wooyung Road, Wooyung	2		56552526	6852340	55	65	45	55

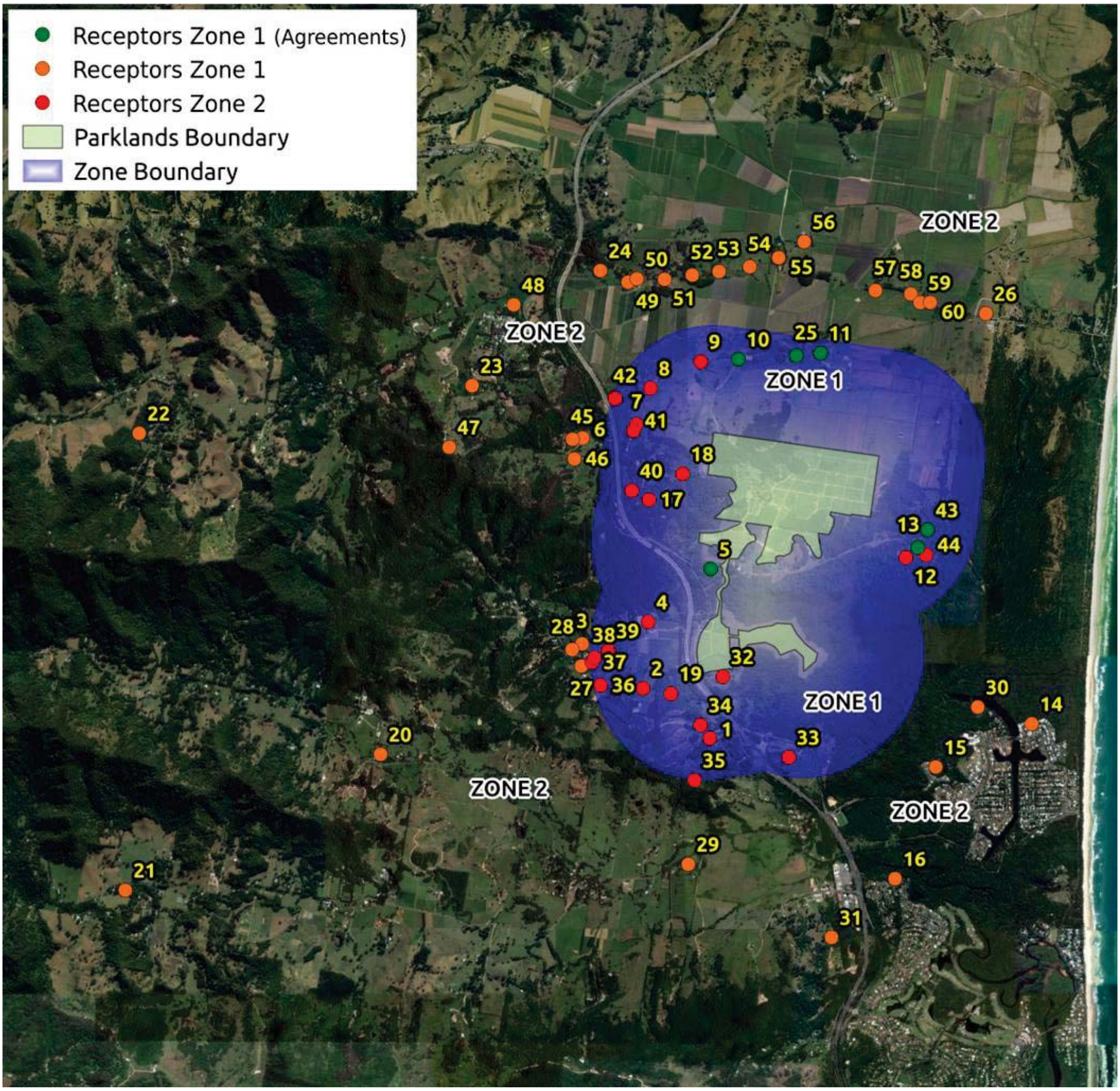


Figure 4.2: Site location and Noise Sensitive Receptors Considered in Acoustic Modelling

4.2.6 Amplified Music Source Noise Levels

Figures 4.3 and 4.4 present the modelled stage locations and orientations for the future scenario for the Permanent application, inclusive of:

- S3, Forest Stage (previously only utilised during Falls Festival).

Noise modelling for previous events has sought to optimise the stage locations to take advantage of topographic shielding, and to optimise the stage orientation to minimise off site noise impacts. The stage positions and orientation shown in Figure 4.4 for the existing stages, represents an optimised noise management scenario. For the new stage, the proposed orientation has been considered through iterative modelling and the orientations in Figure 4.4 were found to be best suited to minimising noise impacts, after consideration of the various viable orientations. Figure 4.5 presents a graphical render of the 3D modelling.

Having defined the source locations, the source noise characteristics must be determined. Noise propagation is highly dependent upon the frequency spectra of the noise source. To allow derivation of typical frequency spectra associated with the types of artist typically performing at Parklands events, noise monitoring data from historic events at Parklands have been analysed. For each stage measurements were made in 1/1 octave frequency bands at the front of house positions. Based on these measurements, source noise levels have been derived based on the 95th percentile of recorded $L_{Aeq,5min}$ front of house noise levels for the Amphitheatre stage. It is noted that analysis of front of house noise levels indicates all main stages operated at similar levels with less than 1 dB difference between the 95th percentile front of house noise levels measured during SITG 2014. This has been verified against monitoring results from subsequent events[12,13,14,15] and shown to be consistent for all events

The FoH L_{Aeq} noise levels presented in Table 4.2 represent the typical upper end emissions from the event during the headline act performances when noise management is not required due to adverse meteorology. In reality, front of house levels would typically be managed such that they increase throughout the day to the highest levels shown in Table 4.2 for the event headline acts. For the purposes of the modelling, the typical operating noise levels presented in Table 4.2 have been adopted. This is because the modelling represents worst case meteorological conditions, and the stages would not be operated to the maximum levels under such conditions.

Generally, when the weather is favourable (light winds or calm conditions), or winds are not in the direction of significantly impacted sensitive receiver areas (e.g. winds blowing toward the ocean), the stages have been found to operate at the measured upper limits (and occasionally higher) in Table 4.2 while maintaining compliance off-site. However, the ISO 9316-2 calculation methodology

12 Falls Festival 2015 Monitoring Report – Final, Look Up and Live Pty Ltd, prepared by Air Noise Environment (March 2016)

13 Splendour in the Grass 2016 – Post Event Noise Impact Report, North Byron Parklands, prepared by Air Noise Environment (18 January 2017)

14 Falls Festival 2016 – Post Event Noise Impact Report, North Byron Parklands, prepared by Air Noise Environment (31 March 2017)

15 Splendour in the Grass – Post Event Noise Impact Report, North Byron Parklands, prepared by Air Noise Environment (7 September 2017)

does not provide for a true 'calm' scenario, and as such modelling has considered the statistically derived upper volume adopted during 'typical worst-case' weather conditions.

Since the commencement of the Modified Approval, which introduced a frequency based criteria, the FOH levels for low frequency noise ('C' weighted) have typically been 10 dB higher than the adopted A-weighted levels. This has been identified as the optimal differential targeted by sound engineers in recognition of both the importance of low frequency content to the patron experience and the potential amenity impacts for nearby residences. Adoption of these source noise levels (when combined with the recommended low frequency noise limits) has been shown to result in a significant improvement in acoustic amenity for the community.

Frequency spectra for each of the stages included in the acoustic model are presented in Appendix B.

Table 4.2: Modelled Source Noise Levels – Main Stages

Stage	Upper Noise Limits @ FOH		Typical Operating Levels @ FOH		Midnight – 2am Limits @ 10m	
	L_{Aeq}	L_{Ceq}	L_{Aeq}	L_{Ceq}	L_{Aeq}	L_{Ceq}
S1 - Amphitheatre	102	112	99	109	0	0
S3 - Forest	102	112	99	109	0	0
S4 - McLennan	100	110	99	109	0	0
S6 – Tiny Dancer	102	112	99	109	0	0
S7 – Mix Up	102	112	99	109	0	0

Table 4.3: Modelled Source Noise Levels – Minor Stages

Stage	Adopted Typical Limits @ 10m		Midnight – 2am Limits @ 10m	
	L_{Aeq}	L_{Ceq}	L_{Aeq}	L_{Ceq}
S2 - Tipi	95	105	95	105
S5 - World	93	105	93	105
S9 – Cabaret Tent	91	101	91	101
V1 - Minor	95	105	95	105
V2 - Minor	95	105	95	105
V3 - Minor	95	105	95	105
V4 - Minor	95	105	95	105
V5 - Minor	95	105	95	105

Stage	Adopted Typical Limits @ 10m		Midnight – 2am Limits @ 10m	
	L_{Aeq}	L_{Ceq}	L_{Aeq}	L_{Ceq}
V6 - Minor	95	105	95	105
V7 - Minor	95	105	95	105
V8 - Minor	95	105	95	105
V9 - Minor	95	105	95	105
V10 - Minor	95	110	95	110

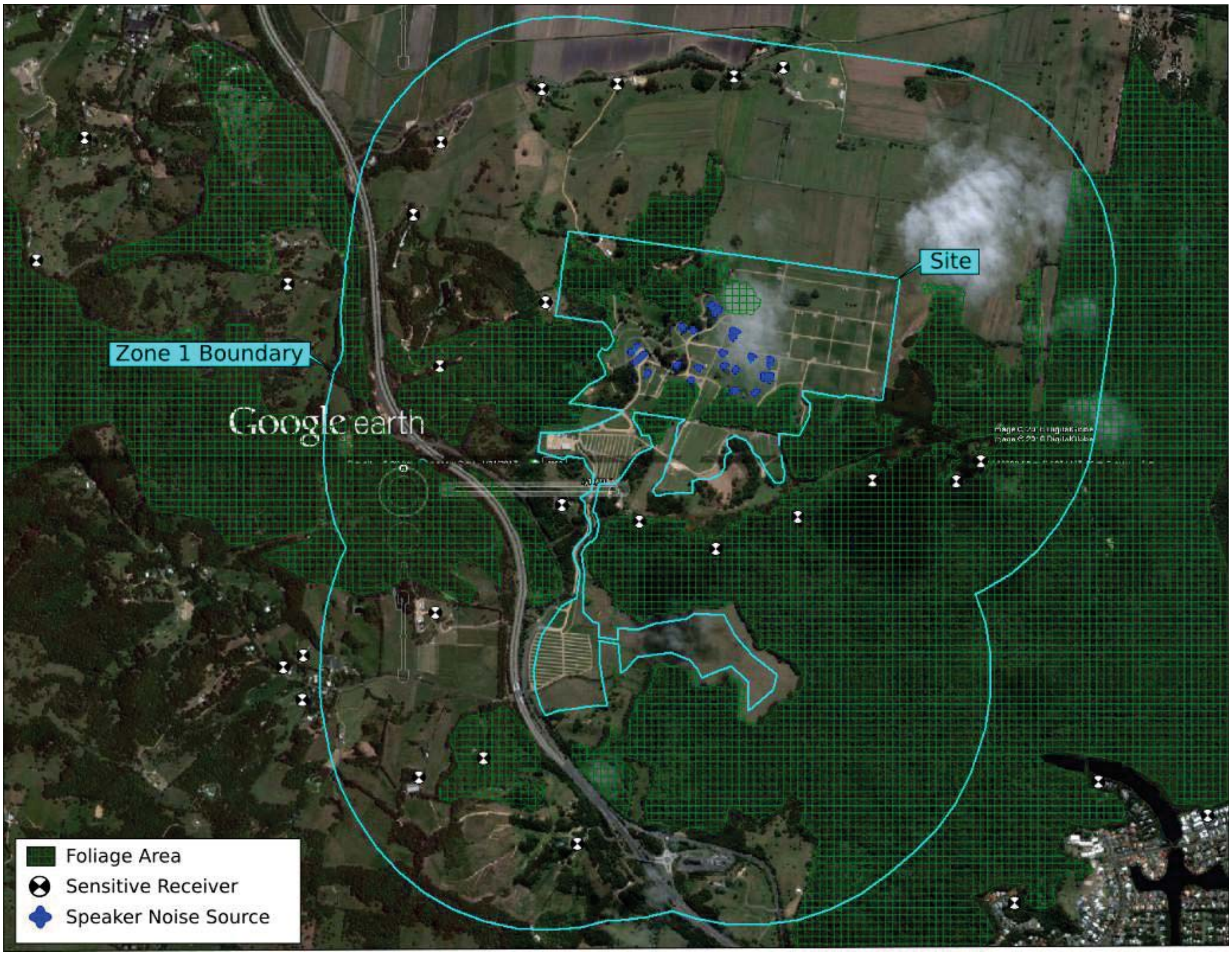


Figure 4.3 - Cadna/A Modelling – Zone 1

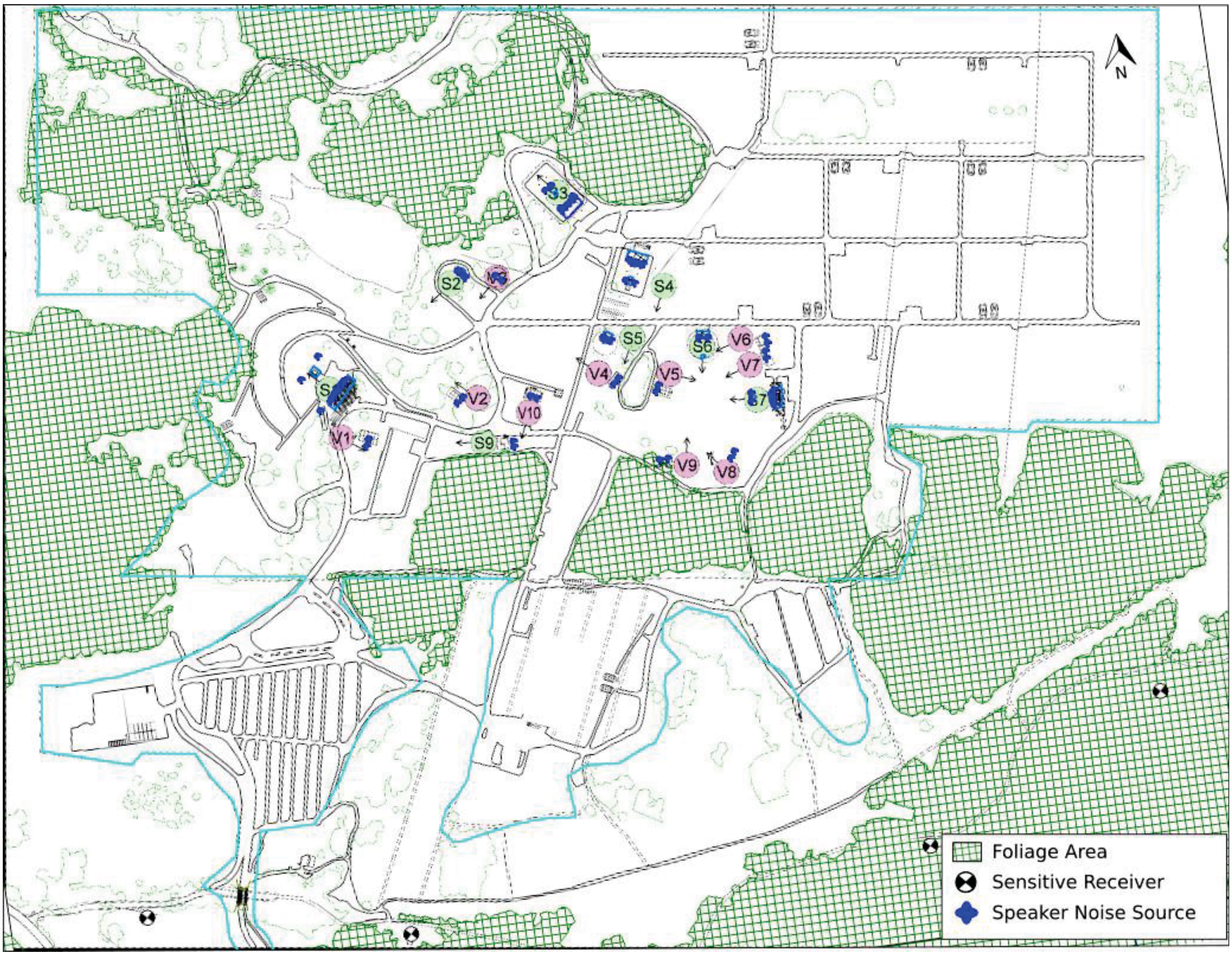


Figure 4.4 - Cadna/A Modelling – Stage Arrangements

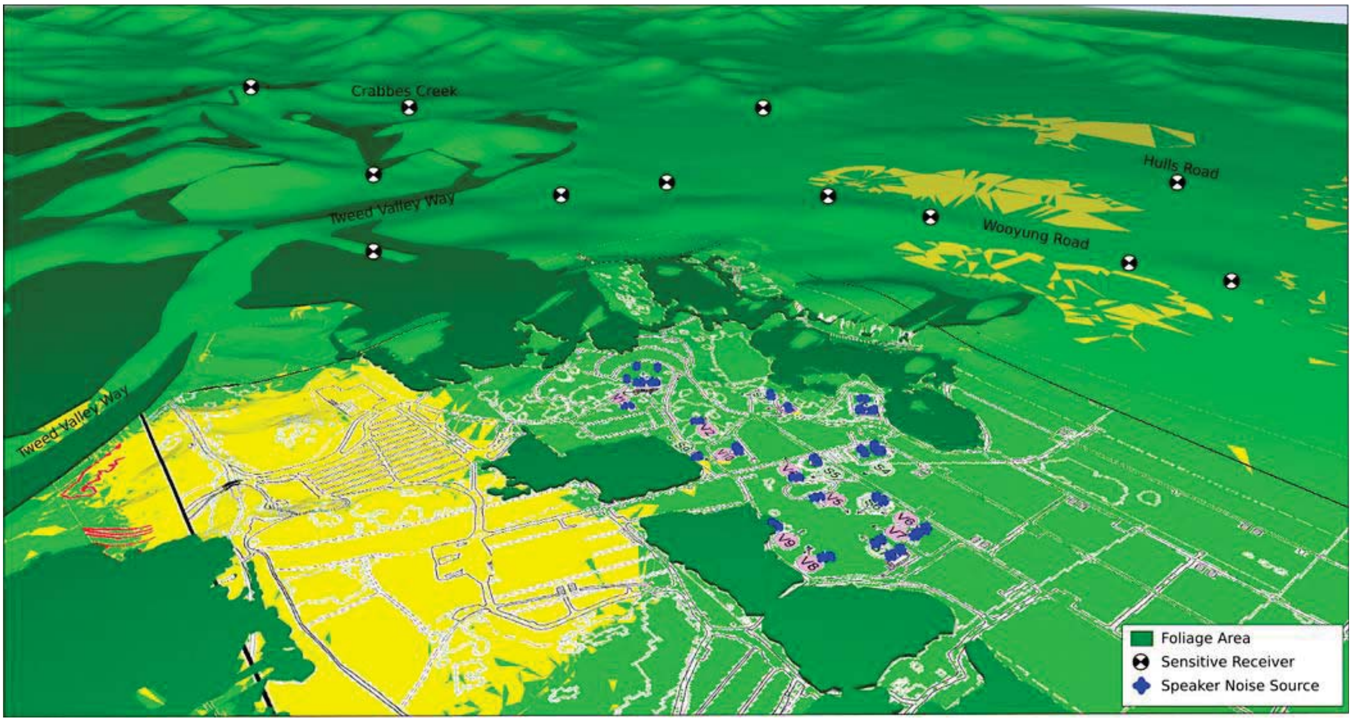


Figure 4.5 - Cadna/A Modelling – Render of Site Looking North-West

4.2.7 Sound System Characteristics

In addition to the absolute noise level and the frequency distribution of noise generated by an event stage, the sound system used also has a significant influence on sound propagation from the venue. For the purposes of the modelling, the updated sound system setup utilised for SITG 2017, as well as the potential to have the Forest Stage (from Falls Festival) operating (S3 in Figure 4.4) has been included in the acoustic model.

In 2017 the SITG system design team undertook an extensive review of all the large audio systems across the festival and the major areas, to optimise the noise levels within the venue/crowd areas, while reducing the noise spill to the surrounding area. as follows:

- Review of the types of speaker boxes used at each stage and the application of new or more suitable boxes where implemented.
- Ensuring that all systems where flown as high as possible and pointing down into the crowd to reduce sound pressure leaving the venue footprint.
- Using Sub Cardiod speaker boxes configurations at each stage where the speaker system was compatible to do so.
- Delay systems and or additional delay towers added to main venues to reduce the need for more volume from the main left and right hangs of PA.
- For the Amphitheatre stage the system also employed a distributed sound system with delay

towers used to fill directed sound beyond the mixing desk location.

Propagation characteristics for the typical speaker types utilised have been included in the modelling. The Cadna/A model and ISO 9613 modelling methodology does not fully account for the benefit of hanging J-curve speaker arrangements and the improved sound directivity associated with this arrangement. These speakers allow higher audience noise levels, while minimising the off-site noise levels. This also contributes to the conservatism inherent in the modelling approach.

Another aspect of the modelling that introduces conservatism relates to the approach adopted for modelling the bars, cafes and dance floors. These smaller venues are assumed to radiate noise in all directions (no directivity assumed for the individual sound sources). Where enclosures or tents are proposed to be constructed around minor stages and bars these structures have been assumed to be acoustically transparent for the purposes of the predictions. Hence the modelling of emissions from these sources also includes some conservatism hence represents a worst-case prediction.

4.3 Modelling Results

4.3.1 Scenario 1: Base Case

The base case considers both the existing SITG and Falls events, to allow validation of the noise model to the existing performance of the venue. Figures 4.6 and 4.7 present the stage layouts for these two events. Figure 4.4 presents the adopted FOH source noise levels as included in the acoustic model.

The results of the modelling are presented in this section as follows:

- Table 4.5 presents the predicted L_{Aeq} and $L_{eq,Oct\text{-}63Hz}$ receptor noise levels between 11 am and midnight.
- Figures 4.8 and 4.9 present the predicted L_{Aeq} and $L_{eq,Oct\text{-}63Hz}$ noise contours between 11 am and midnight (when main stages are operating).

The results represent the maximum predicted noise levels, for:

- all stages operating simultaneously;
- stages operating at highest operating volumes during worst case wind directions;
- predicted for a typical worst case down-wind scenario (to each individual receiver position);and
- for each modelled receptor position (individual and gridded receptors).

Results presented in **bold** are noted to exceed the criteria for all stages operating simultaneously. It is noted that it is rare for all stages to be operating simultaneously, and often stages will not operate at the maximum volume for significant portions of their performance.

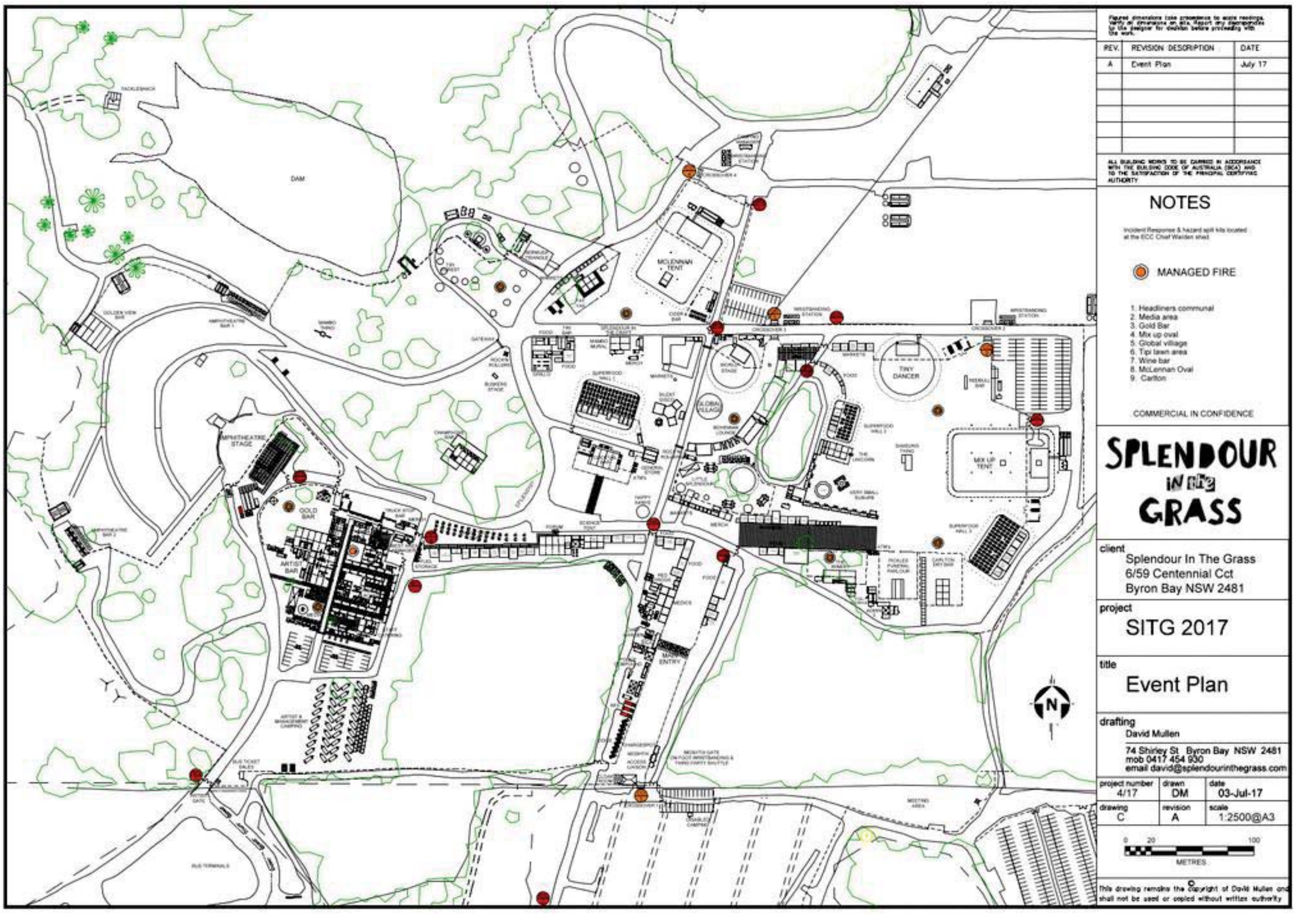


Figure 4.6 - Event Stage Layout – Splendour in the Grass 2017

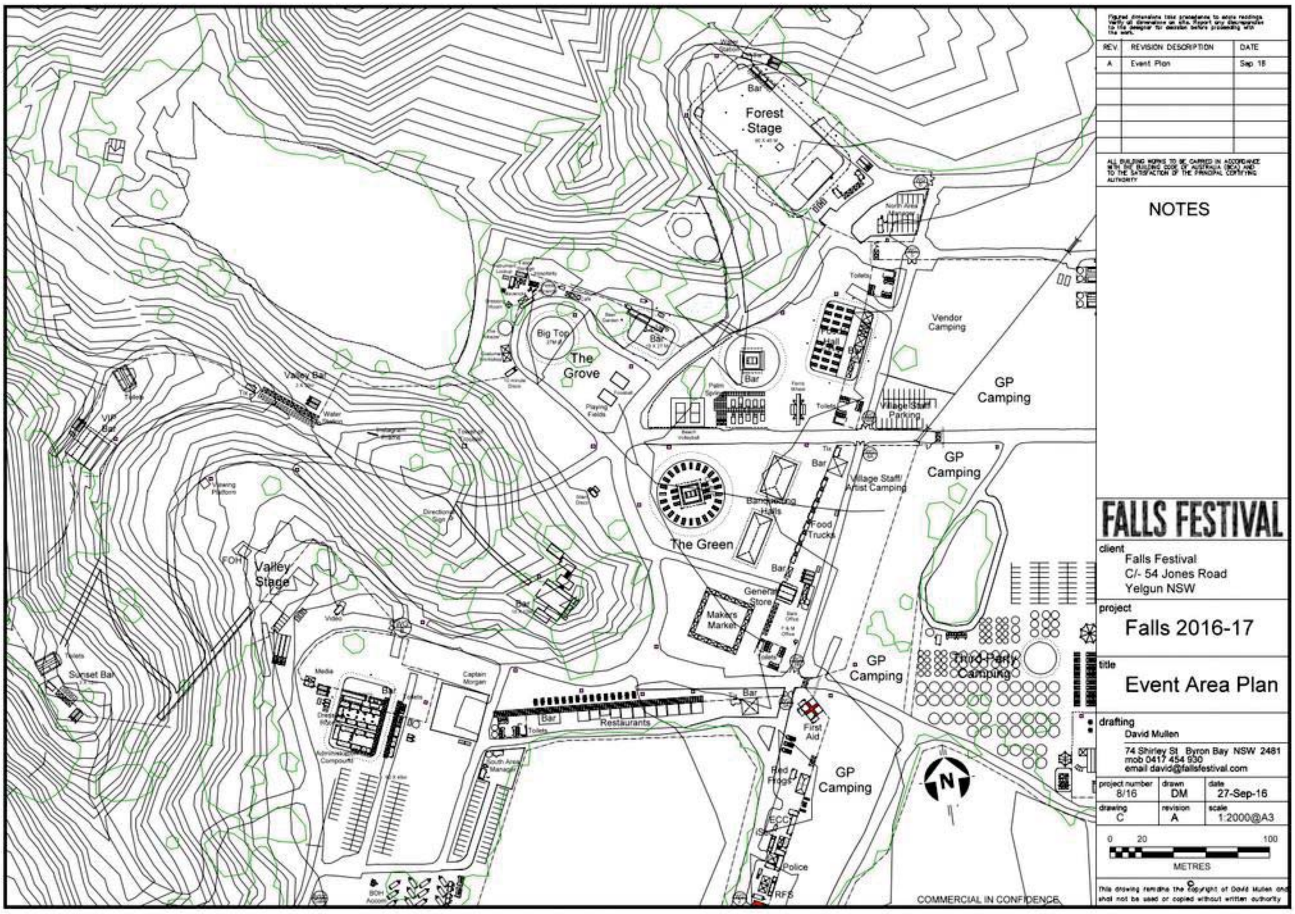


Figure 4.7 - Event Stage Layout – Falls Festival 2016-2017

Table 4.4: Modelled FOH Noise Levels – All Stages, Bars, Cafes and Dance-floors

Stage	SPLENDOUR IN THE GRASS 11am - Midnight		FALLS FESTIVAL Midnight - 2am		Distance (FOH)
	dB(A)	dB(C)	dB(A)	dB(C)	
Amphitheatre	99	109	99	109	30m / 35m
Mix Up	99	109	-	-	22.5m
Forest	-	-	99	109	30m
McLennan	99	109	-	-	20m
Tiny Dancer	99	109	-	-	10m
World Stage / The Green	95	105	95	105	10m
Smirnoff Cocktail	95	105	-	-	10m
Tipi Forest / Big Top	95	105	95	105	10m
Bollywood / Lola's	95	105	95	105	10m
Carlton Bar	95	105	-	-	10m
Tent of Miracles	95	105	-	-	10m
SiTG Red Bull	95	105	-	-	10m
Wine Bar	95	105	-	-	10m
Moet Bar / Bar 6	95	105	95	105	10m
Gold Bar	95	105	95	105	10m
Forum	90	100	-	-	10m
Falls Red Bull	-	-	95	105	10m

Table 4.5: Predicted Receptor Noise Levels – Scenario 1 Base Case (All Sources, 11am-midnight)

Receptor Number	Zone	Predicted dB(A)		Criteria	Predicted dB,Oct-63Hz		Criteria
		SITG 2017	FALLS 2016		SITG 2017	FALLS 2016	
1	1	52	41	60	64	59	70
2	1	53	43	60	64	60	70
3	2	52	43	55	64	60	65
4	1	56	47	[illegible]	[illegible]	62	70
5	1	**65**	55	[illegible]	[illegible]	[illegible]	[illegible]
6	2	52	50	55	65	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	67	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	67	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	66	64	70
10	1	[illegible]	57	60	66	66	70
11	1	59	52	60	**72**	66	70
12	1	55	43	60	66	61	70

Actual 62dB 63Hz 15min 11am-Mid

Actual 62dB 63Hz 15min 11am-Mid. 64dB 63Hz 15min Mid-2am when criteria is 60dB

Actual 53dBA Leq 15min 11am-Mid. 48dBA Leq 15min Mid-2am

Actual <45dBA Leq 15min 11am-Mid and Mid-2am

Therefore Falls Festival after midnight LF is underestimated. Or the low frequency noise is coming from elsewhere within the site.

Receptor Number	Zone	Predicted dB(A)		Criteria	Predicted $dB_{,Oct-63Hz}$		Criteria
		SITG 2017	FALLS 2016		SITG 2017	FALLS 2016	
13	1	57	44	60	67	61	70
14	2	45	34	55	58	55	65
15	2	47	36	55	62	58	65
16	2	44	33	55	58	54	65
17	1	60	56	60	69	67	70
18	1	57	53	60	69	66	70
19	1	53	43	60	64	60	70
20	2	42	36	55	58	54	65
21	2	33	29	55	53	49	65
22	2	39	37	55	55	53	65
23	2	44	43	55	61	56	65
24	2	52	51	55	62	60	65
25	1	59	54	60	**71**	66	70
26	2	49	40	55	63	59	65
27	2	52	43	55	64	60	65
28	2	51	43	55	64	60	65
29	2	45	35	55	60	54	65
30	2	48	37	55	60	56	65
31	2	42	32	55	58	53	65
32	1	56	45	60	66	61	70
33	1	51	40	60	65	58	70
34	1	52	42	60	64	59	70
35	1	52	41	60	**71**	63	70
36	1	52	43	60	64	59	70
37	1	52	43	60	64	60	70
38	1	52	44	60	64	60	70
39	1	53	44	60	65	60	70
40	1	57	51	60	67	64	70
41	1	53	50	60	66	62	70
42	1	54	53	60	66	63	70
43	1	58	44	60	**73**	62	70
44	2	55	42	60	66	61	70
45	2	52	50	55	65	62	65
46	2	53	51	55	65	63	65
47	2	50	46	55	62	60	65
48	2	51	50	55	62	59	65
49	2	54	52	55	63	61	65
50	2	54	52	55	63	61	65

Receptor Number	Zone	Predicted dB(A)		Criteria	Predicted dB,Oct-63Hz		Criteria
		SITG 2017	FALLS 2016		SITG 2017	FALLS 2016	
51	2	54	53	55	63	62	65
52	2	54	52	55	63	62	65
53	2	54	52	55	62	63	65
54	2	53	51	55	62	63	65
55	2	53	50	55	**66**	62	65
56	2	51	48	55	61	62	65
57	2	52	46	55	65	62	65
58	2	51	44	55	62	61	65
59	2	51	44	55	62	61	65
60	2	50	43	55	62	60	65

[a] Note: Results presented in **BOLD** exceed the criteria for all stages operating simultaneously

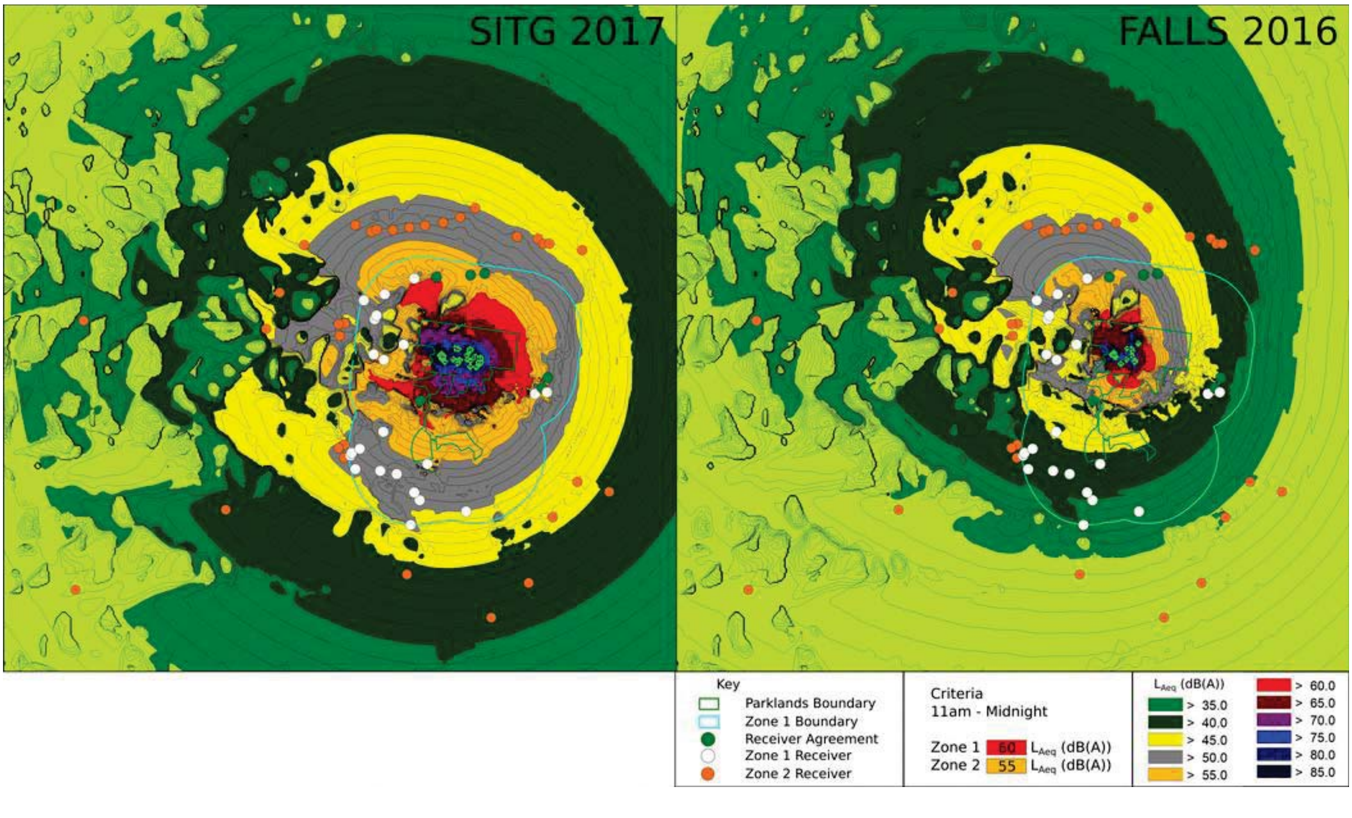


Figure 4.8 - Scenario 1, Base Case, Noise Contour Plot, 11am – Midnight (dB(A))

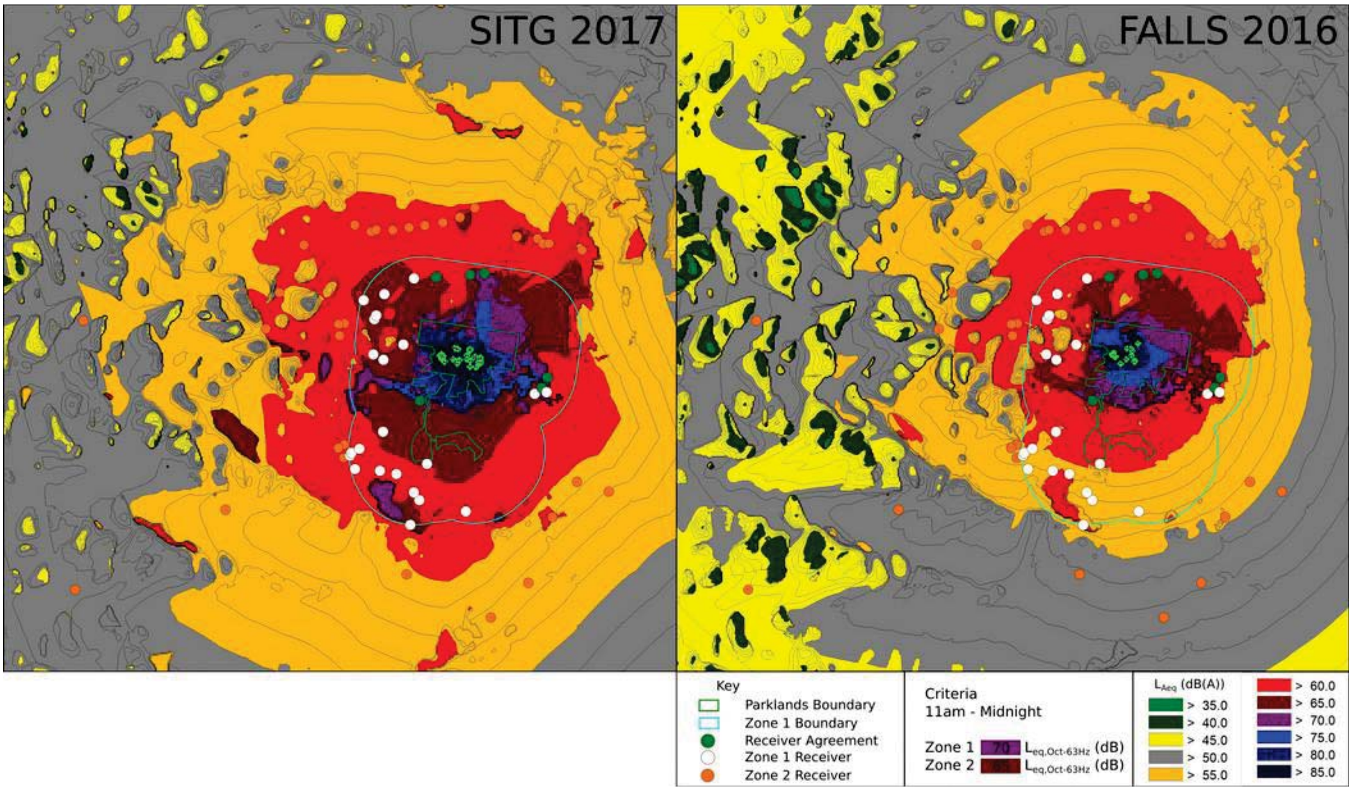


Figure 4.9 - Scenario 1 Base Case, Noise Contour Plot, 11am – Midnight (dB(C))

The results of the predictive noise modelling indicates that from 11am to midnight where all stages and venues are assumed to be operating, compl the modelled sensitive off-site receivers.

Where are the predictions for SITG 2017 and Falls 2016 for Midnight to 2am? This is the period where some of the breaches at R12 were observed.

For the modelling of SITG, 2 sensitive receptors both of which have noise agreements with Parklands in place. 6 sensitive receptors have a predicted exceedances ranging from 1 to 3 dB for the $L_{Oct-63\ Hz}$ criteria, with 4 of these having existing noise agreements in place.

No receivers are predicted to exceed the criteria for Falls Festival. This is consistent with monitoring of the two events. SITG is a larger event with additional stages and venues resulting in a potential for increased community noise.

Review of the noise contour plots highlight that SITG results in greater noise propagation into the surrounding area. This is related to the increased number of stages relative to Falls, and the presence of two larger stages oriented southward (GW McLennan, and Tiny Dancer stages).

Overall the modelling correlates well with the monitoring data from previous events, whereby under stable light-downwind conditions, with FOH noise levels of approximately 99 dB(A) and 109 dB(C), the noise limits are usually achieved at all off-site receivers.

Based on experience of previous events, it is noted that the modelling over-predicts in some specific areas. This specifically relates to receptor R6 to the west, and receptor R26 to the north-east. This suggests that the model may be underestimating one or more of the following:

- terrain shielding;
- vegetation and ground absorption; and
- on-site treatments (e.g. tent and stage enclosures, cardiod sub treatments, speaker hangs, truck bodies, crowd and intervening structure shielding and absorptions).

Alternatively, the model may simply represent the most conservative meteorological scenarios, through the corrections included in the model (refer to Section 4.2.4).

4.3.2 Scenario 2: Proposed Permanent Full Scale

The results of the modelling for the proposed event layout (Figure 4.4) for the FOH noise levels presented in Table 4.6 are provided in this section as follows:

- Tables 4.7 to 4.8 present predicted L_{Aeq} and $L_{eq,Oct\text{-}63Hz}$ receptor noise levels for operations between 11 am and midnight (when all stages are operating).
- Figures 4.10 and 4.11 present predicted L_{Aeq} and $L_{eq,Oct\text{-}63Hz}$ noise contours for operations between 11 am and midnight (when all stages are operating).
- Tables 4.9 to 4.10 present predicted L_{Aeq} and $L_{eq,Oct\text{-}63Hz}$ receptor noise levels as a result of emissions from the future proposed venue layouts, for the period midnight to 2 am.
- Figures 4.12 and 4.13 present predicted L_{Aeq} and $L_{eq,Oct\text{-}63Hz}$ noise contours for the period midnight to 2 am (where only bars, cafes and dance floors operate).

The results represent the maximum predicted noise levels, for:

- all **proposed** stages operating simultaneously,
- stages operating at highest operating volumes during worst case wind directions(based on historic SITG and Falls Festival events),
- predicted for a down-wind scenario (to each individual receiver position),
- for each modelled receptor position (individual and gridded receptors).

Results presented in **bold** are noted to exceed the criteria for all stages operating simultaneously. It is noted that it is rare for all stages to be operating simultaneously, and often stages will not operate at the maximum volume (as modelled) for portions of their performance. It is noted that the main stages S1, S3, S4, S6, S7 will not operate after midnight. Due to modelling limitations, predictions of stage contributions for $L_{eq,Oct\text{-}63Hz}$ have only been presented where the criteria is predicted to be exceeded.

Table 4.6: Scenario 2: Modelled FOH Noise Levels

Stage	11am - Midnight		Midnight - 2am		Distance (FOH)
	dB(A)	dB(C)	dB(A)	dB(C)	
S1	99	109	-	-	35m
S2	95	105	95	105	16m
S3	99	109	-	-	22m
S4	99	109	-	-	20m
S5	95	105	95	105	10m
S6	99	109	-	-	25m
S7	99	109	-	-	22.5m
S9	91	101	91	101	10m
V1	95	105	95	105	10m
V2	95	105	95	105	10m
V3	95	105	95	105	10m
V4	95	105	95	105	10m
V5	95	105	95	105	10m
V6	95	105	95	105	10m
V7	95	105	95	105	10m
V8	95	105	95	105	10m
V9	95	105	95	105	10m
V10	95	105	95	105	10m

Table 4.7: Scenario 2: Predicted L_{Aeq} Receptor Noise Levels – All Stages, Bars, Cafes and Dance-floors (11am-midnight)

Receptor Number	Zone	Predicted[a] dB(A)	Limit dB(A)	Predicted Noise Level, 11am - Midnight																	
				S1	S2	S3	S4	S5	S6	S7	S9	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
1	1	52	60	48	36	36	45	34	44	40	21	29	24	32	23	25	29	29	25	23	35
2	1	53	60	50	39	38	46	35	43	41	25	28	26	34	25	24	32	32	27	23	36
3	2	52	55	49	35	39	44	33	41	41	26	25	28	33	26	22	31	31	28	23	34
4	1	56	60	53	37	42	49	38	46	46	30	27	31	35	29	26	35	36	31	26	39
5	1	**65**	60	62	51	50	58	47	55	55	38	41	39	47	37	33	44	44	39	32	49
6	2	53	55	47	40	46	44	31	39	46	30	22	36	32	34	23	32	32	34	28	29
7	1	54	60	46	39	45	45	33	42	49	31	16	39	30	38	26	33	34	38	31	31
8	1	59	60	57	41	48	45	33	41	48	25	25	39	32	38	25	32	32	38	32	29
9	1	59	60	58	32	40	40	28	34	42	25	26	39	24	34	24	28	28	34	33	28
10	1	**61**	60	60	36	50	47	34	43	49	28	29	41	25	39	27	32	32	39	39	29
11	1	60	60	55	39	54	50	34	46	53	25	29	35	29	35	30	32	32	38	44	30
12	1	55	60	50	37	42	48	35	49	43	21	37	27	29	27	40	30	30	29	30	31
13	1	57	60	52	39	44	50	37	51	46	23	39	28	30	28	44	31	31	31	34	33
14	2	46	55	43	27	31	37	25	37	31	14	29	20	21	19	28	20	20	20	20	24
15	2	48	55	45	29	34	40	28	40	34	15	29	27	24	19	28	22	22	21	21	28
16	2	44	55	41	26	28	36	24	35	29	13	25	18	21	16	22	19	19	18	18	25
17	1	**61**	60	58	44	48	51	39	47	52	39	29	41	39	38	28	39	39	40	31	38
18	1	58	60	53	40	49	48	31	40	53	35	22	39	34	36	28	34	33	41	34	32
19	1	53	60	50	38	37	46	35	44	41	24	29	26	34	24	24	31	31	26	23	36
20	2	42	55	40	26	30	33	21	28	28	16	16	19	22	17	14	22	22	19	15	24
21	2	34	55	31	17	21	26	12	20	20	10	9	13	15	11	9	15	15	13	10	16
22	2	39	55	38	21	25	26	13	19	25	14	12	19	16	16	11	17	17	17	12	15
23	2	44	55	40	29	36	36	23	30	37	21	15	26	23	26	18	25	25	27	21	22
24	2	53	55	52	32	45	38	25	32	38	22	21	32	23	30	19	24	24	30	27	23
25	1	**61**	60	57	30	55	49	34	45	53	26	27	37	28	37	30	33	33	36	41	30
26	2	49	55	46	30	41	41	27	37	40	16	24	29	22	24	27	22	22	24	31	26
27	2	52	55	49	37	38	44	32	40	40	25	25	26	33	24	22	30	31	27	22	34
28	2	52	55	49	36	39	44	32	40	41	26	24	27	33	25	22	31	31	27	22	34
29	2	45	55	42	25	29	38	26	36	32	15	23	19	26	17	20	23	23	19	18	28
30	2	48	55	45	29	34	40	28	40	35	15	31	22	23	21	31	22	23	22	22	27
31	2	42	55	40	25	26	35	23	33	28	12	22	17	21	15	20	19	19	17	16	25
32	1	56	60	52	40	41	49	39	49	45	26	33	28	36	26	28	33	33	29	26	40
33	1	51	60	48	34	35	44	33	44	39	19	30	23	29	21	27	27	27	24	23	34
34	1	52	60	49	37	37	46	35	44	40	22	29	25	33	23	25	30	30	26	23	36
35	1	52	60	48	34	37	46	35	46	40	19	26	30	30	26	28	30	31	23	21	35
36	1	52	60	49	38	38	44	33	41	40	24	26	26	33	24	22	30	30	26	22	34
37	1	52	60	50	38	39	44	33	41	41	25	26	27	34	25	22	31	31	27	22	34
38	1	53	60	50	38	39	45	33	41	41	26	26	27	34	25	22	31	31	27	22	35
39	1	53	60	51	38	39	46	34	42	42	27	27	28	35	26	23	32	32	28	23	36
40	1	57	60	54	38	40	49	37	45	50	37	26	40	35	37	26	37	37	38	30	36
41	1	54	60	44	39	47	47	34	42	49	28	18	37	32	37	26	34	34	38	31	31
42	1	56	60	52	40	49	45	32	40	46	31	21	39	31	36	24	32	32	36	30	29
43	1	58	60	52	40	46	51	39	52	48	24	40	29	30	27	42	30	30	32	36	32
44	2	55	60	50	37	43	48	34	48	43	21	37	27	28	26	41	28	28	29	31	31
45	2	53	55	49	39	45	43	31	39	45	30	23	36	31	33	23	32	32	34	27	30
46	2	54	55	51	39	46	44	31	39	45	31	23	36	32	33	23	33	33	34	27	31
47	2	50	55	49	33	37	37	24	31	37	24	19	29	26	26	18	26	26	27	21	24
48	2	51	55	50	31	41	36	23	30	37	22	20	31	23	28	18	24	24	28	24	22
49	2	54	55	53	33	46	40	26	34	40	23	22	34	25	32	20	25	25	31	29	24
50	2	54	55	53	33	47	40	27	34	40	23	22	34	24	32	21	25	25	31	29	24
51	2	55	55	54	34	48	41	27	35	41	23	22	34	25	32	21	26	26	32	30	24
52	2	55	55	54	34	48	41	28	35	41	23	23	34	24	33	22	26	26	32	32	24
53	2	55	55	53	34	48	41	28	35	41	22	23	34	23	33	22	26	25	32	33	24
54	2	55	55	52	34	48	41	28	35	41	22	23	33	23	32	23	25	25	31	33	24
55	2	54	55	52	33	47	42	28	35	45	21	23	32	24	31	23	29	29	30	34	25
56	2	52	55	50	32	45	40	26	33	39	19	22	30	22	29	23	23	23	28	33	23
57	2	53	55	50	33	45	44	28	40	44	19	25	33	24	28	31	29	29	33	37	26
58	2	52	55	48	32	43	43	27	39	43	18	25	32	24	27	26	23	23	27	34	29
59	2	51	55	48	32	43	43	27	36	43	18	25	29	24	26	27	23	23	27	34	29
60	2	51	55	48	32	43	42	27	36	42	17	25	29	24	26	27	23	23	26	33	29

[a] Note: Results presented in **BOLD** exceed the criteria for all stages operating simultaneously

Table 4.8: Scenario 2: Predicted $L_{eq,Oct\text{-}63Hz}$ Receptor Noise Levels – All Stages, Bars, Cafes and Dance-floors (11am-midnight)

Receptor Number	Zone	Predicted[a] $dB_{,Oct\text{-}63Hz}$	Limit dB	Predicted Noise Level, 11am - Midnight																	
				S1	S2	S3	S4	S5	S6	S7	S9	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
1	1	64	70																		
2	1	65	70																		
3	2	65	65																		
4	1	67	70																		
5	1	**73**	70	67	62	64	65	54	63	67	49	55	55	57	52	50	52	52	53	51	57
6	2	**66**	65	57	56	59	56	44	52	59	44	43	53	49	50	44	45	45	49	45	45
7	1	68	70																		
8	1	69	70																		
9	1	67	70																		
10	1	70	70																		
11	1	**72**	70	62	46	58	48	40	52	71	40	48	53	50	51	47	45	45	50	53	47
12	1	66	70																		
13	1	67	70																		
14	2	59	65																		
15	2	62	65																		
16	2	58	65																		
17	1	69	70																		
18	1	69	70																		
19	1	64	70																		
20	2	59	65																		
21	2	54	65																		
22	2	56	65																		
23	2	61	65																		
24	2	**66**	65	60	50	63	42	37	44	52	39	43	51	43	47	41	41	41	47	45	42
25	1	**72**	70	62	43	65	46	39	51	70	41	48	54	50	52	48	50	50	51	53	48
26	2	65	65																		
27	2	65	65																		
28	2	65	65																		
29	2	60	65																		
30	2	60	65																		
31	2	58	65																		
32	1	66	70																		
33	1	65	70																		
34	1	64	70																		
35	1	**71**	70	63	52	42	66	48	66	53	36	46	56	47	50	52	53	53	42	42	57
36	1	65	70																		
37	1	65	70																		
38	1	66	70																		
39	1	66	70																		
40	1	67	70																		
41	1	68	70																		
42	1	68	70																		
43	1	**73**	70	59	57	48	70	56	70	46	41	53	50	48	48	54	47	47	50	49	48
44	2	66	70																		
45	2	**66**	65	59	55	59	56	44	52	59	43	45	53	49	49	43	45	45	49	45	45
46	2	**66**	65	60	56	57	53	45	53	59	44	45	53	49	49	44	46	46	49	44	46
47	2	62	65																		
48	2	65	65																		
49	2	**66**	65	61	50	64	40	37	45	52	39	44	52	44	48	42	41	41	47	46	43
50	2	**66**	65	61	50	64	38	37	45	52	39	44	52	44	48	42	41	41	47	46	43
51	2	**67**	65	61	50	64	35	36	44	50	39	45	52	45	49	42	41	41	48	47	43
52	2	**67**	65	61	49	65	41	36	44	46	39	45	52	45	49	43	41	41	48	48	43
53	2	**67**	65	60	48	65	47	35	44	43	38	45	52	45	49	43	41	41	48	48	44
54	2	**66**	65	59	46	64	43	34	45	49	38	45	51	45	48	43	41	41	47	49	44
55	2	**68**	65	58	45	62	40	34	46	65	37	44	50	45	48	43	51	51	47	49	43
56	2	63	65																		
57	2	65	65																		
58	2	64	65																		
59	2	65	65																		
60	2	64	65																		

Why are these values not shown?

[a] Note: Results presented in **BOLD** exceed the criteria for all stages operating simultaneously

Table 4.9: Scenario 2: Predicted L_{Aeq} Receptor Noise Levels – Bars, Cafes and Dance-floors Only (midnight-2am)

Receptor Number	Zone	Predicted[a] dB(A)	Limit dB(A)	Predicted Noise Level, Midnight – 2am																	
				S1	S2	S3	S4	S5	S6	S7	S9	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
1	2	42	45		36			32			26	24	27	33	25	22	31	31	27	22	34
2	2	32	45		26			21			16	16	19	22	17	14	22	22	19	15	24
3	1	**46**	45		40			39			26	33	28	36	26	28	33	33	29	26	40
4	2	25	45		17			12			10	9	13	15	11	9	15	15	13	10	16
5	1	45	45		40			31			31	21	39	31	36	24	32	32	36	30	29
6	1	40	45		34			33			19	30	23	29	21	27	27	27	24	23	34
7	2	44	45		40			31			30	22	36	32	34	23	32	32	34	28	29
8	2	44	45		39			31			30	23	36	31	33	23	32	32	34	27	30
9	2	44	45		39			31			31	23	36	32	33	23	33	33	34	27	31
10	2	28	45		21			12			14	12	19	16	16	11	17	17	17	12	15
11	2	38	45		33			24			24	19	29	26	26	18	26	26	27	21	24
12	1	43	45		37			35			22	29	25	33	23	25	30	30	26	23	36
13	1	43	45		38			35			24	29	26	34	24	24	31	31	26	23	36
14	2	36	45		29			23			21	15	26	23	26	18	25	25	27	21	22
15	1	**46**	45		39			34			28	18	37	32	37	26	34	34	38	31	31
16	1	**46**	45		39			33			31	16	39	30	38	26	33	34	38	31	31
17	2	37	45		31			23			22	20	31	23	28	18	24	24	28	24	22
18	1	42	45		34			34			19	26	30	30	26	28	30	31	23	21	35
19	2	39	45		32			25			22	21	32	23	30	19	24	24	30	27	23
20	1	42	45		38			32			24	26	26	33	24	22	30	30	26	22	34
21	1	43	45		38			33			25	26	27	34	25	22	31	31	27	22	34
22	1	43	45		38			33			26	26	27	34	25	22	31	31	27	22	35
23	1	45	45		37			35			21	37	27	29	27	40	30	30	29	30	31
24	1	43	45		38			34			27	27	28	35	26	23	32	32	28	23	36
25	1	**46**	45		37			38			30	27	31	35	29	26	35	36	31	26	39
26	1	**56**	45		51			47			38	41	39	47	37	33	44	44	39	32	49
27	2	40	45		33			26			23	22	34	25	32	20	25	25	31	29	24
28	2	40	45		33			26			23	22	34	24	32	21	25	25	31	29	24
29	2	34	45		25			26			15	23	19	26	17	20	23	23	19	18	28
30	1	42	45		36			34			21	29	24	32	23	25	29	29	25	23	35
31	1	**47**	45		40			39			24	40	29	30	27	42	30	30	32	36	32
32	2	45	45		37			34			21	37	27	28	26	41	28	28	29	31	31
33	1	**46**	45		41			33			25	25	39	32	38	25	32	32	38	32	29
34	1	43	45		32			28			25	26	39	24	34	24	28	28	34	33	28
35	1	44	45		39			35			25	28	26	34	25	24	32	32	27	23	36
36	2	41	45		34			27			23	22	34	25	32	21	26	26	32	30	24
37	2	41	45		34			27			23	23	34	24	33	22	26	26	32	32	24
38	1	**47**	45		36			34			28	29	41	25	39	27	32	32	39	39	29
39	2	41	45		34			28			22	23	34	23	33	22	26	25	32	33	24
40	1	**46**	45		30			34			26	27	37	28	37	30	33	33	36	41	30
41	2	41	45		34			28			22	23	33	23	32	23	25	25	31	33	24
42	1	**47**	45		39			33			25	29	35	29	35	30	32	32	38	44	30
43	2	40	45		33			28			21	23	32	24	31	23	29	29	30	34	25
44	2	39	45		32			26			19	22	30	22	29	23	23	23	28	33	23
45	2	42	45		33			28			19	25	33	24	28	31	29	29	33	37	26
46	2	40	45		32			27			18	25	32	24	27	26	23	23	27	34	29
47	2	40	45		32			27			18	25	31	24	26	27	23	23	27	34	29
48	2	39	45		32			27			17	25	29	24	26	27	23	23	26	33	29
49	2	38	45		30			26			16	24	29	22	24	27	22	22	24	31	26
50	2	35	45		27			24			14	29	20	21	19	28	20	20	20	20	24
51	2	38	45		29			28			15	31	22	23	21	31	22	23	22	22	27
52	2	37	45		29			27			15	29	27	24	19	28	22	22	21	21	28
53	2	33	45		26			24			13	25	18	21	16	22	19	19	18	18	25
54	2	32	45		25			23			12	22	17	21	15	20	19	19	17	16	25
55	1	**47**	45		39			37			23	39	28	30	28	44	31	31	31	34	33
56	1	**48**	45		38			37			37	26	40	35	37	26	37	37	38	30	36
57	2	42	45		35			33			26	25	28	33	26	22	31	31	28	23	34
58	1	**50**	45		44			39			39	29	41	39	38	28	39	39	40	31	38
59	1	**47**	45		40			31			35	22	39	34	36	28	34	33	41	34	32
60	2	42	45		37			32			25	25	26	33	24	22	30	31	27	22	34

[a] Note: Results presented in **BOLD** exceed the criteria for all stages operating simultaneously

Table 4.10: Scenario 2: Predicted $L_{eq,Oct\text{-}63Hz}$ Receptor Noise Levels – Bars, Cafes and Dance-floors Only (midnight-2am)

Receptor Number	Zone	Predicted[a] dB,Oct-63Hz	Limit dB	Predicted Noise Level, Midnight – 2am S1	S2	S3	S4	S5	S6	S7	S9	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
1	1	58	60																		
2	1	59	60																		
3	2	**59**	55		54			46			41	45	47	50	44	42	45	45	45	43	48
4	1	**61**	60		55			48			43	47	50	52	46	45	47	47	48	46	51
5	1	**66**	60		62			53			49	55	55	57	51	50	52	52	53	51	57
6	2	**60**	55		56			44			44	43	53	49	50	44	45	45	49	45	45
7	1	**62**	60		57			45			45	39	56	49	52	46	47	47	51	48	47
8	1	**62**	60		56			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	1	60	60					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	1	**61**	60		51			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	1	60	60					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	1	60	60					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	1	**61**	60		49			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	2	54	55					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	2	**57**	55		48			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	2	53	55					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	1	**64**	60		60			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	1	**65**	60		59			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	1	59	60					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	2	53	55					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	2	48	55					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	2	50	55					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	2	**56**	55					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	2	**57**	55		50			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	1	**61**	60		42			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	2	**57**	55		44			44			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	2	**58**	55		54			45			40	45	47	49	43	42	44	44	45	43	48
28	2	**58**	55		54			45			41	45	47	49	44	42	45	45	45	43	48
29	2	54	55																		
30	2	55	55																		
31	2	52	55																		
32	1	**61**	60		56			49			40	50	49	51	46	45	46	46	46	46	51
33	1	57	60																		
34	1	58	60																		
35	1	**63**	60		52			48			36	46	56	47	50	52	53	53	42	42	57
36	1	58	60																		
37	1	59	60																		
38	1	59	60																		
39	1	59	60																		
40	1	**63**	60		57			48			47	48	56	52	52	46	48	48	51	47	50
41	1	**62**	60		57			46			43	41	56	51	52	46	47	47	51	48	47
42	1	**61**	60		56			43			44	43	55	49	51	44	45	45	50	47	45
43	1	**63**	60		57			56			41	53	50	48	48	54	47	47	50	49	48
44	2	60	60																		
45	2	**60**	55		55			44			43	45	53	49	49	43	45	45	49	45	45
46	2	**60**	55		56			45			44	45	53	49	49	44	46	46	49	44	46
47	2	**56**	55		51			41			40	42	49	45	45	40	42	42	45	40	42
48	2	**56**	55		50			38			39	42	50	43	46	40	41	41	46	43	41
49	2	**57**	55		50			37			39	44	52	44	48	42	41	41	47	46	43
50	2	**57**	55		50			37			39	44	52	44	48	42	41	41	47	46	43
51	2	**58**	55		50			36			39	45	52	45	49	42	41	41	48	47	43
52	2	**58**	55		49			36			39	45	52	45	49	43	41	41	48	48	43
53	2	**57**	55		48			35			38	45	52	45	49	43	41	41	48	48	44
54	2	**57**	55		46			34			38	45	51	45	48	43	41	41	47	49	44
55	2	**58**	55		45			34			37	44	50	45	48	43	51	51	47	49	43
56	2	**56**	55		43			34			36	44	49	45	47	42	40	40	46	48	43
57	2	**62**	55		43			38			37	44	57	46	46	54	52	52	56	50	44
58	2	**59**	55		43			37			36	44	55	45	45	44	41	41	44	49	53
59	2	**59**	55		44			36			36	44	55	45	45	44	41	41	44	49	53
60	2	**57**	55		44			36			36	44	50	45	44	44	41	41	44	49	53

[a] Note: Results presented in **BOLD** exceed the criteria for all stages operating simultaneously

This prediction is right on the 60dB limit, whereas we have measured noise levels above the ANE levels after midnight. There is no detailed ANE modelling provided compared modelled and measured noise levels for SITG2017 and Falls2016 after midnight. Therefore this seems to be a glaring omission.
So in summary, the predcited/measured levels prior to midnight seem to be reasonably well correlated, but the values after midnight would appear to have a much greater margin of error.

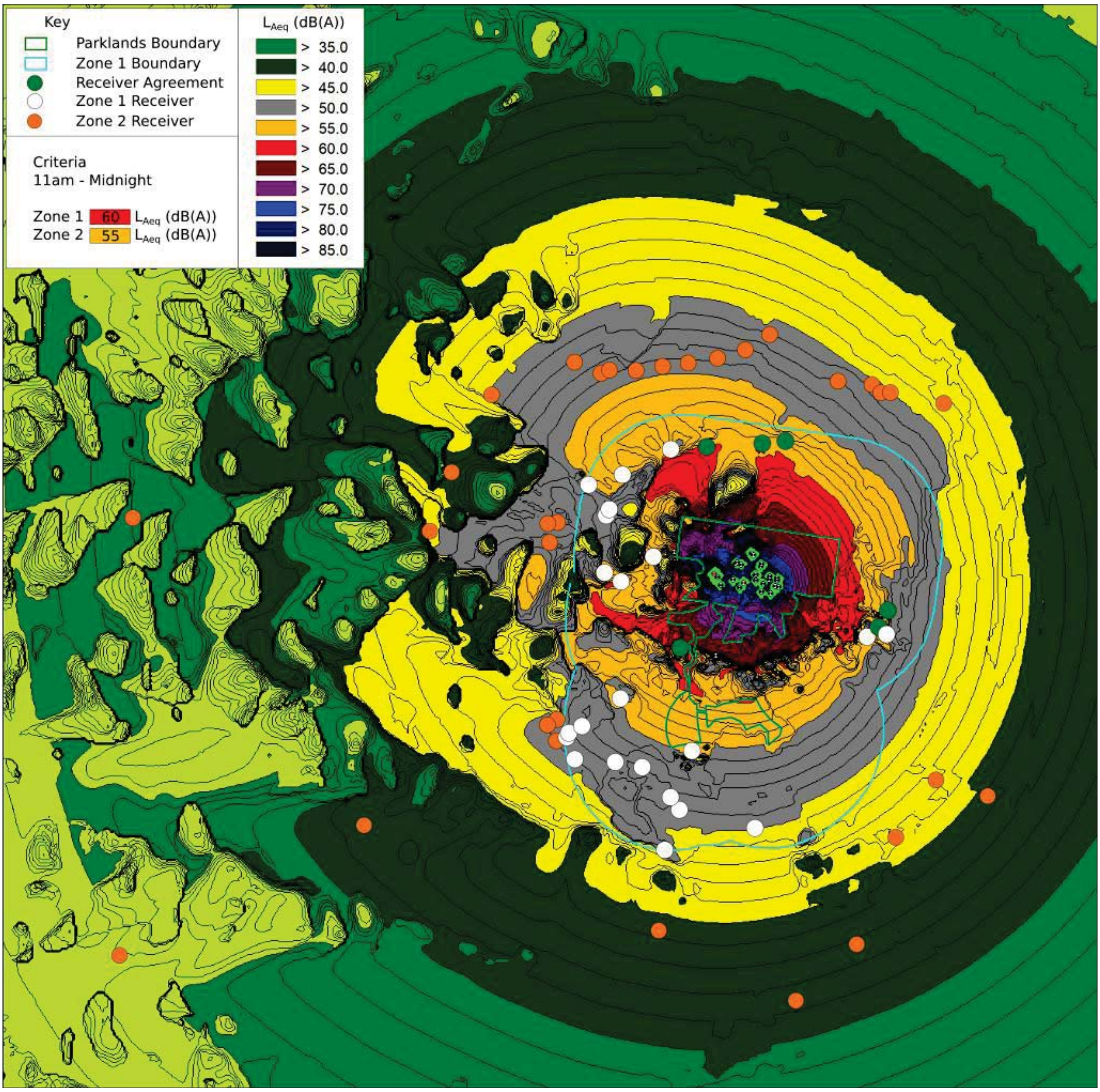


Figure 4.10 - Scenario 2: Noise Contour Plot, 11am – Midnight (dB(A))

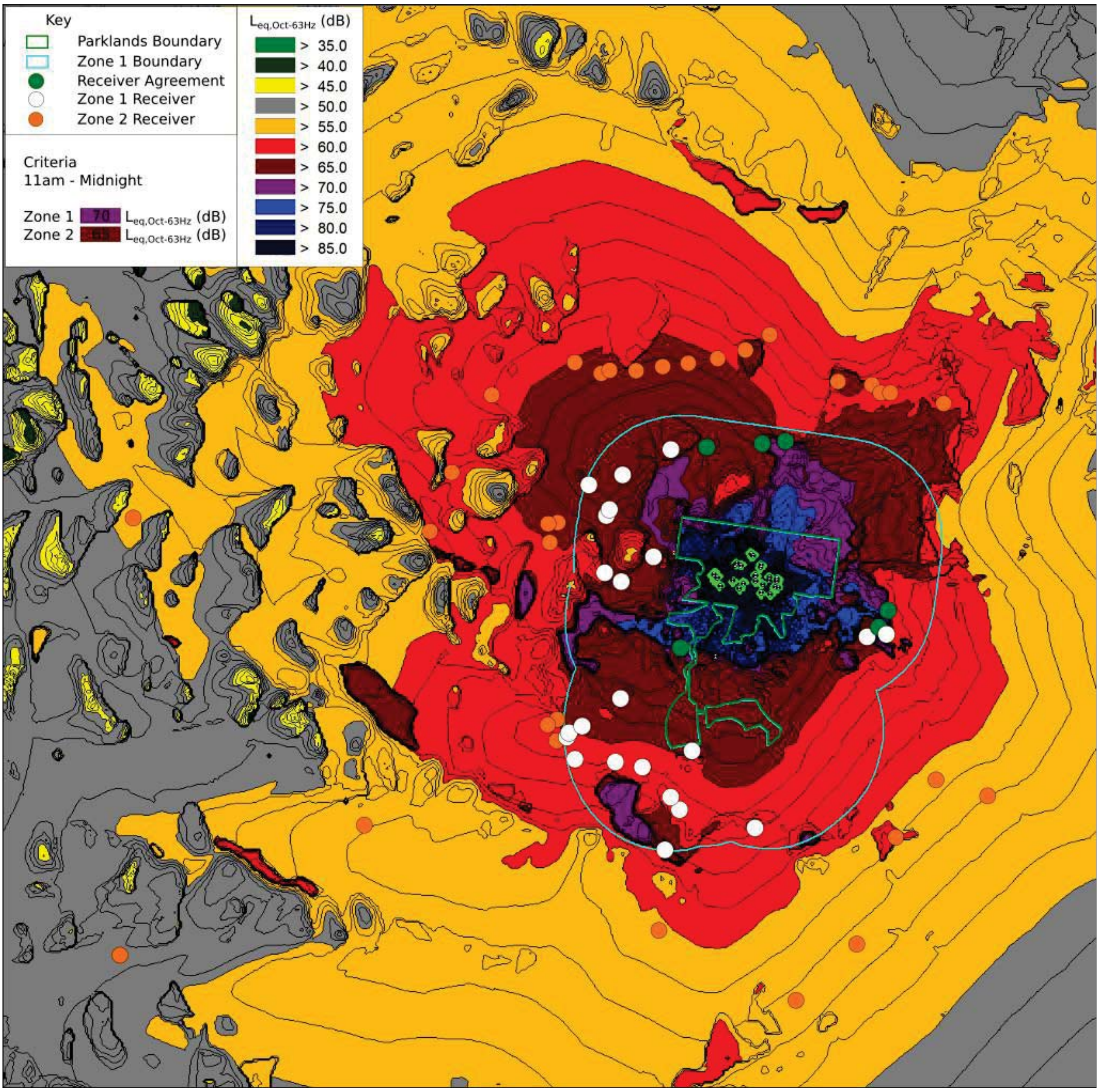


Figure 4.11 - Scenario 2: Noise Contour Plot, 11am – Midnight ($dB_{,Oct-63Hz}$)

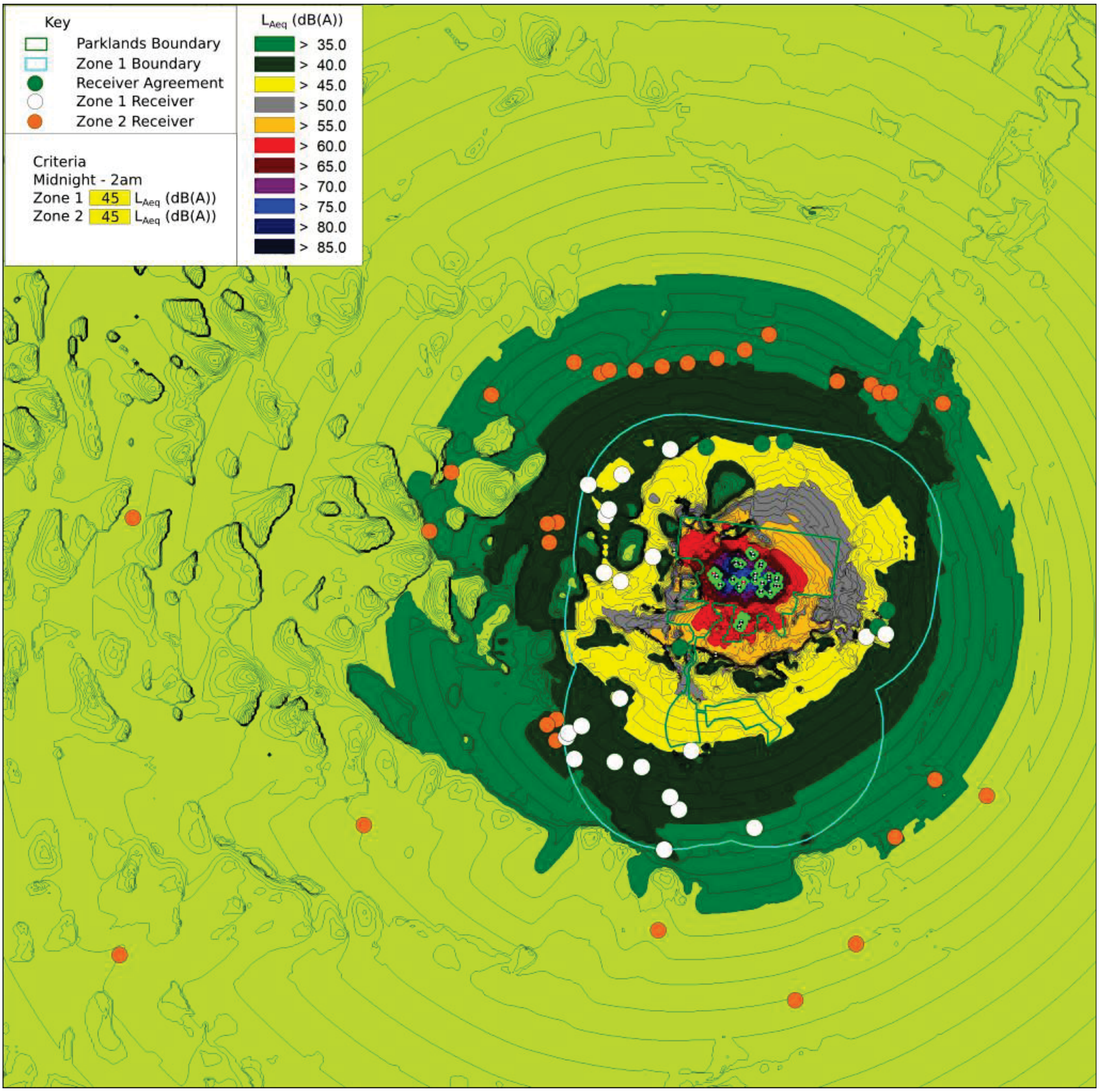


Figure 4.12 - Base Case, Noise Contour Plot, Midnight - 2am (dB(A))

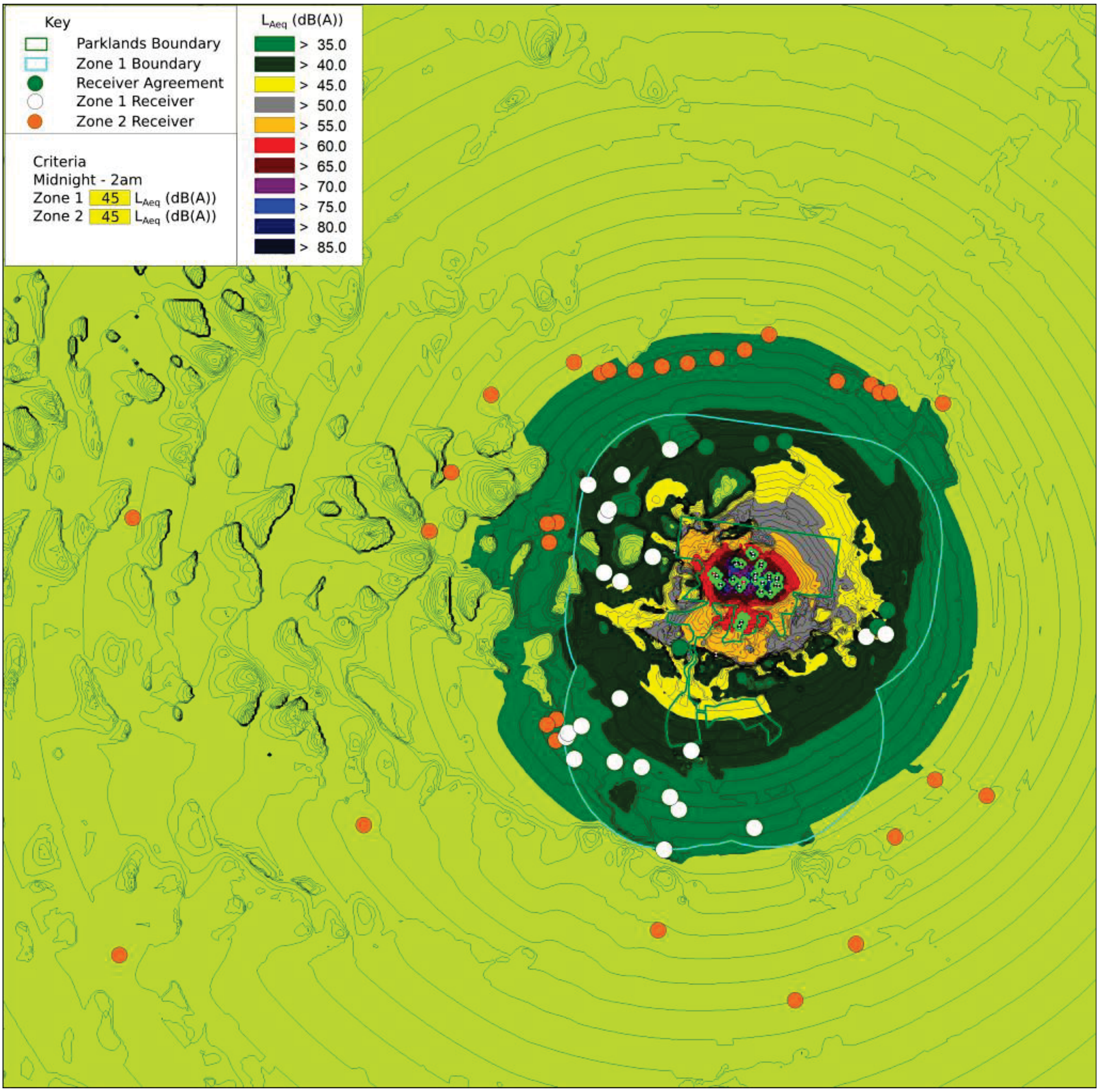


Figure 4.13 - Base Case, Noise Contour Plot, Midnight - 2am ($dB_{,Oct - 63Hz}$)

4.3.3 Discussion of Scenario 2 Modelling Results

4.3.3.1 Full Operations

The results of the predictive noise modelling indicates that from 11 am to midnight where the main stages are operating (cumulatively, in addition to minor stages), compliance with the criteria is predicted for the majority of the modelled sensitive off-site receivers for the worst case meteorological condition. Three (3) of the Zone 1 receivers are predicted to exceed by 1 dB L_{Aeq}, and R5 by 5 dB(A), and 5 of the Zone 1 receivers are predicted to exceed the $dB_{,Oct\text{-}63Hz}$ criteria (4 of these have existing agreements in place). Eleven (11) of the Zone 2 receivers are predicted to exceed the $dB_{,Oct\text{-}63Hz}$ criteria by 1 – 3 dB. Therefore a small adjustment to operating volumes, or consideration of modelling accuracy and meteorological influence, may account for these exceedances. It is noted that, as identified in Table 4.1, some of the modelled sensitive receivers have agreements in place with the Parklands venue, and as a result adjustment of stage noise levels to achieve compliance is not necessarily required for those properties for current events.

For low frequency (Oct-63Hz) noise levels, the results of the modelling indicate that the greatest exceedances of the recommended noise limits are predicted at receptors 5, 43, and 55 at up to 3 dB(A) above the adopted criteria. Two of these have agreements in place, and the other (R55) has been historically measured at various previous events. Based on attended noise measurements at receptors during previous events, exceedances of up to 3 $dB_{,Oct\ 63Hz}$ have been measured (SITG 2017) under adverse source to receptor wind conditions at R55, and adjustments were made to the system to achieve measured compliance. Therefore the modelling calibrates well with previous monitoring data, and equally the attended monitoring demonstrates that the venue is able to manage source noise levels to achieve compliance even under adverse meteorological conditions of this type.

Review of the modelling contour plots indicate that the L_{Aeq} contour extends only to the nearest Zone 2 sensitive receiver areas, and low frequency (Oct-63Hz) contour extends into the Wooyung community to the north-east, with some exceedances of the criteria predicted at elevated landforms to the west.

4.3.3.2 Midnight Until 2am (Bars, Minor Venues)

For the period from midnight to 2am where only bars, cafes and dance floors operate, non-compliance is predicted for 14 receptors for the dB(A) under the worst case meteorological conditions, and exceedances of the $dB_{,Oct\text{-}63Hz}$ criteria at 39 sensitive receivers. Overall the modelling identifies that after midnight a reduction in operating volumes of the minor stages will be required to achieve predicted compliance.

The modelling shows agreement with the site management observations, in that the bass from the Tipi (S2), World (S5) and Smirnoff (V10) venues define the bass levels ($dB_{,Oct\ 63Hz}$) after midnight, and reduction of these sources results in measured compliance to the surrounding areas. Generally these sources are the first point of management for activities between 12 am and 2 am, and have only been a concern under specific adverse meteorological conditions for previous events.

Review of the modelling contour plots indicate that the dB(A) contour extends only to the nearest

Zone 2 sensitive receiver areas, and low frequency (Oct-63Hz) contour extends into the Wooyung community to the north-east, with some spikes above the criteria on surrounding elevated landforms to the west.

4.3.3.3 Comparison To Existing Operations

To allow determination of the change in predicted community noise levels, Figures 4.14 and 4.15 present the changes in predicted noise levels when Scenario 2 (future) is compared to Scenario 1 (existing). This comparison indicates that the increase in predicted L_{Aeq} noise levels at the nearest receptors are typically less than 1 dB(A). For the $L_{Oct\text{-}63\ Hz}$ noise levels are predicted to the north-west (up to 3 dB(A). This is related to noise propagation from the potential inclusion of the Forest stage as a new main stage for future events.

May be reasonably close for 11am to midnight but sketchy between midnight and 2am due to the lack of presentation of investigation of previous modelling/measurement comparison SITG2017 and Falls2016 data.

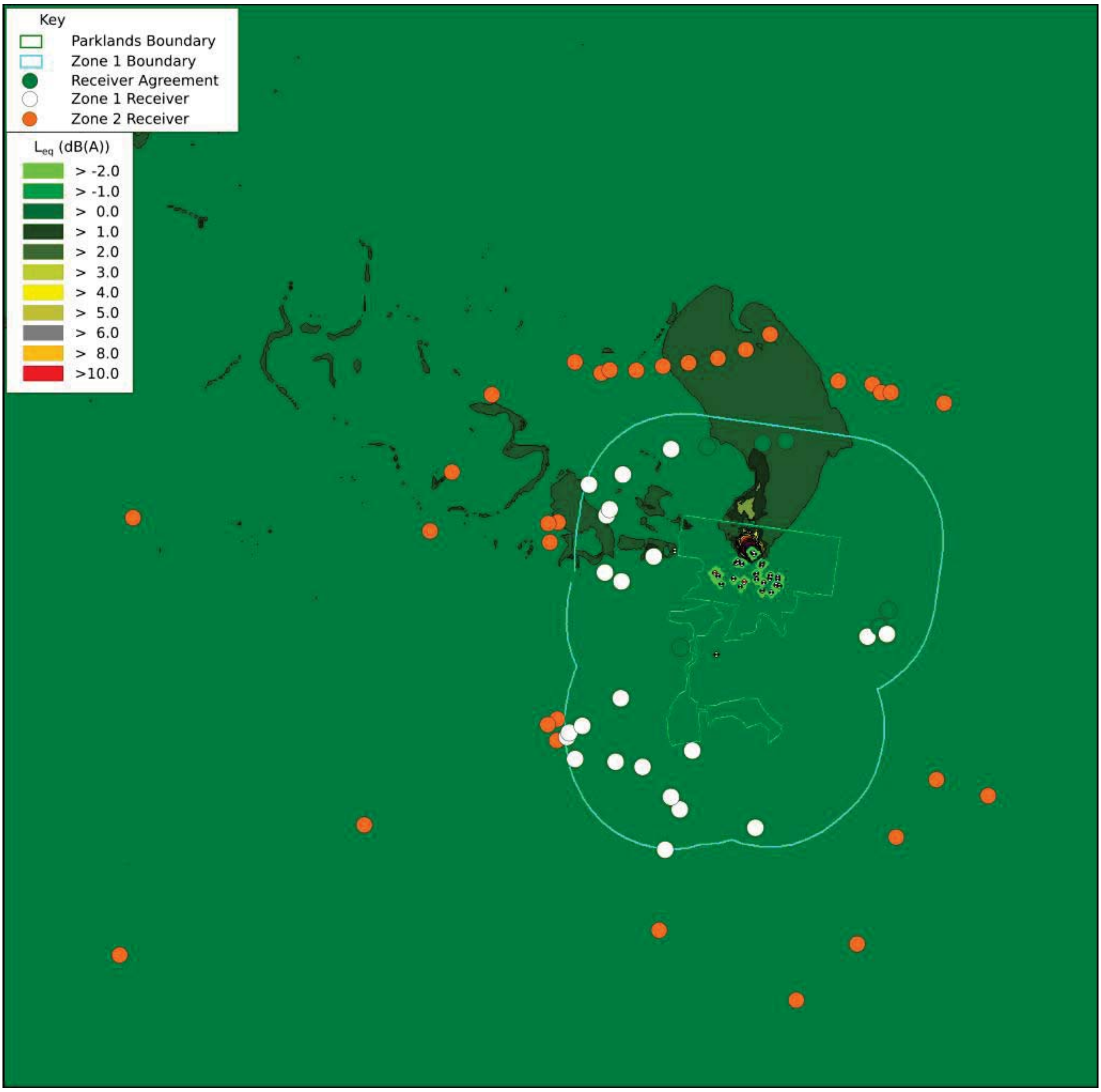


Figure 4.14 - Comparison: Proposed Full Scale Event vs SiTG, 11am – Midnight (L_{Aeq})

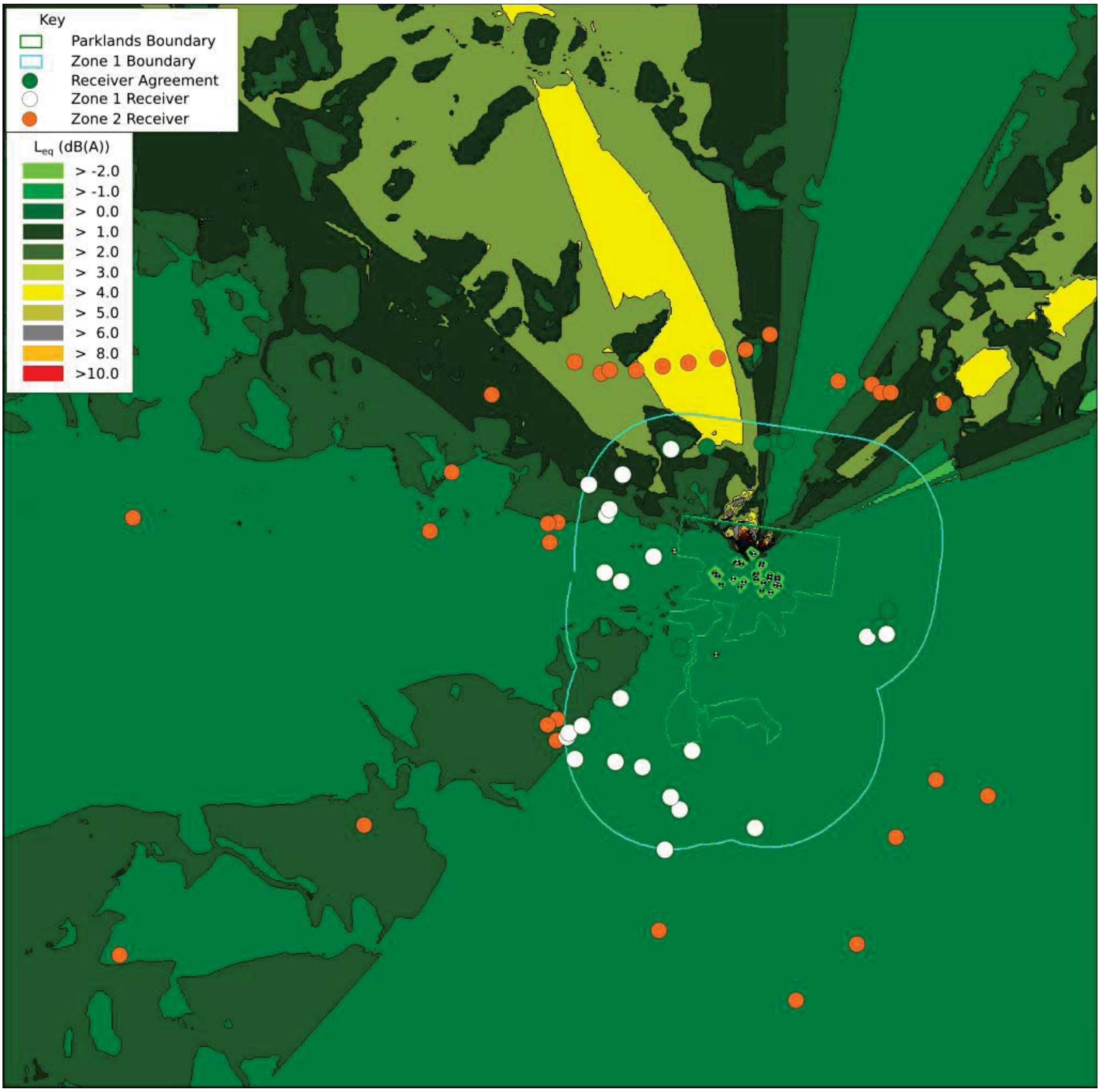


Figure 4.15 - Comparison: Proposed Full Scale Event vs SiTG, 11am – Midnight ($dB_{,Oct - 63Hz}$)

4.3.3.4 Summary

Overall, the results of the Scenario 2 modelling demonstrate that while exceedance of the L_{Aeq} noise limit is predicted to be 1 dB(A) or less off-site, some increase of the $L_{Oct-63Hz}$ noise levels are predicted, up to 3 dB(C) above the criteria at some locations. Whilst these predictions relate to worst case meteorological conditions, coupled with all noise sources (stages/venues) operating at maximum volumes, experience at previous events demonstrates that these conditions may occur during events hence must be considered for the proposed permanent operations.

On this basis, analysis of appropriate noise mitigation and management solutions, over and above the mitigation adopted for previous events, has been completed for the proposed permanent layout.

4.3.4 Scenario 3: Mitigation Investigations

Given the identified non-compliance predicted for the proposed development scenario under worst case meteorology, appropriate mitigation measures to address the non-compliances that may occur under these conditions have been considered.

In terms of best practice, and in accordance with the NSW INP, it is also necessary to consider all reasonable and feasible mitigation measures that could be adopted to minimise the impacts of the proposed permanent facility at Parklands.

On this basis, preliminary modelling and analysis of a range of potential – but not necessarily reasonable and feasible mitigation strategies – were considered to assess the opportunity for incorporating physical acoustic controls at the site. The mitigation options considered were as follows:

- Full enclosure of large stages on 3-sides, including absorptive linings (e.g. blockwork behind stage footprint).
- Three sided structures behind large stages, tall enough to shield flown arrays noise to sides and rear (e.g. light-weight panels).
- Investigation of tall barriers, earth berms, or a combination for heights of 5m, 10m and 20m, located to the rear of large stages (S1 Amphitheatre, S3 Forest Stage) to reduce the throw to surrounding area.
- Review of potential to construct fully enclosed buildings to house some stages (especially low-frequency dominant dance music stages).
- Rotation of specific stages to reduce impacts on the surrounding area, specifically rotating the S3 Forest Stage 180 degrees.
- Acquisition of a formal agreement for properties that have the potential to be impacted beyond the criteria.

Due to the surrounding topography and the distances to the surrounding sensitive receptors, barriers and earth mounds at the boundary of Parklands, at intermediate positions or to the rear of specific stages (e.g. S3 Forest) achieved reductions of less than 1 dB even when very tall barriers (up to 20 m) were included. The main reason for this is that the Parklands venue incorporates a large number of discrete sources of amplified music, distributed over a large site. Because of this, no single source dominates the sound propagation to surrounding areas. Therefore providing acoustic barriers at specific locations will only address a small number of sources. Because the noise scale is logarithmic, reducing a small number of noise sources results in only a small reduction in overall noise levels. In addition, the modelling already considers provision of acoustic screening to the rear of the main stages, which reduces propagation of low frequency noise to the rear of the stages. This also reduces the potential for achieving additional acoustic mitigation by providing barriers at the rear of the main stages. In terms of assessing whether provision of acoustic barriers for the main stages would be considered reasonable and feasible, as a guide, a road traffic noise barrier is only considered effective if it can reduce a minimum of 5 dB(A).

Review of rotating specific stages resulted in increased noise to specific areas, with only a minimal reduction achieved within the area they were previously oriented. For example, the S3 Forest stage is a significant source of noise to the North-West, if rotated to face to the east these noise emission are superimposed on existing noise levels resulting in significant increase in noise levels travelling east to the heavily populated South Golden Beach area.

Full enclosure of venues was not feasible for safety reasons. Construction of permanent stages would provide for some improvement over and above the existing controls at the temporary stages, however Parklands require flexibility in terms of stage locations for the future hence this option was not pursued further. This operational requirement is consistent with the provision of a large scale music festival event which would usually involve provision of stages and venues on a temporary basis, with potential changes in locations occurring over time.

It is important to recognise that the predicted non-compliances for Scenario 2 represent worst case meteorological conditions, hence only specific receptor groups would be affected at any given time. The patterns of meteorology and the frequency of occurrence of these conditions has been considered in detail in Section 3.4. Under favourable meteorological conditions, full compliance would be anticipated. These meteorological conditions (based on analysis of noise complaints relative to wind directions from the Byron Bay Bureau of Meteorology station) are as follows:

- Falls Festival: west, south-west, north-west, east-north-east, south-south-east, south-east;
- SITG: east.

Furthermore, given the temporary nature of events (SITG – 4 days per year, Falls 3 days per year), the cost benefit of large physical structures is significantly less than, for example, for a permanent venue that is utilised on a daily or weekly basis, such as a night club or licensed hotel.

Overall it was found that the current physical mitigation solutions as described in Section 2.2.6.2 represent reasonable and feasible measures that can be implemented by the venue, and achieve noise reductions of 3 dB or more in noise emissions from the venues in specific directions. Given the difficulties associated with the provision of additional physical control solutions, and based on development of a detailed active noise control management process since the first large event was held in 2013, source noise controls are identified as the most appropriate reasonable and feasible noise control strategy to address the potential non-compliances identified for the Scenario 2 acoustic modelling.

4.3.5 Scenario 4: Volume Management Scenario

In order to provide a mitigation solution for the proposed Permanent operations, modelling of the required FoH volume reductions to each stage (with all stages operating simultaneously, under typical worst-case meteorological conditions) have been determined. The FOH volumes have been iteratively adjusted in the modelling to achieve predicted compliance to all sensitive off-site receivers under worst case meteorological conditions as considered in the acoustic modelling. Table 4.11 presents the resultant reduced FOH noise levels for each stage, to achieve this requirement.

Table 4.11: Modelled Mitigated FOH Noise Levels – All Stages, Bars, Cafes and Dance-floors

Stage	11am - Midnight		Midnight - 2am		Distance (FOH)
	dB(A)	dB(C)	dB(A)	dB(C)	
S1	98	108	-	-	35m
S2	95	105	89	99	16m
S3	99	105	-	-	22m
S4	99	108	-	-	20m
S5	95	105	92	104	10m
S6	99	108	-	-	25m
S7	99	107	-	-	22.5m
S9	91	101	87	99	10m
V1	95	105	94	104	10m
V2	95	105	90	98	10m
V3	95	105	91	102	10m
V4	95	105	92	103	10m
V5	95	104	93	99	10m
V6	95	104	91	99	10m
V7	95	104	92	100	10m
V8	95	105	91	98	10m
V9	95	105	94	101	10m
V10	95	105	94	104	10m

Clearly, for an event to be viable it is critical that the FOH sound levels achieved at each venue within the Parklands site is appropriate for audience satisfaction. Based on experience of previous events at Parklands and other venues, the volumes identified in Table 4.11 are considered to be acceptable levels to ensure a viable outdoor concert event, from a patron perspective.

The lower FOH noise levels are considered necessary under worst-case meteorological conditions, with all stages operating simultaneously. These adjusted FOH levels have proved to be a workable solution under similar circumstances to the worst case modelling, for previous events.

It is also noted that higher volumes for individual stages may be achievable depending which stages are operating concurrently, and similarly under certain meteorological conditions (wind blowing up-wind from the sensitive receiver area it is oriented toward).

Modelling results for the adjusted volumes in Table 4.11 are presented below:

- Tables 4.12 to 4.13 present predicted L_{Aeq} and $L_{eq,Oct-63Hz}$ receptor noise levels as a result of emissions from the future proposed venue layouts, for amplification between 11 am and midnight.
- Figures 4.16 and 4.17 present predicted L_{Aeq} and $L_{eq,Oct-63Hz}$ noise contours for amplification between 11 am and midnight (when main stages are operating).
- Tables 4.14 to 4.15 present predicted L_{Aeq} and $L_{eq,Oct-63Hz}$ receptor noise levels as a result of emissions from the future proposed venue layouts, for amplification between midnight and 2 am.
- Figures 4.18 and 4.19 present predicted L_{Aeq} and $L_{eq,Oct-63Hz}$ noise contours for amplification between midnight and 2 am (where only bars, cafes and dance floors operate) respectively.

It is noted that after midnight, the weather conditions are typically more stable than daytime, and the predicted values are likely to over-predict by at least 6 dB(A) due to the modelled downwind or inversion conditions. However as discussed in Section 4.2.4, the ISO 9613-2 standard does not provide for a truly calm condition, and a worst-case downwind or light inversion scenario has been considered.

Currently there appears to be a mismatch between measured data and modelling after midnight

Table 4.12: Scenario 4: Predicted Mitigated L_{Aeq} Receptor Noise Levels – All Stages, Bars, Cafes and Dance-floors (11am-midnight)

Receptor Number	Zone	Predicted[a] dB(A)	Limit dB(A)	Predicted Noise Level, 11am - Midnight																	
				S1	S2	S3	S4	S5	S6	S7	S9	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
1	1	51	60	47	36	36	45	34	44	39	21	29	24	32	23	25	29	29	25	23	35
2	1	53	60	49	39	38	46	35	43	41	25	28	26	34	25	24	32	32	27	23	36
3	2	52	55	48	35	38	44	33	41	41	26	25	28	33	26	22	31	31	28	23	34
4	1	56	60	52	37	41	49	38	46	46	30	27	31	35	29	26	35	36	31	26	39
5	1	**65**	60	61	51	50	58	47	55	55	38	41	39	47	37	33	44	44	39	32	49
6	2	52	55	46	40	45	44	31	39	45	30	22	36	32	34	23	32	32	34	28	29
7	1	54	60	46	39	45	45	33	42	49	31	16	39	30	38	26	33	34	38	31	31
8	1	58	60	56	41	48	45	33	41	48	25	25	39	32	38	25	32	32	38	32	29
9	1	58	60	57	32	40	40	28	34	42	25	26	39	24	34	24	28	28	34	33	28
10	1	60	60	59	36	50	47	34	43	49	28	29	41	25	39	27	32	32	39	39	29
11	1	59	60	55	39	54	50	34	46	52	25	29	35	29	35	30	32	32	38	44	30
12	1	55	60	50	37	42	48	35	49	43	21	37	27	29	27	40	30	30	29	30	31
13	1	57	60	51	39	44	50	37	51	45	23	39	28	30	28	44	31	31	31	34	33
14	2	45	55	42	27	31	37	25	37	31	14	29	20	21	19	28	20	20	20	20	24
15	2	47	55	44	29	33	40	28	40	34	15	29	27	24	19	28	22	22	21	21	28
16	2	44	55	41	26	28	36	24	35	28	13	25	18	21	16	22	19	19	18	18	25
17	1	60	60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28	39	39	40	31	38
18	1	58	60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28	34	33	41	34	32
19	1	53	60	49	38	37	46	35	44	41	24	29	26	34	24	24	31	31	26	23	36
20	2	42	55	40	26	28	33	21	28	28	16	16	19	22	17	14	22	22	19	15	24
21	2	34	55	31	17	18	25	12	20	18	10	9	13	15	11	9	15	15	13	10	16
22	2	39	55	38	21	23	26	13	19	24	14	12	19	16	16	11	17	17	17	12	15
23	2	44	55	39	29	35	36	23	30	37	21	15	26	23	26	18	25	25	27	21	22
24	2	52	55	51	32	44	38	25	32	38	22	21	32	23	30	19	24	24	30	27	23
25	1	60	60	56	30	55	49	34	45	53	26	27	37	28	37	30	33	33	36	41	30
26	2	49	55	46	30	40	41	27	37	39	16	24	29	22	24	27	22	22	24	31	26
27	2	51	55	49	37	37	44	32	40	40	25	25	26	33	24	22	30	31	27	22	34
28	2	51	55	48	36	38	44	32	40	40	26	24	27	33	25	22	31	31	27	22	34
29	2	45	55	42	25	29	38	26	36	31	15	23	19	26	17	20	23	23	19	18	28
30	2	48	55	44	29	33	40	28	40	35	15	31	22	23	21	31	22	23	22	22	27
31	2	42	55	40	25	26	35	23	33	27	12	22	17	21	15	20	19	19	17	16	25
32	1	56	60	51	40	40	49	39	49	44	26	33	28	36	26	28	33	33	29	26	40
33	1	51	60	47	34	35	44	33	44	38	19	30	23	29	21	27	27	27	24	23	34
34	1	52	60	48	37	37	46	35	44	40	22	29	25	33	23	25	30	30	26	23	36
35	1	52	60	47	34	37	46	35	46	40	19	26	30	30	26	28	30	31	23	21	35
36	1	51	60	48	38	37	44	33	41	40	24	26	26	33	24	22	30	30	26	22	34
37	1	52	60	49	38	38	44	33	41	41	25	26	27	34	25	22	31	31	27	22	34
38	1	52	60	49	38	38	45	33	41	41	26	26	27	34	25	22	31	31	27	22	35
39	1	53	60	50	38	39	46	34	42	42	27	27	28	35	26	23	32	32	28	23	36
40	1	57	60	53	38	40	49	37	45	50	37	26	40	35	37	26	37	37	38	30	36
41	1	54	60	44	39	46	47	34	42	49	28	18	37	32	37	26	34	34	38	31	31
42	1	55	60	51	40	49	45	32	40	46	31	21	39	31	36	24	32	32	36	30	29
43	1	58	60	51	40	45	51	39	52	48	24	40	29	30	27	42	30	30	32	36	32
44	2	55	60	50	37	43	48	34	48	43	21	37	27	28	26	41	28	28	29	31	31
45	2	53	55	49	39	45	43	31	39	45	30	23	36	31	33	23	32	32	34	27	30
46	2	54	55	50	39	46	44	31	39	45	31	23	36	32	33	23	33	33	34	27	31
47	2	50	55	48	33	37	37	24	31	37	24	19	29	26	26	18	26	26	27	21	24
48	2	50	55	49	31	41	36	23	30	37	22	20	31	23	28	18	24	24	28	24	22
49	2	54	55	52	33	46	40	26	34	40	23	22	34	25	32	20	25	25	31	29	24
50	2	54	55	52	33	46	40	27	34	40	23	22	34	24	32	21	25	25	31	29	24
51	2	54	55	53	34	47	41	27	35	41	23	22	34	25	32	21	26	26	32	30	24
52	2	55	55	53	34	48	41	28	35	41	23	23	34	24	33	22	26	26	32	32	24
53	2	54	55	52	34	48	41	28	35	41	22	23	34	23	33	22	26	25	32	33	24
54	2	54	55	51	34	48	41	28	35	41	22	23	33	23	32	23	25	25	31	33	24
55	2	54	55	51	33	47	42	28	35	45	21	23	32	24	31	23	29	29	30	34	25
56	2	51	55	49	32	45	40	26	33	39	19	22	30	22	29	23	23	23	28	33	23
57	2	53	55	49	33	45	44	28	40	44	19	25	33	24	28	31	29	29	33	37	26
58	2	51	55	48	32	43	43	27	39	42	18	25	32	24	27	26	23	23	27	34	29
59	2	51	55	48	32	43	43	27	36	43	18	25	29	24	26	27	23	23	27	34	29
60	2	51	55	47	32	42	42	27	36	42	17	25	29	24	26	27	23	23	26	33	29

No change compared to unmitigated

[a] Note: Results presented in **BOLD** exceed the criteria for all stages operating simultaneously

Table 4.13: Scenario 4: Predicted Mitigated $L_{eq,Oct\text{-}63Hz}$ Receptor Noise Levels – Bars, Cafes and Dance-floors Only (11am-midnight)

Receptor Number	Zone	Predicted[a] $dB_{,Oct\text{-}63Hz}$	Limit dB	Predicted Noise Level, 11am - Midnight																	
				S1	S2	S3	S4	S5	S6	S7	S9	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
1	1	63	70																		
2	1	64	70																		
3	2	64	65																		
4	1	66	70																		
5	1	**72**	70	66	62	60	64	53	62	65	49	55	55	57	51	50	52	52	53	51	56.84
6	2	65	65																		
7	1	66	70																		
8	1	68	70																		
9	1	66	70																		
10	1	68	70																		
11	1	70	70																		
12	1	66	70																		
13	1	66	70																		
14	2	58	65																		
15	2	62	65																		
16	2	58	65																		
17	1	68	70																		
18	1	69	70																		
19	1	64	70																		
20	2	58	65																		
21	2	53	65																		
22	2	55	65																		
23	2	60	65																		
24	2	64	65																		
25	1	70	70																		
26	2	64	65																		
27	2	64	65																		
28	2	64	65																		
29	2	60	65																		
30	2	60	65																		
31	2	58	65																		
32	1	66	70																		
33	1	65	70																		
34	1	64	70																		
35	1	70	70																		
36	1	64	70																		
37	1	64	70																		
38	1	64	70																		
39	1	65	70																		
40	1	66	70																		
41	1	66	70																		
42	1	67	70																		
43	1	**73**	70	59	57	44	68	56	70	44	41	53	50	48	48	54	47	47	50	49	47.63
44	2	65	70																		
45	2	65	65																		
46	2	65	65																		
47	2	61	65																		
48	2	63	65																		
49	2	64	65																		
50	2	64	65																		
51	2	65	65																		
52	2	65	65																		
53	2	64	65																		
54	2	64	65																		
55	2	65	65																		
56	2	61	65																		
57	2	64	65																		
58	2	63	65																		
59	2	63	65																		
60	2	63	65																		

Where are the data values for the rest of the table?

[a] Note: Results presented in **BOLD** exceed the criteria for all stages operating simultaneously

Table 4.14: Scenario 4: Predicted Mitigated L_{Aeq} Receptor Noise Levels – Bars, Cafes and Dance-floors Only (midnight-2am)

Receptor Number	Zone	Predicted[a] dB(A)	Limit dB(A)	Predicted Noise Level, Midnight – 2am																		
				S1	S2	S3	S4	S5	S6	S7	S9	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
1	1	39	45		30			32			18	28	19	29	21	23	26	27	22	22	34
2	1	41	45		33			33			21	27	21	31	23	22	28	30	24	22	35
3	2	39	45		29			31			23	24	22	30	24	20	28	29	25	22	33
4	1	43	45		31			36			26	27	26	32	27	24	32	33	28	25	38
5	1	**53**	45		45			45			34	40	34	43	35	31	41	42	36	32	48
6	2	41	45		34			29			26	21	31	28	32	21	29	30	31	27	29
7	1	43	45		33			31			28	16	34	27	36	24	30	32	35	31	31
8	1	43	45		35			31			21	25	34	28	37	23	29	30	35	32	29
9	1	40	45		25			27			21	25	34	23	32	22	25	26	31	33	27
10	1	44	45		29			32			25	28	35	23	37	25	29	30	35	39	29
11	1	45	45		33			32			21	29	30	26	33	28	29	30	35	43	29
12	1	43	45		31			33			18	36	22	26	25	39	26	27	26	30	30
13	1	45	45		32			35			20	37	23	27	27	42	27	28	28	33	32
14	2	33	45		20			23			11	28	15	18	18	27	17	18	17	19	23
15	2	34	45		22			26			12	29	18	21	18	26	19	20	17	19	27
16	2	31	45		19			22			10	24	12	19	15	20	16	17	14	16	24
17	1	45	45		37			37			35	29	36	36	36	25	36	36	36	31	36
18	1	44	45		34			30			32	22	34	32	35	26	31	31	38	33	31
19	1	40	45		32			33			20	28	21	30	23	22	28	29	23	22	35
20	2	29	45		19			19			14	16	13	20	15	11	18	19	15	14	23
21	2	22	45		10			11			7	9	7	13	10	5	11	12	9	8	15
22	2	24	45		14			12			11	12	13	14	15	7	13	14	14	10	14
23	2	33	45		23			21			18	15	21	21	24	16	22	23	24	20	21
24	2	36	45		26			23			19	21	27	21	29	17	21	22	27	27	22
25	1	44	45		24			32			22	27	32	26	35	28	30	31	33	41	29
26	2	35	45		24			25			13	24	21	19	22	25	18	19	21	31	24
27	2	39	45		31			30			21	25	21	30	23	19	27	28	24	21	33
28	2	39	45		30			30			22	24	22	29	23	19	28	29	24	21	33
29	2	32	45		18			24			12	22	14	22	16	17	19	20	16	17	27
30	2	36	45		23			26			13	30	17	20	19	29	19	20	19	21	26
31	2	30	45		19			21			9	22	11	18	14	17	15	16	13	15	24
32	1	44	45		34			37			22	33	22	33	25	27	30	31	26	25	39
33	1	38	45		28			31			16	30	17	26	20	25	24	25	20	22	33
34	1	40	45		31			33			19	29	19	29	22	23	26	28	22	22	35
35	1	39	45		27			33			16	26	22	26	24	24	26	27	19	20	34
36	1	39	45		31			31			21	25	20	30	22	20	27	28	23	21	33
37	1	39	45		31			31			22	25	22	30	23	20	28	29	24	21	34
38	1	40	45		31			31			22	25	22	31	24	20	28	29	24	22	34
39	1	40	45		31			32			23	26	23	31	24	21	29	30	25	22	35
40	1	45	45		32			35			33	26	35	31	35	24	34	35	35	30	35
41	1	43	45		32			32			24	17	32	29	36	24	31	32	35	30	30
42	1	42	45		34			30			27	21	34	28	34	22	29	29	33	30	28
43	1	45	45		34			37			21	39	23	27	26	40	27	28	28	35	31
44	2	43	45		31			32			18	36	21	25	25	40	25	26	26	31	30
45	2	40	45		33			29			27	23	31	28	31	21	29	30	31	27	29
46	2	41	45		33			29			27	23	31	28	31	21	29	30	31	27	30
47	2	34	45		26			22			20	19	23	23	24	15	23	24	24	20	24
48	2	34	45		25			21			19	20	25	20	26	15	21	22	25	23	21
49	2	37	45		27			24			20	21	28	22	30	18	22	23	28	28	23
50	2	37	45		27			25			20	21	28	22	30	18	22	23	28	29	23
51	2	38	45		28			25			20	22	29	22	31	19	23	23	29	30	23
52	2	38	45		28			26			20	22	29	21	31	19	23	23	29	31	23
53	2	38	45		28			26			19	23	29	21	31	20	22	23	29	33	23
54	2	38	45		28			26			18	23	28	21	30	20	22	23	28	33	23
55	2	38	45		27			26			17	23	26	21	29	21	25	26	27	33	24
56	2	36	45		26			24			16	22	24	20	27	20	20	21	25	33	22
57	2	39	45		26			25			16	24	26	21	26	26	24	24	27	36	24
58	2	37	45		26			25			15	24	25	21	25	24	20	21	24	34	27
59	2	37	45		26			25			15	24	24	21	25	25	20	21	24	34	27
60	2	37	45		26			25			15	24	23	21	24	25	20	20	23	33	27

[a] Note: Results presented in **BOLD** exceed the criteria for all stages operating simultaneously

Table 4.15: Scenario 4: Predicted Mitigated $L_{eq,Oct\text{-}63Hz}$ Receptor Noise Levels – Bars, Cafes and Dance-floors Only (midnight-2am)

				Predicted Noise Level, Midnight – 2am																	
Receptor Number	Zone	Predicted[a] $dB_{,Oct\text{-}63Hz}$	Limit dB	S1	S2	S3	S4	S5	S6	S7	S9	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
1	1	54	60																		
2	1	55	60																		
3	2	54	55																		
4	1	57	60																		
5	1	**63**	60		55			53			49	55	45	54	49	42	46	46	43	46	55
6	2	55	55																		
7	1	56	60																		
8	1	56	60																		
9	1	55	60																		
10	1	57	60																		
11	1	56	60																		
12	1	57	60																		
13	1	57	60																		
14	2	51	55																		
15	2	52	55																		
16	2	50	55																		
17	1	60	60																		
18	1	59	60																		
19	1	55	60																		
20	2	49	55																		
21	2	44	55																		
22	2	45	55																		
23	2	50	55																		
24	2	52	55																		
25	1	56	60																		
26	2	53	55																		
27	2	54	55																		
28	2	54	55																		
29	2	50	55																		
30	2	52	55																		
31	2	49	55																		
32	1	57	60																		
33	1	54	60																		
34	1	55	60																		
35	1	59	60																		
36	1	54	60																		
37	1	54	60																		
38	1	55	60																		
39	1	55	60																		
40	1	58	60																		
41	1	57	60																		
42	1	55	60																		
43	1	59	60																		
44	2	56	60																		
45	2	55	55																		
46	2	55	55																		
47	2	51	55																		
48	2	51	55																		
49	2	52	55																		
50	2	52	55																		
51	2	53	55																		
52	2	53	55																		
53	2	53	55																		
54	2	52	55																		
55	2	53	55																		
56	2	51	55																		
57	2	55	55																		
58	2	54	55																		
59	2	54	55																		
60	2	54	55																		

Values?

[a] Note: Results presented in **BOLD** exceed the criteria for all stages operating simultaneously

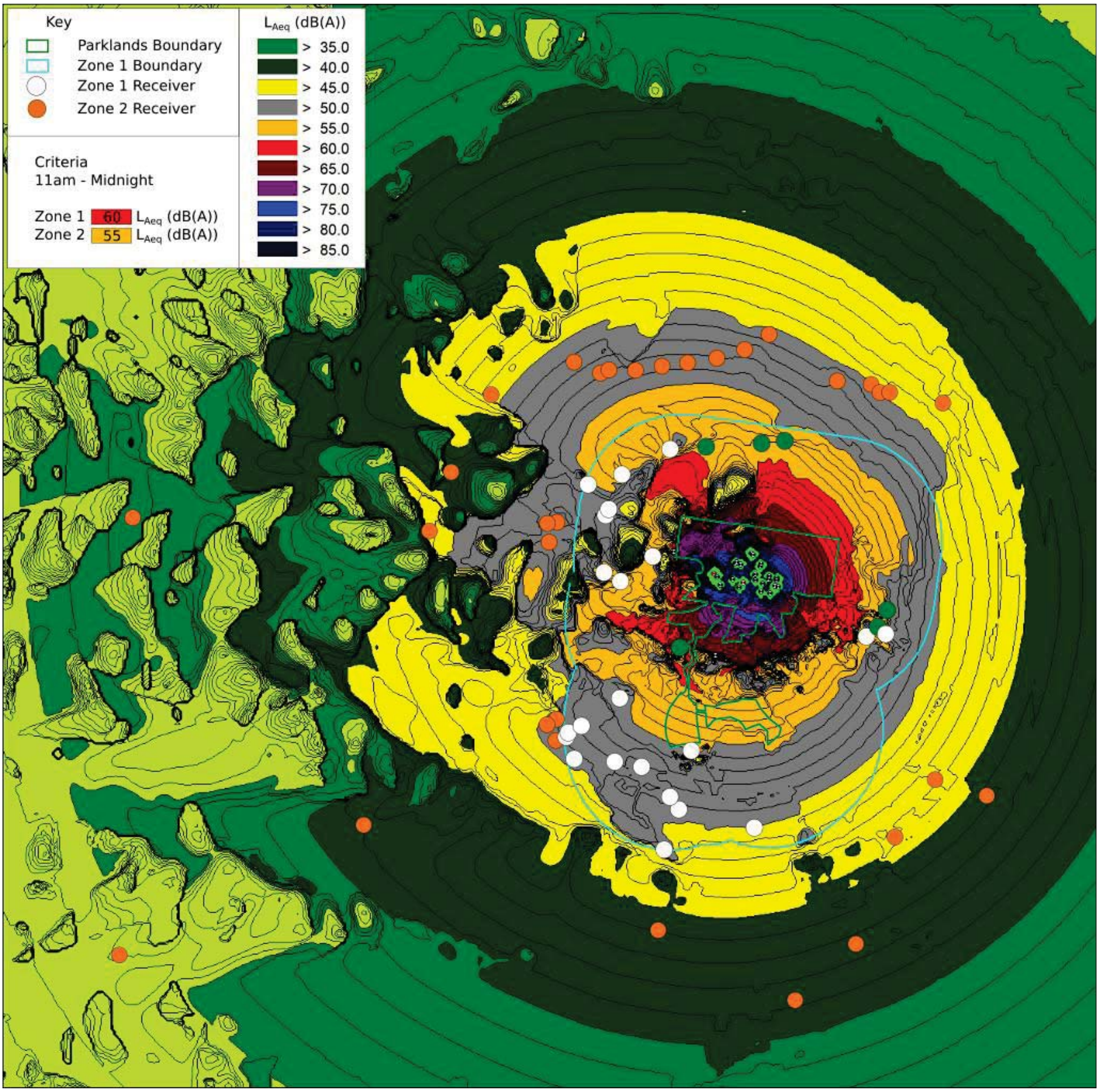


Figure 4.16 - Mitigated Case, Noise Contour Plot, 11am – Midnight (dB(A))

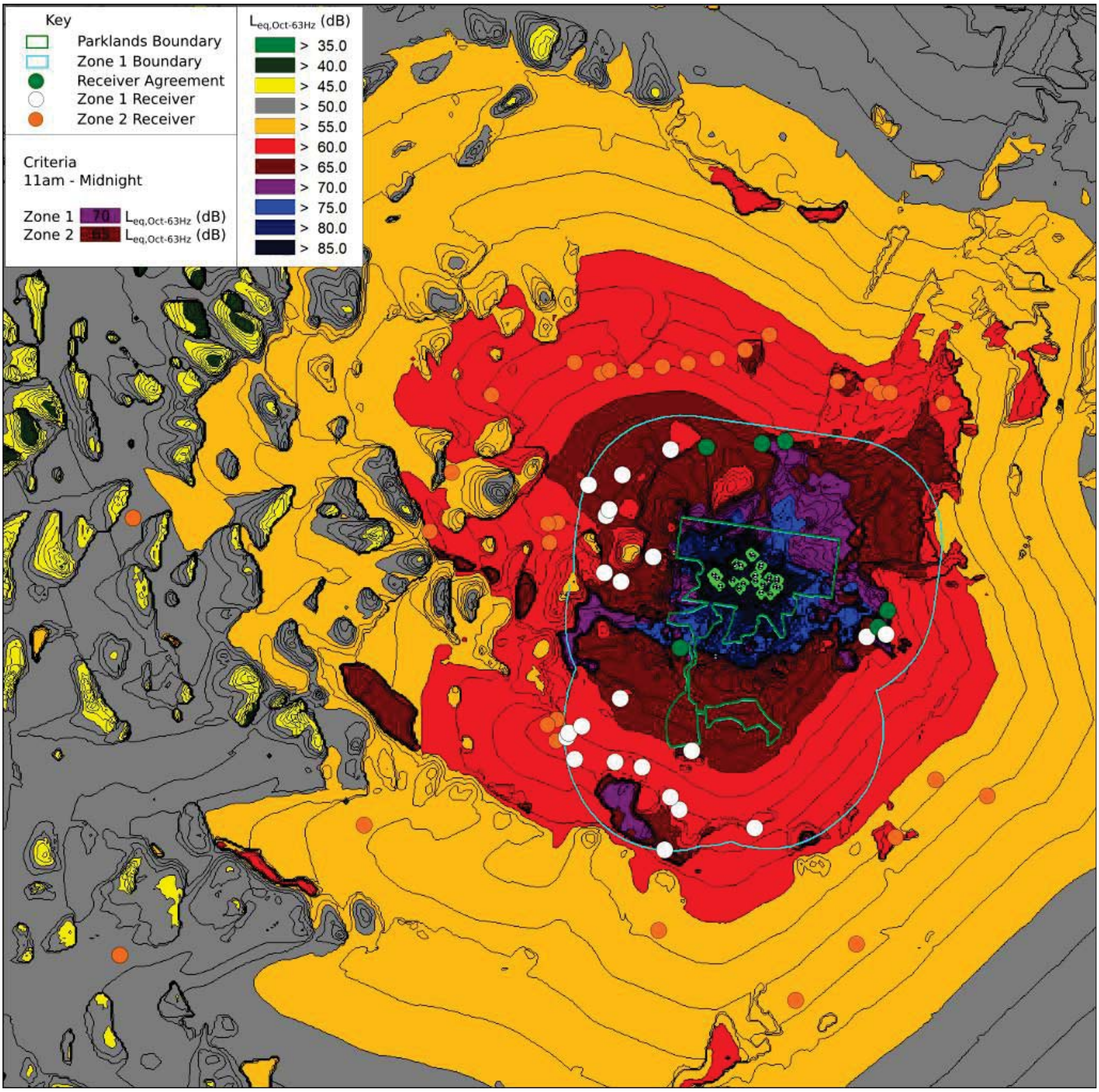


Figure 4.17 - Mitigated Case, Noise Contour Plot, 11am – Midnight ($dB_{,Oct\text{ - }63Hz}$)

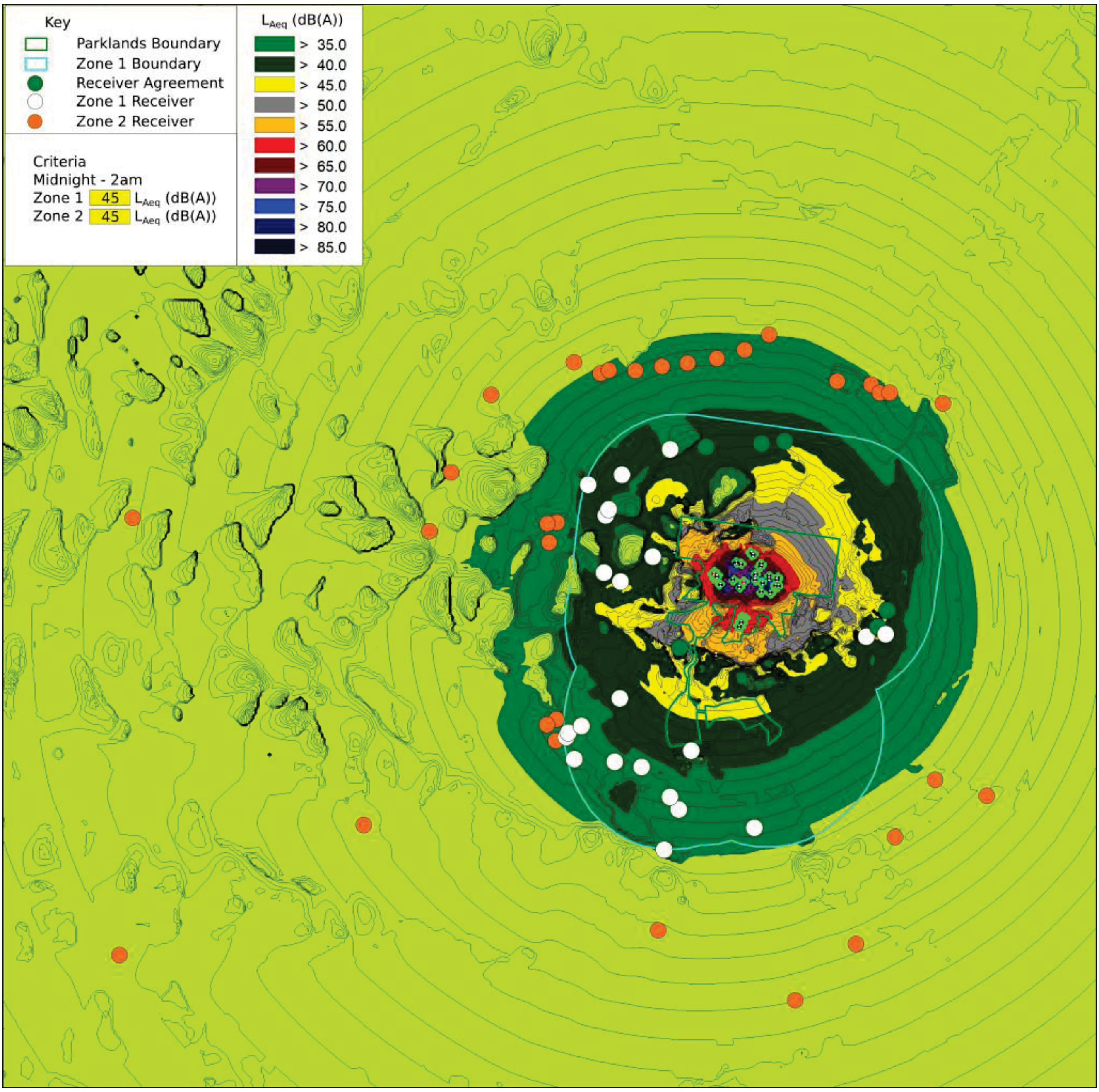


Figure 4.18 - Mitigated Case, Noise Contour Plot, Midnight - 2am (dB(A))

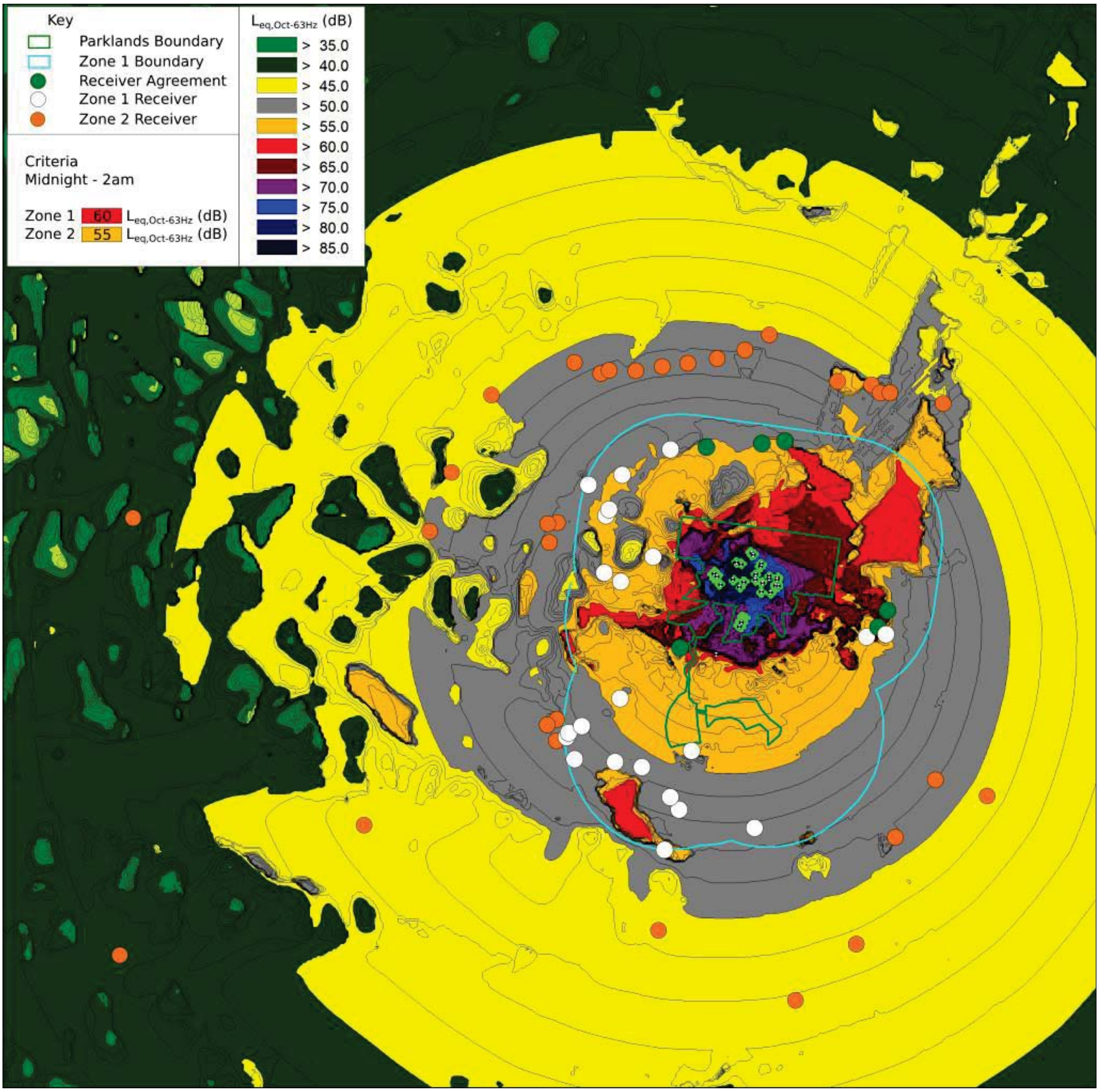


Figure 4.19 - Mitigated Case, Noise Contour Plot, Midnight - 2am ($dB_{,Oct-63Hz}$)

4.3.6 Discussion of Mitigated (Volume) Modelling Results

4.3.6.1 Full Operations

The results of the mitigated (adjusted volume) noise modelling indicates that from 11am to midnight where the main stages are operating (cumulatively, in addition to minor stages), compliance with the criteria are predicted for the majority of the modelled sensitive off-site receivers for the unfavourable meteorological condition. There are minor exceedances predicted for Receptor 5 (2 dB(A)) and 43 (3 dB(A)) within Zone 1. Receptors 5 and 43 currently have noise agreements in place which would extend to the permanent approval.

Review of the modelling contour plots indicate that the dB(A) contour extends only to the nearest Zone 2 sensitive receiver areas, and low frequency (Oct-63Hz) contour extends toward the Wooyung community to the north-east, with some elevated levels above the criteria occurring on surrounding elevated landforms to the west.

4.3.6.2 Midnight Until 2am (Bars, Minor Venues)

For the period from midnight to 2 am where only bars, cafes and dance floors operate, compliance with the dB(A) criteria are predicted for the majority of sensitive off-site receivers for the predicted typically unfavourable meteorological condition, and small exceedances of the $dB_{,Oct\text{-}63Hz}$ criteria. Overall the modelling identifies that after midnight a reduction in operating volumes of the minor stages will be required to achieve predicted complian

Still have correlation issues between measured and modelled after midnight so these assertions are debatable for R12

It is noted that an 8 dB exceedance is predicted at Re

is not feasibly treated through management of volumes or stage mitigation. This has been identified and an agreement was entered with Receptor 5 which will extend to the permanent approval.

The modelling shows agreement with the site management observations, in that the bass from the Tipi (S2), World (S5) and Smirnoff (V10) venues define the bass levels ($dB_{,Oct\ 63Hz}$) after midnight, and reduction of these sources results in measured compliance to the surrounding areas.

Generally these sources are the

Needs to be better checked by ANE to determine why there are particular issues after midnight

am and 2 am, and only a concern under specific

Review of the modelling contour plots indicate that the dB(A) contour extends only to the boundary of Zone 1 sensitive receiver areas, and low frequency (Oct-63Hz) contour extends into the Wooyung community to the north-east, with some spikes above the criteria on surrounding elevated landforms to the west.

4.3.6.3 Mitigated Scenario Compared To Existing Operations

To allow determination of the change in predicted community noise levels, Figures 4.20 and 4.21 present the changes in predicted noise levels when the mitigated Scenario 2 (future) is compared to the existing base case (Scenario 1). This comparison indicates that the increase in predicted L_{Aeq} noise levels at the nearest receptors are typically less than 1 dB(A). For the $L_{Oct\text{-}63\ Hz}$ predictions there is a significant reduction in noise levels relative to the unmitigated Scenario 2, with increases of up to 3 dB(A) relative to the existing scenario. In particular, noise increase to the north are now less than 1 dB for the majority of receptors.

In addition to adopting the reduced stage noise levels as presented in Table 4.11, active noise monitoring and management as defined in the existing Noise Management Plan for Parklands will need to be adopted to ensure full compliance at all receptors. As discussed in Section 3, the Noise Management Plan has proved to be effective in achieving full compliance with the current noise criteria for the majority of large events held at Parklands, including SITG 2017, 2016 and Falls 2016.

Not true, refer to earlier comments regarding compliance

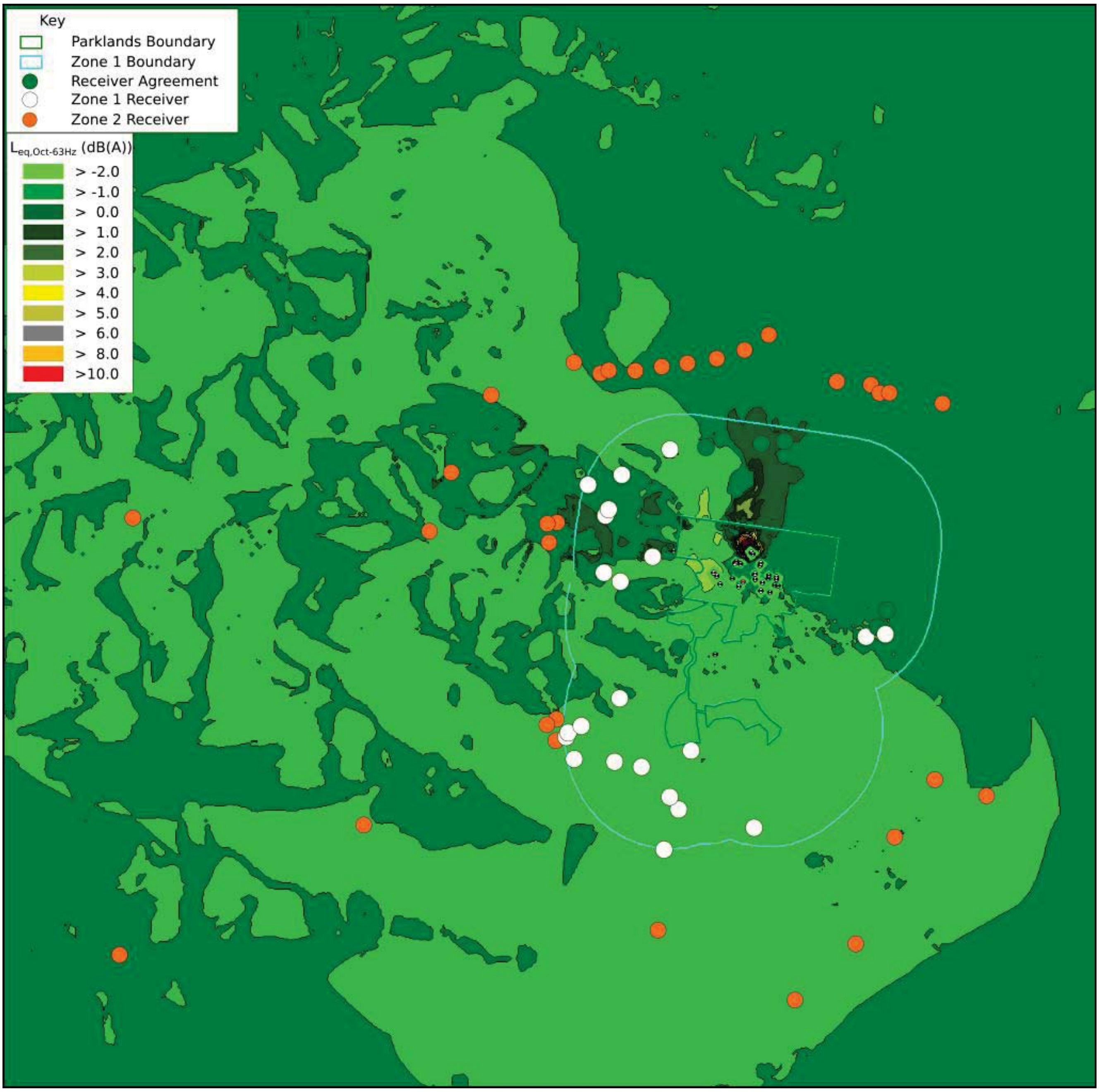


Figure 4.20 - Comparison: Mitigated Proposed Full Scale Event vs SiTG, 11am – Midnight (dB(A))

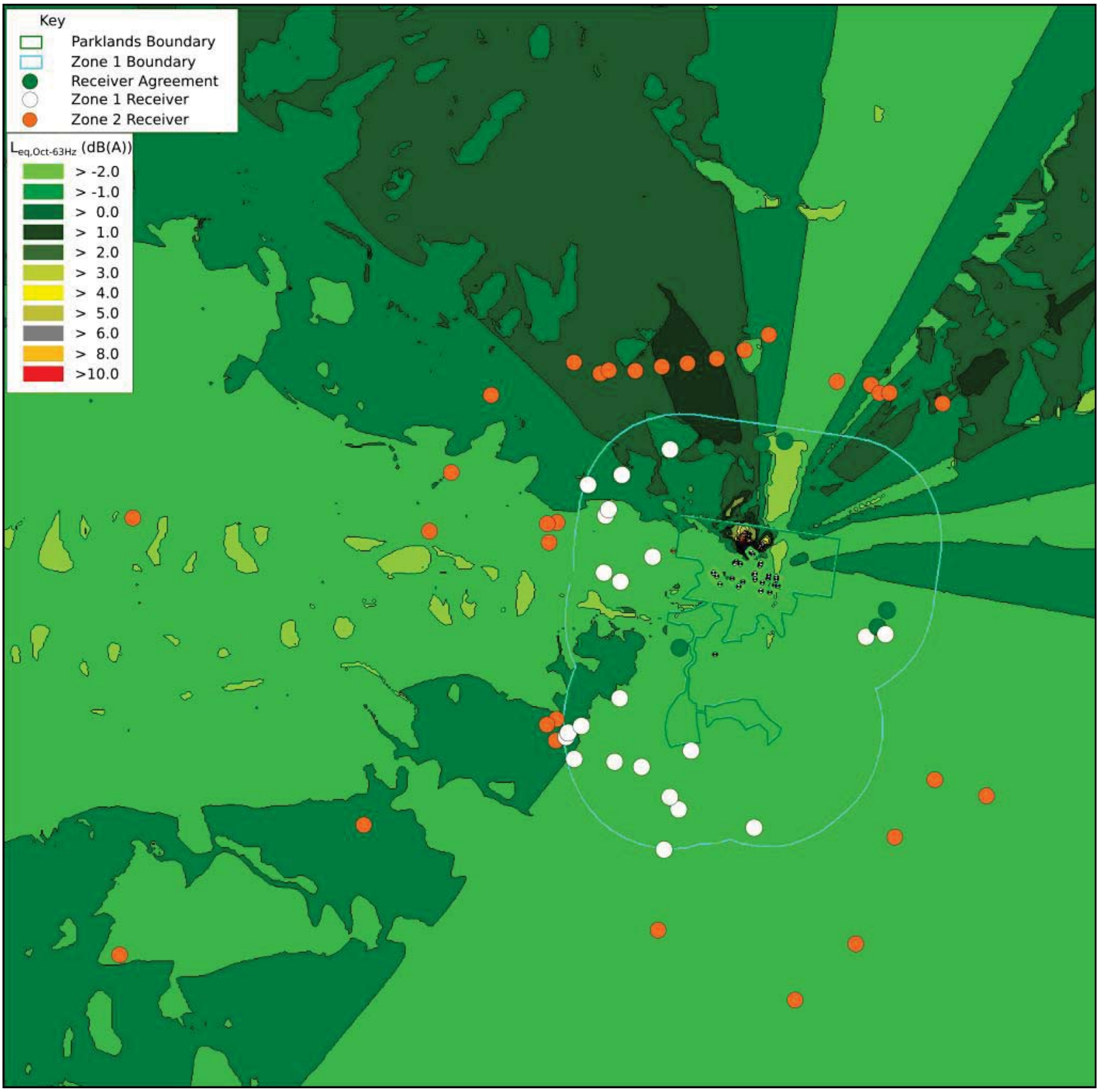


Figure 4.21 - Comparison: Mitigated Proposed Full Scale Event vs SiTG, 11am – Midnight (dB$_{,Oct\text{ - }63Hz}$)

4.3.6.4 Summary

Overall, the results of the predicted noise modelling combined with historical management and noise measurements, indicate that, with the adopted noise limits, noise emissions from the venue are able to be managed to achieve compliance at the vast majority of nearby sensitive receptors while achieving an appropriate acoustic level within the performance venue. For two receivers on Jones Road, located on elevated ground in close proximity to the venue, non-compliance is predicted for the mitigated modelling scenario. However, noise agreements are in place for these two receptors, hence is proposed to be adopted as the future management strategy for these properties. Alternatively, should noise agreements not prove possible. minor additional adjustments to the operating volume of specific stages will be completed under worst case meteorological conditions for these properties to allow the acoustic criteria to be achieved through active noise management measures during live entertainment events. This approach is documented in the current Noise Management Plan for Parklands, and the effectiveness of this strategy has been demonstrated in the full compliance achieved with noise criteria for the most recent events held at Parklands.

Once again not true, based on measured data at R12

5 Ancillary Noise Sources

5.1 Fixed Plant and Equipment

During large events at Parklands, there are additional noise sources occurring as part of the event activities. A significant noise sources is that of lighting generators throughout the site, which have the potential to operate after midnight and 2 am time period. Some small scale generators operate power to the commercial vendors and areas of the site, however they are generally smaller scale.

It is noted that in addition to the lighting towers, there are generators located at the large event stages, however these are all powered down after completion of entertainment. During the event, noise emissions from the stages are typically 10 dB or more higher. Therefore, it is not considered necessary to consider the generators in the noise assessment.

Modelling of the most commonly installed diesel power light towers has been completed for the larger scale event (Splendour in the Grass). Table 5.1 presents an average measured Sound Power Level (SWL) for a typical diesel powered light tower utilised at the Parklands festival events, and Figure 5.1 presents the modelled locations. It is noted that the barrel light towers are not typically diesel powered, and operate at a much lower volume. As a conservative assumption, all light towers have been modelled as the louder units.

Modelling results for stable conditions or a light inversion for the identified surrounding sensitive receivers are presented in Table 5.2. The adopted criteria is based on the historic ambient noise data, having an Assessment (ABL[16]) or Rating Background Level (RBL) as low as 30 dB(A), targeting background plus 5 dB(A) to minimise impacts, based on the NSW Industrial Noise Policy guidelines for noise from continuous noise sources.

Table 5.1: Light Towers – Sound Power Level (SWL) dB

Source	1/1/ Octave Frequency Band (Hz)									Total	
	31.5	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(Lin)
Diesel Light Tower	101	108	99	87	83	79	77	72	64	88	110

16 Determination of the assessment background level is by the tenth percentile method described in Appendix B of the NSW Industrial Noise Policy

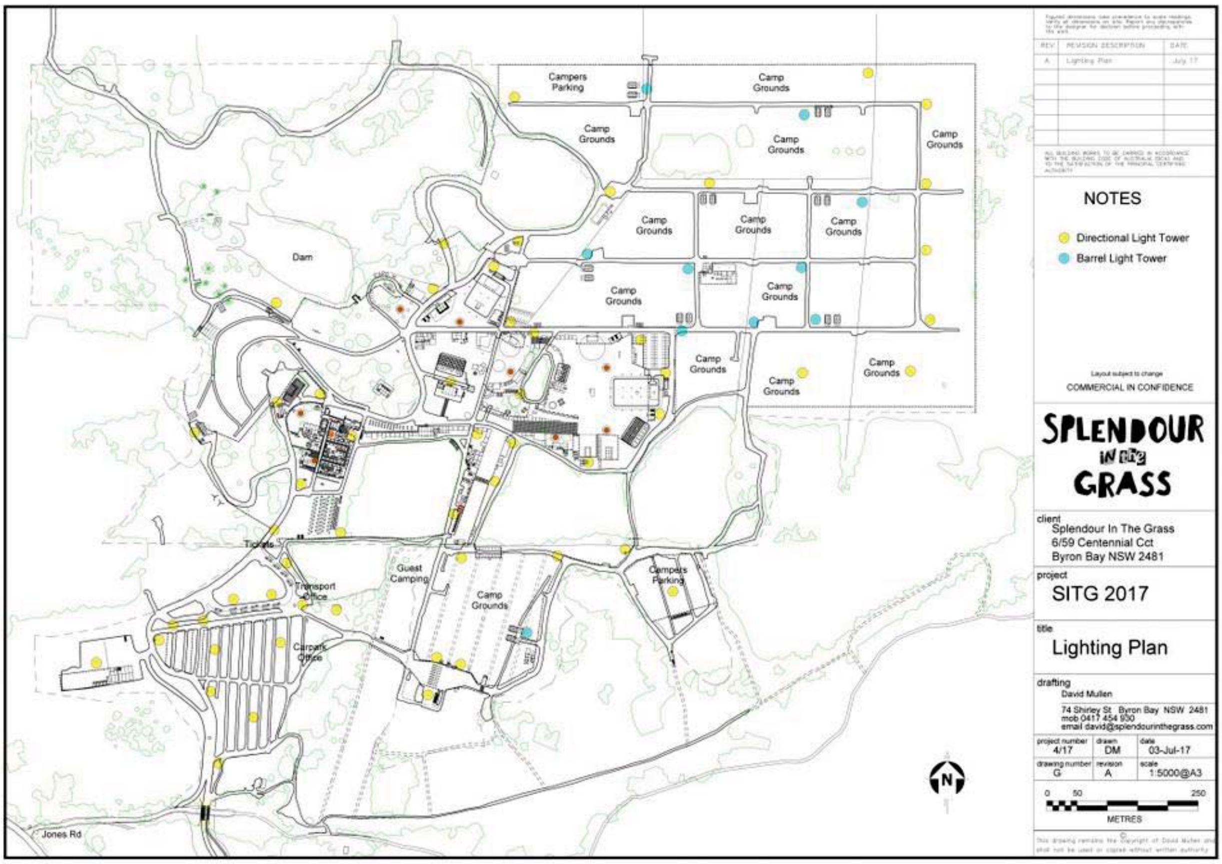


Figure 5.1 - Modelled Diesel powered Light Towers*

* Note: Additional towers located at the entry to Jones Road, and the venue entry points

Table 5.2: Predicted L_{Aeq} Receptor Noise Levels – Diesel Light Generators

Receptor Number	Zone	Predicted L_{Aeq} (dB(A))	Criteria
1	1	21	35
2	1	24	35
3	2	20	35
4	1	27	35
5	1	34	35
6	2	20	35
7	1	20	35
8	1	20	35
9	1	20	35
10	1	22	35
11	1	27	35
12	1	22	35
13	1	26	35
14	2	15	35
15	2	16	35
16	2	14	35
17	1	29	35
18	1	27	35
19	1	26	35
20	2	12	35
21	2	7	35
22	2	9	35
23	2	15	35
24	2	16	35
25	1	26	35
26	2	23	35
27	2	19	35
28	2	19	35
29	2	14	35
30	2	17	35
31	2	13	35
32	1	31	35
33	1	21	35
34	1	22	35
35	1	23	35
36	1	20	35
37	1	20	35
38	1	20	35
39	1	21	35
40	1	22	35
41	1	21	35
42	1	20	35
43	1	26	35
44	2	27	35
45	2	19	35
46	2	20	35
47	2	19	35
48	2	15	35
49	2	17	35
50	2	17	35
51	2	18	35
52	2	20	35
53	2	20	35
54	2	19	35
55	2	20	35
56	2	17	35
57	2	22	35
58	2	18	35
59	2	19	35
60	2	18	35

Review of the predicted results for operating of diesel powered lighting towers indicates full compliance with the INP criteria.

Management to ensure the impacts of specific sources are not contributing to a cumulative impact concurrent with event noise, it is recommended to the select quietest feasible plant, and appropriate orientation of plant in locations with nearby sensitive receivers should be adopted to minimise impacts.

Overall the predicted impact from diesel powered lighting towers through the venue is minimal, which is consistent with the post 2 am noise measurements completed for historic events at the Parklands venue.

5.2 Conference Centre Use

5.2.1 Introduction

The Parklands Venue, in addition to the festival event noise, is currently proposing the inclusion of a conference centre at the location shown in Figure 5.2. The conference centre is proposed to be utilised throughout the year, and operational sources of noise may include:

- amplified entertainment or announcements (e.g. music or presentations);
- vehicle movements (including car door closures);
- outdoor activities; and
- mechanical plant and equipment.

The potential noise impacts associated with these sources is considered in the following sections.

5.2.2 Continuous Noise Sources

Modelling of typical split system air conditioning (a/c) units has been considered for each building proposed within the conference centre development, as well as refrigeration plant to the roof of the conference centre buildings. It is noted that there is a preference for the accommodation units to be naturally ventilated, however modelling has considered the potential for a/c systems to be provided to each building to provide a conservative assessment. Table 5.3 presents an average measured Sound Power Level (SWL) for typical mechanical plant items, and Figure 5.2 presents the proposed layout. Modelling has assumed the plant items are all running concurrently, and continuously.

The adopted criterion is based on the historic ambient noise data, which indicates an Assessment Background Level (ABL[17]) or Rating Background Level (RBL) as low as 30 dB(A). This results in a criterion of background plus 5 dB(A), or 35 dB(A), to minimise impacts, as per the NSW Industrial Noise Policy guidelines for noise from continuous noise sources.

Modelling results for worst case meteorological conditions for the surrounding sensitive receivers are

17 Determination of the assessment background level is by the tenth percentile method described in Appendix B of the NSW Industrial Noise Policy

presented in Table 5.4. An additional sensitive receiver has been included to predict the noise level at the boundary of Receptor 18 (the nearest property).

Table 5.3: Conference Centre Mechanical Plant – Sound Power Level (SWL) dB

Source	1/1/ Octave Frequency Band (Hz)									Total	
	31.5	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(Lin)
A/C Condenser	85	85	86	81	71	69	67	65	65	78	91
Refrigeration Plant	99	99	100	95	85	83	81	79	79	92	105

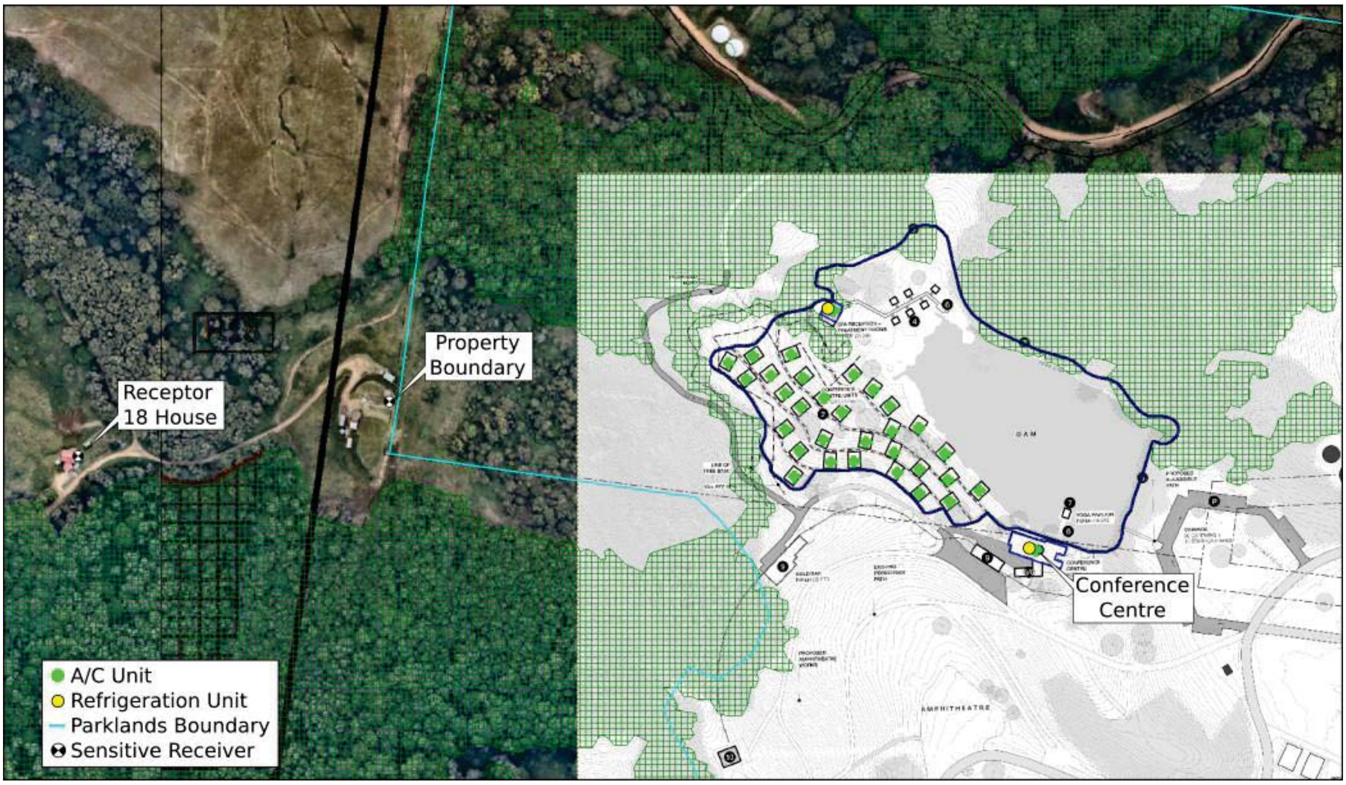


Figure 5.2 - Conference Centre Layout Plan and Modelled Sources

Table 5.4: Predicted L_{Aeq} Receptor Noise Levels – Conference Centre Mechanical Plant

Receptor Number	Zone	Predicted L_{Aeq} (dB(A))	Criteria
1	1	14	35
2	1	15	35
3	2	13	35
4	1	16	35
5	1	24	35
6	2	17	35
7	1	17	35
8	1	18	35
9	1	21	35
10	1	22	35
11	1	21	35
12	1	17	35
13	1	18	35
14	2	10	35
15	2	11	35
16	2	8	35
17	1	18	35
18	1	21	35
18 – Boundary	1	28	35
19	1	15	35
20	2	6	35
21	2	1	35
22	2	4	35
23	2	10	35
24	2	15	35
25	1	21	35
26	2	13	35
27	2	13	35
28	2	13	35
29	2	8	35
30	2	12	35
31	2	7	35
32	1	17	35
33	1	13	35
34	1	15	35
35	1	12	35
36	1	14	35
37	1	14	35
38	1	14	35
39	1	14	35
40	1	17	35
41	1	19	35
42	1	18	35
43	1	18	35
44	2	17	35
45	2	17	35
46	2	17	35
47	2	13	35
48	2	13	35
49	2	16	35
50	2	16	35
51	2	17	35
52	2	17	35
53	2	17	35
54	2	17	35
55	2	17	35
56	2	15	35
57	2	16	35
58	2	15	35
59	2	15	35
60	2	15	35

Review of the predicted results for all mechanical plant at the proposed conference centre operating simultaneously, results in compliance for all off-site sensitive areas, including the boundary of the nearest property.

If mechanical plant with SWL higher than those provided in Table 5.3 are proposed, minor treatments may be required to maintain compliance to off-site areas. However, even the most impacted existing sensitive receiver is predicted to remain 9 dB(A) below the INP criteria, hence there is some scope for slightly higher source noise levels from specific plant, providing the noise from all plant sources combined does not increase by more than 9 dB.

5.2.3 Combined Activities at Conference Centre

5.2.3.1 Overview

The proposed conference facility is located in excess of 450 m from the nearest off-site receptor and is shielded by terrain. Generally activities at the centre will be located within the air conditioned Conference Centre building hence the risk off-site noise impacts is low. During specific periods, there is potential for activities to occur external to the building, therefore an assessment of the potential noise impacts during these periods has been completed. In addition, the risk of noise associated with patron vehicles accessing the car parking area has been considered.

To provide for a complete overview of potential noise sources, and to provide for a conservative assessment of the risk of impacts, all potential sources have been considered to operate simultaneously. The sources included in the acoustic modelling are as follows:

- all assumed plant and equipment (as per Section 5.1);
- 180 patrons at conference centre, in external areas;
- 30 patrons utilising the nature walk or gardens area;
- 30 patrons within the accommodation area;
- 2 cars driving (L_{Aeq}) or car door slams (L_{Amax}) in car park area, and
- 2 speakers operating in an open area at a sound power level 10 dB above the level of patrons.

Noise source data used in the modelling is based on measured spectrum data from ANE's in-house noise database and predictive equations for crowd noise presented in 'Prediction of Noise from Small to Medium Sized Crowds' (Proceedings of Acoustics 2011)[18]. The Acoustics 2011 paper provides equations for predicting the sound power level of crowds as a function of crowd size. The equations are based on measured data for a range of crowd sizes (6 to 93 people) in various outdoor settings (restaurants, cafes, churches, RSL clubs, etc). For the purpose of the study, three groups of patrons (group sizes of 100, 50 and 30 people) have been considered for the conference centre. The model has also considered 30 people at the nature walk area and external to the accommodation area.

18 Hayne, M.J. Et al, Prediction of Noise from Small to Medium Sized Crowds, Paper Number 133, Proceedings of Acoustics 2011.

This is a conservative assumption as the facility is recommended to cater to a total of 180 people.

Table 5.5 presents the adopted Sound Power Levels (SWL) for the ancillary activities at the proposed Conference Centre, and Figure 5.3 presents the modelled source noise locations

The modelling has also included all continuous noise sources from Section 5.1.

Table 5.5: Conference Centre Activities Sources – Sound Power Level (SWL) dB

Source	1/1/ Octave Frequency Band (Hz)									Total	
	31.5	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(Lin)
L_{A10} / L_{Aeq} sources											
Vehicle Movement	67	67	79	71	76	76	76	74	68	82	84
100 Patrons	82	88	87	85	91	90	87	79	67	94	97
50 Patrons	77	83	82	80	86	85	82	74	62	89	92
30 Patrons	74	80	79	77	83	82	79	71	59	86	89
Amplified music (per speaker)	83	95	99	99	103	98	96	92	93	104	107
L_{AMax} / L_{A1} sources											
Car Door Slam	96	82	84	87	88	88	84	82	77	92	98
100 Patrons	91	97	96	94	100	99	96	88	76	103	106
50 Patrons	88	94	93	91	97	96	93	85	73	100	103
30 Patrons	85	91	90	88	94	93	90	82	70	97	100
Amplified music	92	104	108	108	112	107	105	101	102	113	116

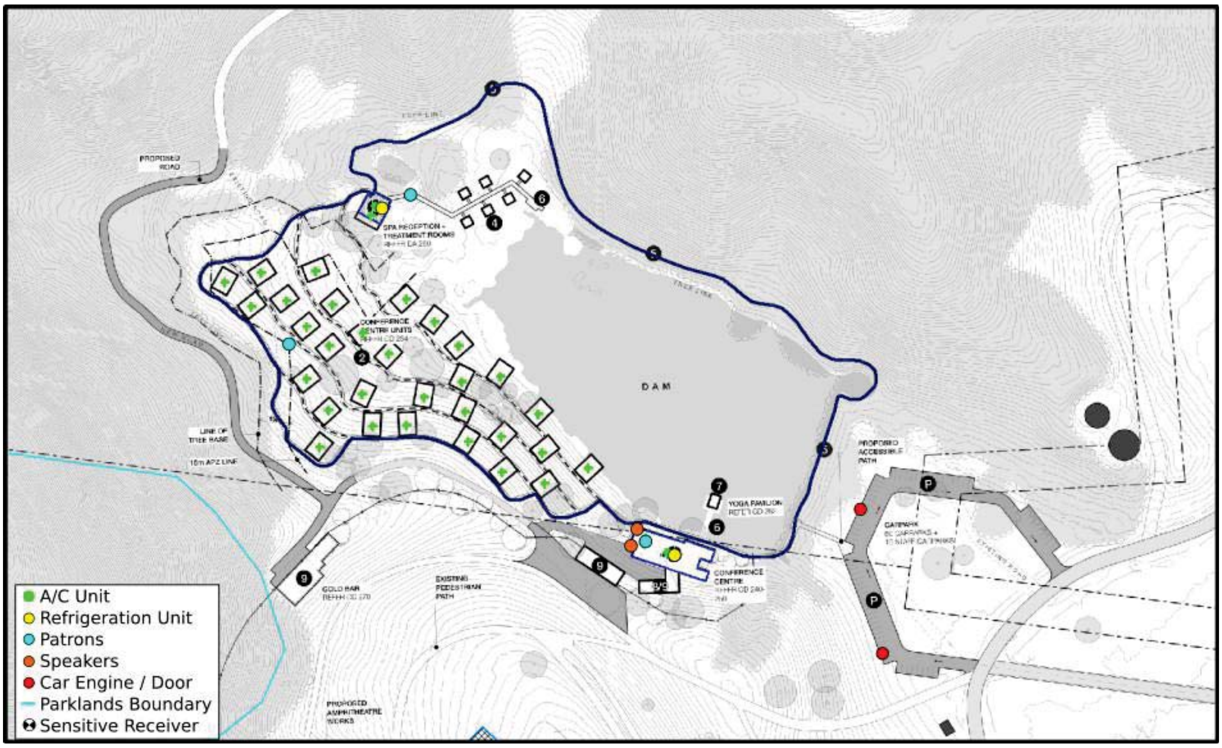


Figure 5.3 - Conference Centre Modelled Noise Sources

Modelling results for source-to-receiver wind conditions (1 to 3 m/s) or a temperature inversion under calm conditions for the identified surrounding sensitive receivers are presented in Table 4.2. The adopted criteria is based on the historic ambient noise data, having an Assessment (ABL[19]) or Rating Background Level (RBL) as low as 30 dB(A), targeting background plus 5 dB(A) to minimise impacts, based on the NSW Industrial Noise Policy guidelines for noise from continuous noise sources. This is equivalent to a noise limit of 35 dB(A) based on the requirements of the INP.

For the inclusion of amplified noise (music or announcements) an additional review against Liquor Licensing conditions have been considered, including consideration of achieving the following criteria:

- L_{A10} >= BG (L_{A90}) in any Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) + 5 dB between 07:00am and 12:00 midnight at the boundary of any affected residence.
- L_{A10} >= BG (L_{A90}) in any Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) + 0 dB from 12:00 midnight to 7 am at the boundary of any affected residence.
- Not withstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00

19 Determination of the assessment background level is by the tenth percentile method described in Appendix B of the NSW Industrial Noise Policy

midnight and 07:00am.

Ambient octave band frequency data is unavailable for the nearest sensitive receivers. Therefore a screening assessment of the likelihood of inaudibility within any habitable room has been completed assuming a minimum L_{oct} noise level of 30 dB for each Octave Band Centre Frequency from 31.5Hz – 8kHz. For the purposes of defining an assessment criterion, it is assumed that a minimum 5 dB reduction facade attenuation (external to internal) for a habitable room is achieved, giving a criterion of 25 dB L_{oct} in the Octave Band Centre Frequencies 31.5Hz – 8kHz for a 30 dB L_{oct} background noise level. This is based on achieving inaudibility, which is typically defined as 10 dB below ambient. It is noted this criteria is only applicable from midnight until 7:00 am, and for the period 7 am to midnight a higher criterion of 35 dB L_{oct} (ie, background plus 5 dB) would apply.

For the analysis of the live entertainment scenario, it is assumed that all patrons are external to the venue, with no reduction from the walls, roof, or windows of the facility. Similarly the amplified music has been predicted to operate external to the facility. This is a highly conservative scenario.

Typically, where a licensed premises proposes to host live entertainment, it would be necessary to complete an acoustic Liquor Licensing assessment at the commissioning phase to establish maximum music levels and appropriate management measures to achieve compliance with the liquor licence criteria. The modelling presented in this assessment is intended to identify that live entertainment is feasible for the proposed location, and a more detailed analysis will be required at the commissioning stage to allow definition of specific liquor licence conditions and noise limits, prior to commencement of operations at the conference centre.

It is noted that, if a detailed Liquor Licensing assessment is not completed at the commissioning stage, the operation of amplified entertainment could be restricted to internal speakers only operating at 75 dB(C) measured at 3 m from 7 am – 12 midnight.

5.2.3.2 Combined Activities – Modelling Results

Table 5.6 and 5.7 present the L_{A10} / L_{Aeq} values and L_{Amax} / L_{A1} values respectively for all plant and activities operating simultaneously. Comparison is made to the INP (35 dB(A) L_{Aeq}) and sleep disturbance criteria (45 dB L_{Amax}), as well as review of the results has included a screening assessment as to whether the results and 1/1 octave band results are also below 25 dB $L_{Aeq,Oct}$ (in each octave band frequency), to provide a guide as to whether inaudibility is achievable for operations from 12 midnight until 7 am.

Table 5.6: Predicted L_{A10}/L_{Aeq} Receptor Noise Levels – Conference Centre Full Scale Activities (dB(A))

Receptor	1/1/ Octave Frequency Band (Hz)									LL Review Criteria	Total dB(A)	INP Criteria
	31.5	63	125	250	500	1000	2000	4000	8000			
1	0	1	10	12	13	7	1	1	0	25	17	35
2	0	2	11	13	15	9	1	1	0	25	19	35
3	0	0	10	11	13	7	1	1	0	25	17	35
4	0	3	13	14	17	13	2	1	0	25	21	35
5	0	10	20	22	26	23	17	1	0	25	29	35
6	0	4	14	15	17	11	1	1	0	25	21	35
7	0	4	14	15	17	11	1	1	0	25	21	35
8	0	5	15	16	18	12	2	1	0	25	22	35
9	0	7	18	19	20	16	7	1	0	25	25	35
10	0	8	18	20	23	19	13	1	0	25	27	35
11	0	7	16	19	21	18	10	1	0	25	25	35
12	0	4	13	15	17	12	3	1	0	25	21	35
13	0	5	14	16	19	14	5	1	0	25	22	35
14	0	0	7	7	7	0	1	1	0	25	12	35
15	0	0	8	8	9	2	1	1	0	25	14	35
16	0	0	6	5	5	0	1	1	0	25	11	35
17	0	5	15	15	16	11	2	1	0	25	21	35
18	0	9	17	17	14	9	4	1	0	25	22	35
18 – Boundary	2	15	24	25	24	20	14	1	0	25	30	35
19	0	2	12	12	14	9	1	1	0	25	18	35
20	0	0	4	3	2	0	1	1	0	25	9	35
21	0	0	0	0	0	0	1	1	0	25	2	35
22	0	0	2	0	0	0	1	1	0	25	5	35
23	0	0	7	7	5	0	1	1	0	25	12	35
24	0	2	11	12	13	8	1	1	0	25	18	35
25	0	7	17	19	21	17	8	1	0	25	25	35
26	0	1	10	11	12	6	1	1	0	25	16	35
27	0	1	10	11	13	7	1	1	0	25	17	35
28	0	0	10	11	13	7	1	1	0	25	17	35
29	0	0	6	5	6	0	1	1	0	25	11	35
30	0	0	8	9	10	3	1	1	0	25	15	35
31	0	0	5	4	3	0	1	1	0	25	9	35
32	0	4	13	15	17	12	2	1	0	25	21	35
33	0	1	10	11	12	7	1	1	0	25	17	35
34	0	2	11	12	14	8	1	1	0	25	18	35
35	0	0	9	10	13	8	1	1	0	25	17	35
36	0	2	11	12	13	8	1	1	0	25	18	35
37	0	1	11	11	14	8	1	1	0	25	18	35
38	0	1	11	11	14	9	1	1	0	25	18	35
39	0	2	11	12	15	9	1	1	0	25	19	35
40	0	5	13	12	6	1	1	1	0	25	17	35
41	0	5	15	17	19	14	5	1	0	25	23	35
42	0	5	14	16	19	14	4	1	0	25	22	35
43	0	5	14	15	19	18	9	1	0	25	23	35
44	0	4	14	14	17	13	3	1	0	25	21	35
45	0	4	13	15	16	11	1	1	0	25	20	35
46	0	4	14	15	12	6	1	1	0	25	19	35
47	0	0	9	10	11	4	1	1	0	25	15	35
48	0	1	10	11	11	5	1	1	0	25	16	35
49	0	3	12	13	15	10	1	1	0	25	19	35
50	0	3	12	14	15	10	1	1	0	25	19	35
51	0	3	13	14	16	11	1	1	0	25	20	35
52	0	4	13	14	16	11	1	1	0	25	20	35
53	0	4	13	15	16	12	1	1	0	25	20	35
54	0	4	13	14	16	11	1	1	0	25	20	35
55	0	3	13	15	15	11	1	1	0	25	20	35
56	0	2	11	13	14	9	1	1	0	25	18	35
57	0	3	12	14	15	10	1	1	0	25	19	35
58	0	2	11	13	14	9	1	1	0	25	18	35
59	0	2	11	13	14	9	1	1	0	25	18	35
60	0	2	11	12	14	8	1	1	0	25	18	35

Table 5.7: Predicted $L_{Amax / LA1}$ Receptor Noise Levels – Conference Centre Full Scale Activities (dB(A))

Receptor	1/1/ Octave Frequency Band (Hz)									LL Review Criteria	Total dB(A)	INP Sleep Criteria
	31.5	63	125	250	500	1000	2000	4000	8000			
1	0	3	13	16	22	16	3	1	0	25	24	45
2	0	4	14	17	23	18	6	1	0	25	26	45
3	0	2	13	17	22	16	3	1	0	25	24	45
4	0	5	16	20	**26**	21	11	1	0	25	29	45
5	0	11	22	**26**	**34**	**31**	**26**	3	0	25	37	45
6	0	6	16	20	**25**	20	9	1	0	25	28	45
7	0	6	17	21	**25**	20	10	1	0	25	28	45
8	0	7	18	22	**26**	21	11	1	0	25	29	45
9	0	9	20	24	**29**	24	16	1	0	25	32	45
10	0	10	20	24	**32**	**28**	21	1	0	25	34	45
11	0	8	19	23	**30**	**26**	18	1	0	25	32	45
12	0	6	16	19	**26**	21	11	1	0	25	28	45
13	0	6	17	20	**27**	23	14	1	0	25	30	45
14	0	0	9	12	16	8	1	1	0	25	19	45
15	0	1	10	13	17	10	1	1	0	25	20	45
16	0	0	8	10	13	4	1	1	0	25	16	45
17	0	7	18	21	25	19	11	1	0	25	28	45
18	0	10	19	20	22	17	10	1	0	25	26	45
18 – Boundary	3	16	**26**	**29**	**33**	**28**	22	7	0	25	36	45
19	0	4	14	17	23	17	6	1	0	25	25	45
20	0	0	7	8	11	1	1	1	0	25	14	45
21	0	0	2	1	0	0	1	1	0	25	5	45
22	0	0	4	4	5	0	1	1	0	25	10	45
23	0	0	10	12	14	5	1	1	0	25	17	45
24	0	3	13	16	22	16	3	1	0	25	24	45
25	0	9	20	23	**30**	25	17	1	0	25	32	45
26	0	2	12	15	20	14	1	1	0	25	23	45
27	0	2	13	16	22	16	3	1	0	25	24	45
28	0	2	13	16	22	16	2	1	0	25	24	45
29	0	0	9	11	15	7	1	1	0	25	17	45
30	0	1	11	14	19	12	1	1	0	25	21	45
31	0	0	7	9	12	2	1	1	0	25	15	45
32	0	5	15	19	**26**	21	11	1	0	25	28	45
33	0	2	12	15	21	15	3	1	0	25	23	45
34	0	3	13	17	22	17	4	1	0	25	25	45
35	0	2	11	14	22	17	2	1	0	25	24	45
36	0	3	13	16	22	16	3	1	0	25	24	45
37	0	3	13	16	23	17	4	1	0	25	25	45
38	0	3	13	17	23	17	5	1	0	25	25	45
39	0	3	14	17	24	18	6	1	0	25	26	45
40	0	5	14	14	12	5	1	1	0	25	19	45
41	0	7	18	23	**28**	23	14	1	0	25	30	45
42	0	6	17	21	**27**	22	13	1	0	25	30	45
43	0	6	16	19	**28**	**26**	17	1	0	25	31	45
44	0	6	16	19	**26**	21	12	1	0	25	28	45
45	0	5	16	20	25	20	9	1	0	25	28	45
46	0	6	16	18	20	13	1	1	0	25	24	45
47	0	2	11	14	19	12	1	1	0	25	22	45
48	0	2	12	15	20	13	1	1	0	25	22	45
49	0	4	14	17	23	18	6	1	0	25	26	45
50	0	4	14	18	23	18	6	1	0	25	26	45
51	0	5	15	18	24	19	8	1	0	25	27	45
52	0	5	15	19	25	20	9	1	0	25	27	45
53	0	5	15	19	25	20	9	1	0	25	27	45
54	0	5	15	19	25	20	9	1	0	25	27	45
55	0	4	15	19	24	19	7	1	0	25	27	45
56	0	4	14	17	23	17	5	1	0	25	25	45
57	0	4	14	18	24	19	7	1	0	25	26	45
58	0	4	14	17	23	17	5	1	0	25	25	45
59	0	4	14	17	23	17	5	1	0	25	25	45
60	0	3	13	17	22	17	4	1	0	25	25	45

Review of the predicted results for all mechanical plant and activities at the proposed conference centre operating simultaneously, results in compliance for all off-site sensitive areas for the INP criteria and the daytime liquor licence criterion (7 am - midnight). Review of the potential for inaudibility from L_{Amax} / L_{A1} noise sources for the period midnight to 7 am has identified a number of positions (including the boundary of the nearest property) predicted to exceed the adopted liquor licence screening criteria of 25 dB in each octave band frequency. This criteria is only applicable from midnight – 7:00 am, and review of the contributions from the different noise sources confirms that amplified music is the dominant noise source at these locations and all other sources comply with the criteria. Therefore mitigation of the amplified music source has been considered.

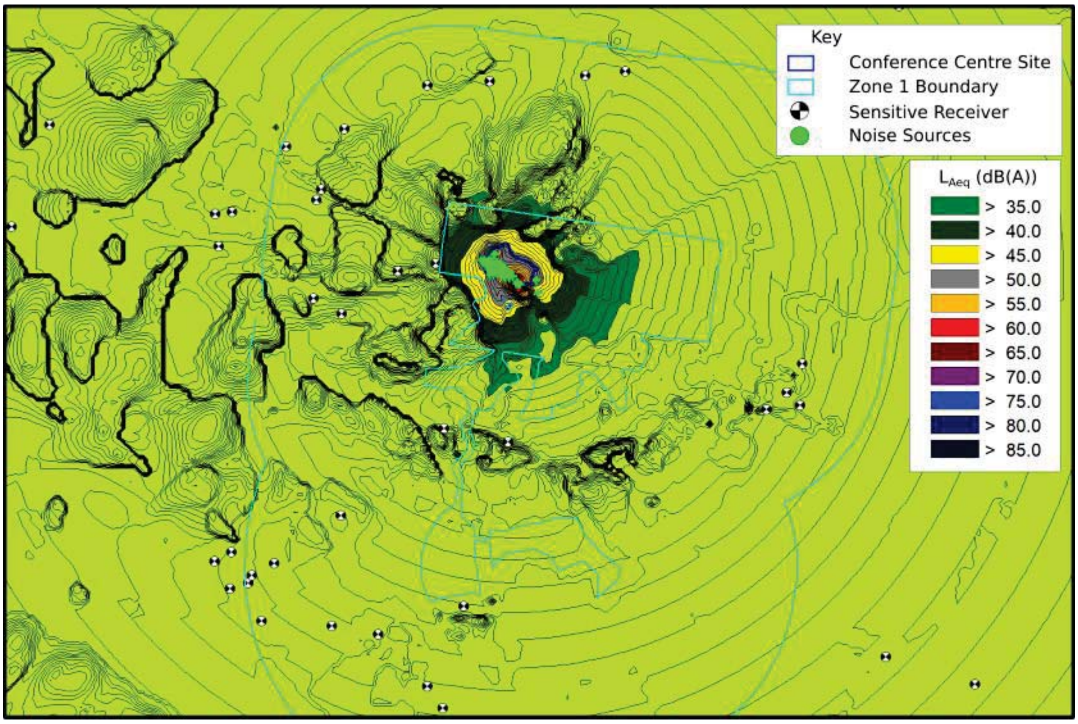


Figure 5.4 - Conference Centre Modelled Noise Contours (L_{A10} / L_{Aeq})

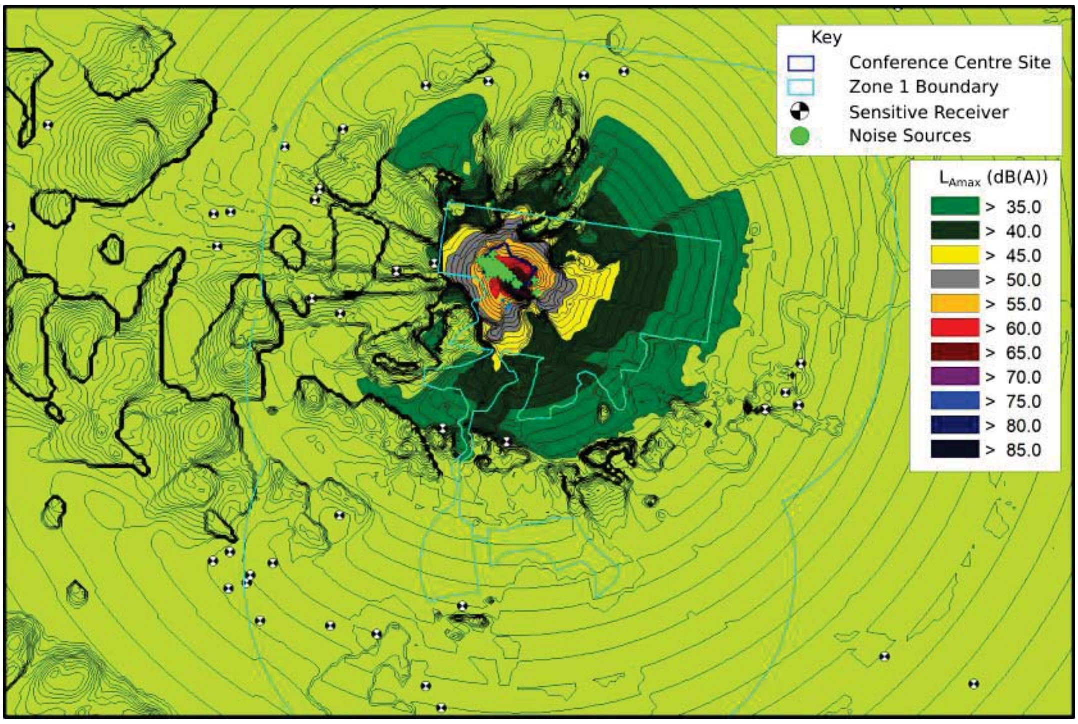


Figure 5.5 - Conference Centre Modelled Noise Contours (L_{Amax} / L_{A1})

5.2.3.3 Mitigation

To confirm the likelihood of compliance with the liquor licence requirements for the period midnight to 7 am, a mitigation scenario has been considered. This assumes the live entertainment during this time period is carried out within the building only, with all doors and windows closed, and assumes that the building fabric achieves a minimum attenuation equivalent to the typical noise attenuation of 6 mm glazing result (as per Table 5.8). No additional reduction for roof or walls has been considered (which would reduce the level of noise significantly more than the assumed glazing). It is noted that patron noise has not been mitigated, and is assumed to remain external to the building as a conservative worst case.

Table 5.8: Material Transmission Loss dB

Source	1/1/ Octave Frequency Band (Hz)									Rw
	31.5	63	125	250	500	1000	2000	4000	8000	
6.38 mm Laminated Glazing	1	11	21	25	31	35	34	37	37	33

5.2.3.4 Mitigation Modelling Results

Table 5.9 presents the mitigation scenario results for the midnight to 7 am period, for amplified music.

Table 5.9: Predicted $L_{Amax\ /\ LA1}$ Receptor Noise Levels – Mitigated Conference Centre Full Scale Activities

Receptor	1/1/ Octave Frequency Band (Hz)									LL Review Criteria	Total dB(A)	INP Sleep Criteria
	31.5	63	125	250	500	1000	2000	4000	8000			
4	0	3	13	13	15	13	2	1	0	25	20	45
5	0	10	19	21	23	23	17	1	0	25	28	45
6	0	5	14	14	14	12	1	1	0	25	20	45
7	0	4	13	14	14	12	1	1	0	25	20	45
8	0	5	15	15	15	13	2	1	0	25	21	45
9	0	8	17	18	18	17	7	1	0	25	24	45
10	0	9	18	19	21	21	13	1	0	25	26	45
11	0	7	16	18	19	19	10	1	0	25	24	45
12	0	4	13	14	15	14	3	1	0	25	20	45
13	0	5	14	15	17	16	5	1	0	25	22	45
18 – Boundary	3	15	24	24	23	21	15	1	0	25	30	45
25	0	7	17	18	19	18	8	1	0	25	24	45
32	0	4	13	14	15	14	2	1	0	25	20	45
41	0	6	15	16	16	14	4	1	0	25	22	45
42	0	5	14	15	16	14	4	1	0	25	21	45
43	0	5	14	14	17	19	9	1	0	25	23	45
44	0	4	13	13	15	14	3	1	0	25	20	45

Review of the results confirms that, for the amplified entertainment occurring within the building from midnight to 7 am, no sensitive receivers were predicted to receive noise levels above the 25 dB screening criterion for the liquor licence assessment. As noted previously, all areas were predicted to remain below the INP criteria for L_{Aeq} for the unmitigated scenario.

Figure 5.6 presents the modelled noise levels for the mitigated scenario.

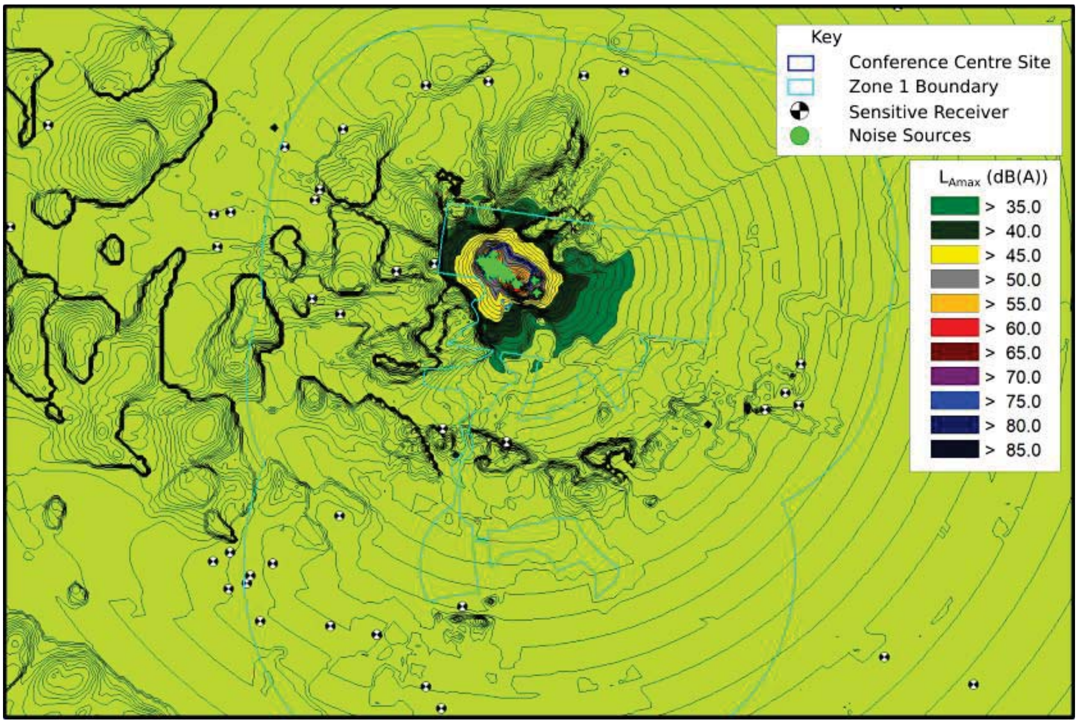


Figure 5.6 - Mitigated Conference Centre Amplified Music - Noise Contours (L_{Amax} / L_{A1})

5.2.3.5 Summary – Conference Centre Activities

Modelling of the facility under full scale operation and amplification activities are predicted to achieve acceptable noise levels at the nearest sensitive receiver positions for 24-hour operations, provided speakers are located within the Conference Centre and doors/windows are closed between the hours of 12 midnight and 7 am, during live entertainment.

5.3 Construction Noise and Vibration

There are limited construction works associated with the proposed expanded facility. The primary noise and vibration risks are associated with construction of the proposed conference centre. In terms of the likelihood of impacts, the nearest residential receptors are located at a distance of 450 m from the conference centre – R18 located on the eastern side of the Pacific Highway (refer to Figure 4.2). This residence does not have a direct line of sight to the proposed location of the conference centre.

Given the separation distance involved, it is considered that construction noise and vibration impacts are unlikely to occur. However, it is recommended that a noise and vibration management plan is implemented for the construction works, to provide guidance on the appropriate timing of activities and best practice approaches to minimising construction noise impacts.

6 Conclusions and Recommendations

The noise assessment has considered the potential for changes in community noise levels to occur, relative to previous large events, for proposed future large events at Parklands. The analysis has included consideration of the existing acoustic performance of the venue, and has considered a range of potential noise management measures.

The proposed permanent operations introduce an additional main stage, and provide for additional patron numbers relative to the previous events. Acoustic modelling has determined that there is potential for increased community impacts for the larger proposed events if the same operating volumes are maintained for each venue. Provision of additional physical mitigation measures for the venue is problematic due to the distributed nature of the noise sources, and because stage specific mitigation measures are already adopted for large events and will continue to be adopted for future events.

Historically, an extensive noise monitoring and acoustic management programme has been adopted for large events at Parklands, and the effectiveness of this approach has been demonstrated through the high degree of compliance achieved for all recent events. These monitoring and management approaches are documented in an approved Noise Management Plan. The acoustic assessment has concluded that adoption of the noise monitoring and mitigation strategies defined in the approved Noise Management Plan, in combination with reductions in operating volumes for main stages as defined in Table 4.11 will achieve compliance with the venue noise criteria for both L_{Aeq} and $L_{Oct\text{-}63\ Hz}$ noise levels.

The noise assessment has also considered ancillary noise sources associated with large events, and the proposed construction and operation of a conference centre at the venue. Mitigation measures and source noise limits are identified, where appropriate, for these sources. Management measures for ancillary noise sources at large events are also identified and will be adopted for future operations and events as required.

Appendix A - Acoustic Glossary

APPENDIX A: GLOSSARY OF ACOUSTIC TERMINOLOGY	
A-Weighting	A response provided by an electronic circuit which modifies sound in such a way that the resulting level is similar to that perceived by the human ear.
dB (decibel)	This is the scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and the reference pressure ($0.00002 N/m^2$).
dB(A)	This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Facade Noise Level	Refers to a sound pressure level determined at a point close to an acoustically reflective surface (in addition to the ground). Typically a distance of 1 metre is used.
Free Field	Refers to a sound pressure level determined at a point away from reflective surfaces other than the ground with no significant contribution due to sound from other reflective surfaces; generally as measured outside and away from buildings.
Hertz (Hz)	A measure of the frequency of sound. It measures the number of pressure peaks per second passing a point when a pure tone is present.
L_{Aeq} Equivalent Continuous Sound Level	This is the equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over the given period. For a steady sound with small fluctuations, its value is close to the average sound pressure level.
$L_{A90,T}$	This is the dB(A) level exceeded 90% of the time, T.
$L_{A10,T}$	This is the dB(A) level exceeded 10% of the time, T.
$L_{A50, T}$	This is the dB(A) level exceeded 50% of the time, T.
L_{WA}	The A-weighted sound power level in dB.

Appendix B – Frequency Spectra for Live Event Noise Sources

Table B1: SITG FOH Levels

Stage	Distance to FOH (m)	dB(A)	dB(C)	Octave Band Frequency (dB(Lin))								
				31.5	63	125	250	500	1000	2000	4000	8000
S1	35m	99	109	106	105	101	97	95	97	88	80	69
S2	16m	95	105	97	105	89	79	91	94	82	75	71
S4	20m	99	109	102	108	98	96	93	98	83	75	66
S5	10m	95	105	104	103	89	88	86	94	79	72	64
S6	25m	99	109	109	105	87	77	86	99	80	72	66
S7	22.5m	99	109	106	108	93	80	88	98	79	71	66
S9	10m	91	101	99	98	93	82	85	86	86	78	74
V1	10m	95	105	99	104	95	87	90	90	89	82	78
V2	10m	95	105	99	104	96	86	90	90	89	82	79
V3	10m	95	105	99	104	94	86	90	90	89	82	79
V4	10m	95	105	101	104	94	85	89	91	88	81	78
V5	10m	95	105	103	103	96	85	89	92	89	81	78
V6	10m	95	105	103	102	97	85	89	91	89	81	78
V7	10m	95	105	103	102	97	85	89	92	89	82	78
V8	10m	95	105	102	103	96	85	89	91	89	82	78
V9	10m	95	105	102	103	96	85	89	91	89	82	78
V10	10m	95	105	105	102	93	88	90	90	89	82	79

Table B2: FALLS FOH Levels

Stage	Distance to FOH (m)	dB(A)	dB(C)	Octave Band Frequency (dB(Lin))								
				31.5	63	125	250	500	1000	2000	4000	8000
S1	35m	99	109	100	104	107	98	92	95	88	89	74
S3	25m	99	109	100	103	107	98	92	95	88	89	76
The Village	10m	95	105	96	100	103	96	90	91	84	85	72
Bar 6	10m	95	105	96	105	98	84	91	91	89	82	73
Wilderness	10m	95	105	99	104	94	81	92	91	89	82	70
Red Bull	10m	95	105	99	105	94	81	92	91	89	82	70
CUB	10m	96	105	99	104	94	83	93	91	89	82	69
Big Top	10m	95	105	99	104	95	81	91	90	89	82	70
Captain Morgan	10m	95	105	80	86	104	94	88	91	83	85	72

Table B3: Base Case Full Scale FOH Levels, 11am - Midnight

Stage	Distance to FOH (m)	dB(A)	dB(C)	Octave Band Frequency (dB(Lin))								
				31.5	63	125	250	500	1000	2000	4000	8000
S1	35m	99	109	106	105	101	97	95	97	88	80	69
S2	16m	95	105	97	105	89	79	91	94	82	75	71
S3	22m	99	109	99	109	94	82	91	98	85	77	73
S4	20m	99	109	102	108	98	96	93	98	83	75	66
S5	10m	95	105	104	103	89	88	86	94	79	72	64
S6	25m	99	109	109	105	87	77	86	99	80	72	66
S7	22.5m	99	109	106	108	93	80	88	98	79	71	66
S9	10m	91	101	99	98	93	82	85	87	86	78	74
V1	10m	95	105	99	104	95	87	90	90	89	82	78
V2	10m	95	105	99	104	96	86	90	90	89	82	79
V3	10m	95	105	99	104	94	86	90	90	89	82	79
V4	10m	95	105	101	104	94	85	89	91	88	81	78
V5	10m	95	105	103	103	96	85	89	92	89	81	78
V6	10m	95	105	103	102	97	85	89	91	89	81	78
V7	10m	95	105	103	102	97	85	89	92	89	82	78
V8	10m	95	105	102	103	96	85	89	91	89	82	78
V9	10m	95	105	102	103	96	85	89	91	89	82	78
V10	10m	95	105	105	102	93	88	90	90	89	82	79

Table B4: Base Case Full Scale FOH Levels, Midnight - 2am

Stage	Distance to FOH (m)	dB(A)	dB(C)	Octave Band Frequency (dB(Lin))								
				31.5	63	125	250	500	1000	2000	4000	8000
S1	35m											
S2	16m	95	105	97	105	89	78	91	94	82	75	71
S3	22m											
S4	20m											
S5	10m	94	105	104	102	88	88	86	93	79	71	64
S6	25m											
S7	22.5m											
S9	10m	91	100	98	97	93	81	85	86	86	78	74
V1	10m	95	105	99	104	94	85	89	90	89	82	78
V2	10m	95	105	98	104	96	85	89	90	89	82	79
V3	10m	95	105	99	104	94	85	90	90	89	82	79
V4	10m	94	104	99	103	94	85	89	89	88	81	78
V5	10m	94	104	101	102	96	84	88	89	88	81	78
V6	10m	94	104	102	100	97	85	89	89	89	81	78
V7	10m	94	104	102	100	97	85	89	89	89	82	78
V8	10m	94	104	100	102	95	85	89	89	89	82	78
V9	10m	94	104	101	103	96	85	89	89	89	82	78
V10	10m	95	105	105	101	93	88	90	90	89	82	79

Table B5: Mitigated Full Scale FOH Levels, 11am - Midnight

Stage	Distance to FOH (m)	dB(A)	dB(C)	Octave Band Frequency (dB(Lin))								
				31.5	63	125	250	500	1000	2000	4000	8000
S1	35m	98	108	105	105	102	96	94	96	86	79	68
S2	16m	95	105	97	105	89	79	91	94	82	75	71
S3	22m	99	105	95	105	92	82	91	98	85	77	73
S4	20m	99	108	101	107	98	96	93	98	83	75	66
S5	10m	95	105	104	103	89	88	86	94	79	72	64
S6	25m	99	109	109	104	87	77	86	99	80	72	66
S7	22.5m	99	107	103	106	91	80	88	98	79	71	66
S9	10m	91	101	99	98	93	81	85	86	86	78	74
V1	10m	95	105	99	104	96	87	90	90	89	82	78
V2	10m	95	105	98	104	96	86	90	90	89	82	79
V3	10m	95	105	99	104	94	86	90	90	89	82	79
V4	10m	95	105	101	104	94	85	89	91	88	81	78
V5	10m	95	105	103	103	96	85	89	92	89	81	78
V6	10m	95	105	103	101	97	85	89	91	89	81	78
V7	10m	95	105	103	101	97	85	89	92	89	82	78
V8	10m	95	105	102	103	96	85	89	91	89	82	78
V9	10m	95	105	102	103	96	85	89	91	89	82	78
V10	10m	95	105	105	102	93	88	90	90	89	82	79

Table B6: Base Case Full Scale FOH Levels, Midnight - 2am

Stage	Distance to FOH (m)	dB(A)	dB(C)	Octave Band Frequency (dB(Lin))								
				31.5	63	125	250	500	1000	2000	4000	8000
S1	35m											
S2	16m	89	99	96	98	83	72	85	88	76	69	65
S3	22m											
S4	20m											
S5	10m	92	104	104	102	88	86	84	91	77	69	62
S6	25m											
S7	22.5m											
S9	10m	87	99	98	97	89	77	81	82	82	75	70
V1	10m	94	104	99	104	94	84	88	89	88	81	77
V2	10m	90	98	93	94	93	80	84	85	84	77	74
V3	10m	91	102	99	101	94	81	86	86	85	78	75
V4	10m	92	103	99	101	94	83	87	87	86	79	76
V5	10m	93	99	96	95	94	83	87	88	87	80	77
V6	10m	91	99	96	94	94	82	86	86	86	78	75
V7	10m	92	100	96	94	95	83	86	87	87	79	76
V8	10m	91	98	93	93	94	82	86	86	86	79	75
V9	10m	94	101	96	98	96	85	89	89	89	82	78
V10	10m	94	104	105	99	93	87	89	89	88	81	78

Table B7: Source Input SWL data

Stage	Stage Type	dB(A)	dB(Lin)	Octave Band Frequency (dB(Lin)) 31.5	63	125	250	500	1000	2000	4000	8000
S1_Amph	Vocal_Main_Stage	128	136	130	132	127	127	124	126	116	110	101
S2_Tipi	Bass_Main_Stage	128	138	127	137	121	112	124	127	115	109	105
S3_Forest	Bass_Main_Stage	128	137	130	136	121	112	121	128	115	109	105
S4_McLennan	Vocal_Main_Stage	131	138	129	135	126	126	123	130	115	109	100
S5_World	Vocal_Main_Stage	126	135	131	131	120	120	116	125	109	103	94
S6_Tiny	Bass_Main_Stage	133	141	138	138	117	108	117	133	111	105	101
S7_MixUp	Bass_Main_Stage	128	135	129	133	115	106	115	128	109	103	99
Other	PA	117	135	124	135	123	112	113	111	110	103	100

Table B8: Directivities

Directivity — Name: D and B Q7 — ☐ normalized

	31.5	63	125	250	500	1000	2000	4000	8000
0°	-99.0	-99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15°	-99.0	-99.0	0.0	0.0	-0.5	-1.0	-1.5	-3.0	-2.0
30°	-99.0	-99.0	0.0	0.0	-1.0	-2.0	-3.0	-6.0	-4.0
45°	-99.0	-99.0	0.0	-0.5	-3.0	-5.0	-6.5	-9.0	-10.5
60°	-99.0	-99.0	0.0	-1.0	-5.0	-8.0	-10.0	-12.0	-17.0
75°	-99.0	-99.0	-0.5	-2.0	-6.0	-10.5	-13.5	-16.0	-21.0
90°	-99.0	-99.0	-1.0	-3.0	-7.0	-13.0	-17.0	-20.0	-25.0
105°	-99.0	-99.0	-1.0	-4.0	-8.0	-15.5	-18.5	-21.5	-27.5
120°	-99.0	-99.0	-1.0	-5.0	-9.0	-18.0	-20.0	-23.0	-30.0
135°	-99.0	-99.0	-1.0	-5.0	-9.5	-18.0	-20.0	-24.5	-31.5
150°	-99.0	-99.0	-1.0	-5.0	-10.0	-18.0	-20.0	-26.0	-33.0
165°	-99.0	-99.0	-1.0	-4.0	-9.0	-17.5	-20.0	-26.5	-32.0
180°	-99.0	-99.0	-1.0	-3.0	-8.0	-17.0	-20.0	-27.0	-31.0

Directivity — Name: L_Acoustics 108P — ☐ normalized

	31.5	63	125	250	500	1000	2000	4000	8000
0°	-99.0	-99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15°	-99.0	-99.0	0.0	0.0	0.0	-1.0	-1.0	-1.5	-0.5
30°	-99.0	-99.0	0.0	0.0	0.0	-2.0	-2.0	-3.0	-1.0
45°	-99.0	-99.0	0.0	-1.0	-2.0	-3.5	-3.5	-5.5	-3.0
60°	-99.0	-99.0	0.0	-2.0	-4.0	-5.0	-5.0	-8.0	-5.0
75°	-99.0	-99.0	-0.5	-3.0	-5.0	-6.5	-7.5	-11.5	-11.5
90°	-99.0	-99.0	-1.0	-4.0	-6.0	-8.0	-10.0	-15.0	-18.0
105°	-99.0	-99.0	-1.0	-3.5	-5.5	-9.0	-11.5	-18.0	-20.0
120°	-99.0	-99.0	-1.0	-3.0	-5.0	-10.0	-13.0	-21.0	-22.0
135°	-99.0	-99.0	-1.0	-3.0	-5.5	-11.0	-14.0	-21.0	-23.5
150°	-99.0	-99.0	-1.0	-3.0	-6.0	-12.0	-15.0	-21.0	-25.0
165°	-99.0	-99.0	-1.0	-2.5	-5.5	-13.5	-22.5	-25.5	-28.5
180°	-99.0	-99.0	-1.0	-2.0	-5.0	-15.0	-30.0	-30.0	-32.0

Directivity — Name: L_Acoustics 112P — ☑ normalized

	31.5	63	125	250	500	1000	2000	4000	8000
0°	-99.0	-99.0	-99.0	0.0	0.0	0.0	0.0	0.0	0.0
15°	-99.0	-99.0	-99.0	0.0	-0.5	1.0	-1.0	-0.5	-1.0
30°	-99.0	-99.0	-99.0	0.0	-1.0	2.0	-2.0	-1.0	-2.0
45°	-99.0	-99.0	-99.0	-1.0	-2.5	0.0	-6.0	-2.5	-7.0
60°	-99.0	-99.0	-99.0	-2.0	-4.0	-2.0	-10.0	-4.0	-12.0
75°	-99.0	-99.0	-99.0	-3.0	-6.5	-3.5	-11.5	-10.0	-18.5
90°	-99.0	-99.0	-99.0	-4.0	-9.0	-5.0	-13.0	-16.0	-25.0
105°	-99.0	-99.0	-99.0	-4.5	-11.0	-5.5	-15.5	-19.0	-27.5
120°	-99.0	-99.0	-99.0	-5.0	-13.0	-6.0	-18.0	-22.0	-30.0
135°	-99.0	-99.0	-99.0	-5.5	-11.5	-6.0	-17.5	-22.0	-31.0
150°	-99.0	-99.0	-99.0	-6.0	-10.0	-6.0	-17.0	-22.0	-32.0
165°	-99.0	-99.0	-99.0	-4.5	-10.5	-13.0	-21.0	-26.0	-32.5
180°	-99.0	-99.0	-99.0	-3.0	-11.0	-20.0	-25.0	-30.0	-33.0

Directivity — Name: D and B J_Woofers — ☐ normalized

	31.5	63	125	250	500	1000	2000	4000	8000
0°	0.0	0.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
15°	-0.5	-0.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
30°	-1.0	-1.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
45°	-1.5	-1.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
60°	-2.0	-2.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
75°	-3.5	-3.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
90°	-5.0	-5.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
105°	-7.5	-7.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
120°	-10.0	-10.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
135°	-12.0	-12.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
150°	-14.0	-14.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
165°	-12.0	-12.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
180°	-10.0	-10.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0

Directivity — Name: CD18_Subbass — ☑ normalized

	31.5	63	125	250	500	1000	2000	4000	8000
0°	0.0	-0.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
15°	0.0	-0.3	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
30°	0.0	0.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
45°	0.0	0.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
60°	0.0	0.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
75°	-2.0	-1.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
90°	-4.0	-3.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
105°	-6.0	-7.3	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
120°	-8.0	-11.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
135°	-10.0	-12.3	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
150°	-12.0	-13.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
165°	-12.0	-12.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
180°	-12.0	-11.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0

Directivity — Name: T4805_T2815_Nexo_Tangent — ☐ normalized

	31.5	63	125	250	500	1000	2000	4000	8000
0°	-99.0	-99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15°	-99.0	-99.0	-0.5	-0.5	-0.5	-0.5	-0.5	-0.8	-1.3
30°	-99.0	-99.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.5	-2.5
45°	-99.0	-99.0	-5.0	-5.0	-5.0	-5.0	-5.0	-6.3	-9.0
60°	-99.0	-99.0	-9.0	-9.0	-9.0	-9.0	-9.0	-11.0	-15.5
75°	-99.0	-99.0	-13.5	-13.5	-13.5	-13.5	-13.5	-16.0	-19.8
90°	-99.0	-99.0	-18.0	-18.0	-18.0	-18.0	-18.0	-21.0	-24.0
105°	-99.0	-99.0	-21.0	-21.0	-21.0	-21.0	-21.0	-22.5	-24.0
120°	-99.0	-99.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0
135°	-99.0	-99.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0
150°	-99.0	-99.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0
165°	-99.0	-99.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0
180°	-99.0	-99.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0

Directivity — Name: S1_Amph_SUB_Array — ☐ normalized

	31.5	63	125	250	500	1000	2000	4000	8000
0°	0.0	0.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
15°	-4.0	0.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
30°	-7.0	-2.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
45°	-7.0	-6.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
60°	-10.0	-16.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
75°	-12.0	-4.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
90°	-16.0	-2.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
105°	-17.0	-7.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
120°	-18.0	-24.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
135°	-18.0	-12.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
150°	-20.0	-20.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
165°	-18.0	-16.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
180°	-14.0	-20.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0

Directivity — Name: DJ_15inch_PA — ☑ normalized

	31.5	63	125	250	500	1000	2000	4000	8000
0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15°	-0.5	-0.5	-0.5	-0.5	-0.5	-1.5	-2.5	-2.0	-1.5
30°	-1.0	-1.0	-1.0	-1.0	-1.0	-3.0	-5.0	-4.0	-3.0
45°	-2.0	-2.0	-2.0	-2.0	-3.0	-6.0	-8.5	-8.0	-7.5
60°	-3.0	-3.0	-3.0	-3.0	-5.0	-9.0	-12.0	-12.0	-12.0
75°	-4.5	-4.5	-4.5	-5.0	-6.5	-11.5	-15.0	-16.0	-16.0
90°	-6.0	-6.0	-6.0	-7.0	-8.0	-14.0	-18.0	-20.0	-20.0
105°	-6.0	-6.0	-6.0	-8.0	-10.0	-16.0	-21.0	-25.0	-22.0
120°	-6.0	-6.0	-6.0	-9.0	-12.0	-18.0	-24.0	-30.0	-24.0
135°	-6.0	-6.0	-6.0	-8.5	-15.5	-18.0	-26.0	-30.0	-28.0
150°	-6.0	-6.0	-6.0	-8.0	-19.0	-18.0	-28.0	-30.0	-32.0
165°	-6.0	-6.0	-6.0	-8.0	-15.5	-18.0	-27.0	-32.0	-32.0
180°	-6.0	-6.0	-6.0	-8.0	-12.0	-18.0	-26.0	-34.0	-32.0

Table B9: Point Source Descriptors

Source	Adjusted PWL (dB(A))	Reference Value	Direct.	Directivity X	Directivity Y	Directivity Z	Height
S1_Main_J8_L_1	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	0.000	7.75
S1_Main_J8_L_1	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	0.000	7.40
S1_Main_J8_L_1	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	-0.030	7.00
S1_Main_J8_L_1	124	S1_Amph	L_Acoustics 108P	-0.706	0.706	-0.050	6.70
S1_Main_J8_L_1	124	S1_Amph	L_Acoustics 108P	-0.705	0.705	-0.070	6.30
S1_Main_J8_L_1	124	S1_Amph	L_Acoustics 108P	-0.704	0.704	-0.090	5.90
S1_Main_J8_L_1	124	S1_Amph	L_Acoustics 108P	-0.702	0.702	-0.120	5.60
S1_Main_J8_L_1	124	S1_Amph	L_Acoustics 108P	-0.694	0.694	-0.191	5.20
S1_Main_J8_L_1	122	S1_Amph	L_Acoustics 108P	-0.679	0.679	-0.280	4.85
S1_Main_J8_L_1	122	S1_Amph	L_Acoustics 108P	-0.657	0.657	-0.369	4.50
S1_Main_J12_L_11	122	S1_Amph	L_Acoustics 112P	-0.617	0.617	-0.488	4.20
S1_Main_J12_L_11	122	S1_Amph	L_Acoustics 112P	-0.571	0.571	-0.591	3.90
S1_Main_J12_L_11	122	S1_Amph	L_Acoustics 112P	-0.542	0.542	-0.642	3.60
S1_Main_J12_L_11	122	S1_Amph	L_Acoustics 112P	-0.499	0.499	-0.709	3.30
S1_Main_J8_R_1	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	0.000	7.75
S1_Main_J8_R_1	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	0.000	7.40
S1_Main_J8_R_1	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	-0.030	7.00
S1_Main_J8_R_1	124	S1_Amph	L_Acoustics 108P	-0.706	0.706	-0.050	6.70
S1_Main_J8_R_1	124	S1_Amph	L_Acoustics 108P	-0.705	0.705	-0.070	6.30
S1_Main_J8_R_1	124	S1_Amph	L_Acoustics 108P	-0.704	0.704	-0.090	5.90
S1_Main_J8_R_1	124	S1_Amph	L_Acoustics 108P	-0.702	0.702	-0.120	5.60
S1_Main_J8_R_1	124	S1_Amph	L_Acoustics 108P	-0.694	0.694	-0.191	5.20
S1_Main_J8_R_1	122	S1_Amph	L_Acoustics 108P	-0.679	0.679	-0.280	4.85
S1_Main_J8_R_1	122	S1_Amph	L_Acoustics 108P	-0.657	0.657	-0.369	4.50
S1_Main_J12_R_1	122	S1_Amph	L_Acoustics 112P	-0.617	0.617	-0.488	4.20
S1_Main_J12_R_1	122	S1_Amph	L_Acoustics 112P	-0.571	0.571	-0.591	3.90
S1_Main_J12_R_1	122	S1_Amph	L_Acoustics 112P	-0.542	0.542	-0.642	3.60
S1_Main_J12_R_1	122	S1_Amph	L_Acoustics 112P	-0.499	0.499	-0.709	3.30
S1_Main_JSub_L_1	124	S1_Amph	D and B J_Woofers	-0.707	0.707	0.000	3.30
S1_Main_JSub_L_1	124	S1_Amph	D and B J_Woofers	-0.707	0.707	0.000	3.30
S1_Main_JSub_L_1	124	S1_Amph	D and B J_Woofers	-0.707	0.707	0.000	3.30
S1_Main_JSub_L_1	124	S1_Amph	D and B J_Woofers	-0.707	0.707	0.000	3.30
S1_Main_JSub_R_1	124	S1_Amph	D and B J_Woofers	-0.707	0.707	0.000	3.30
S1_Main_JSub_R_1	124	S1_Amph	D and B J_Woofers	-0.707	0.707	0.000	3.30
S1_Main_JSub_R_1	124	S1_Amph	D and B J_Woofers	-0.707	0.707	0.000	3.30
S1_Main_JSub_R_1	124	S1_Amph	D and B J_Woofers	-0.707	0.707	0.000	3.30
S1_Main_Q7_C_1	124	S1_Amph	D and B Q7	-0.707	0.707	0.000	0.50
S1_Main_Q7_C_1	124	S1_Amph	D and B Q7	-0.707	0.707	0.000	0.50
S1_Main_Q7_C_1	124	S1_Amph	D and B Q7	-0.707	0.707	0.000	0.50
S1_Main_Q7_C_1	124	S1_Amph	D and B Q7	-0.707	0.707	0.000	0.50
S1_Main_Q7_C_1	124	S1_Amph	D and B Q7	-0.707	0.707	0.000	0.50
S1_Main_Q7_C_1	124	S1_Amph	D and B Q7	-0.707	0.707	0.000	0.50
S1_Main_Q7_C_1	124	S1_Amph	D and B Q7	-0.707	0.707	0.000	0.50
S1_Main_Q7_C_1	124	S1_Amph	D and B Q7	-0.707	0.707	0.000	0.50
S1_Main_Q7_C_1	124	S1_Amph	D and B Q7	-0.707	0.707	0.000	0.50
S1_Main_Q7_C_1	124	S1_Amph	D and B Q7	-0.707	0.707	0.000	0.50
S1_Main_B22_Front_1_24_G3	132	S1_Amph	S1_Amph_SUB_Array	-0.707	0.707	0.000	0.50
S1_Main_B22_Front_1_24_G3	132	S1_Amph	S1_Amph_SUB_Array	-0.707	0.707	0.000	0.50
S1_Main_B22_Front_1_24_G3	132	S1_Amph	S1_Amph_SUB_Array	-0.707	0.707	0.000	0.50
S1_Main_B22_Front_1_24_G3	132	S1_Amph	S1_Amph_SUB_Array	-0.707	0.707	0.000	0.50
S1_Main_B22_Front_1_24_G3	132	S1_Amph	S1_Amph_SUB_Array	-0.707	0.707	0.000	0.50
S1_Main_B22_Front_1_24_G3	132	S1_Amph	S1_Amph_SUB_Array	-0.707	0.707	0.000	0.50
S1_Main_B22_Front_1_24_G3	132	S1_Amph	S1_Amph_SUB_Array	-0.707	0.707	0.000	0.50
S1_Main_B22_Front_22_24_G3	132	S1_Amph	S1_Amph_SUB_Array	-0.707	0.707	0.000	0.50
S1_Main_J8_Delay_1	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	-0.030	12.75
S1_Main_J8_Delay_2	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	-0.030	12.50
S1_Main_J8_Delay_3	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	-0.040	12.00
S1_Main_J8_Delay_4	124	S1_Amph	L_Acoustics 108P	-0.706	0.706	-0.060	11.60
S1_Main_J12_Delay_1	122	S1_Amph	L_Acoustics 112P	-0.705	0.705	-0.081	11.30
S1_Main_J12_Delay_2	122	S1_Amph	L_Acoustics 112P	-0.703	0.703	-0.110	10.90
S1_Main_J12_Delay_3	122	S1_Amph	L_Acoustics 112P	-0.699	0.699	-0.150	10.70
S1_Main_J12_Delay_4	122	S1_Amph	L_Acoustics 112P	-0.693	0.693	-0.201	10.20
S1_Main_J12_Delay_5	122	S1_Amph	L_Acoustics 112P	-0.674	0.674	-0.302	9.80
S1_Main_J12_Delay_6	122	S1_Amph	L_Acoustics 112P	-0.648	0.648	-0.399	9.50
S1_Main_J8_Delay_1	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	-0.030	12.75
S1_Main_J8_Delay_2	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	-0.030	12.50
S1_Main_J8_Delay_3	124	S1_Amph	L_Acoustics 108P	-0.707	0.707	-0.040	12.00
S1_Main_J8_Delay_4	124	S1_Amph	L_Acoustics 108P	-0.706	0.706	-0.060	11.60
S1_Main_J12_Delay_1	122	S1_Amph	L_Acoustics 112P	-0.705	0.705	-0.081	11.30
S1_Main_J12_Delay_2	122	S1_Amph	L_Acoustics 112P	-0.703	0.703	-0.110	10.90
S1_Main_J12_Delay_3	122	S1_Amph	L_Acoustics 112P	-0.699	0.699	-0.150	10.70
S1_Main_J12_Delay_4	122	S1_Amph	L_Acoustics 112P	-0.693	0.693	-0.201	10.20
S1_Main_J12_Delay_5	122	S1_Amph	L_Acoustics 112P	-0.674	0.674	-0.302	9.80
S1_Main_J12_Delay_6	122	S1_Amph	L_Acoustics 112P	-0.648	0.648	-0.399	9.50

Table B9: Point Source Descriptors … continued

Source	Adjusted PWL (dB(A))	Reference Value	Direct.	Directivity X	Directivity Y	Directivity Z	Height
S1_Main_J8_SideHangR_1	124	S1_Amph	L_Acoustics 108P	0.000	0.999	-0.050	5.75
S1_Main_J8_SideHangR_2	124	S1_Amph	L_Acoustics 108P	0.000	0.994	-0.110	5.25
S1_Main_J8_SideHangR_3	124	S1_Amph	L_Acoustics 108P	0.000	0.987	-0.160	5.00
S1_Main_J8_SideHangR_4	124	S1_Amph	L_Acoustics 108P	0.000	0.960	-0.280	4.75
S1_Main_J8_SideHangR_5	124	S1_Amph	L_Acoustics 108P	0.000	0.933	-0.360	4.50
S1_Main_J8_SideHangR_6	124	S1_Amph	L_Acoustics 108P	0.000	0.876	-0.483	4.25
S1_Main_J8_SideHangL_1	124	S1_Amph	L_Acoustics 108P	-1.000	0.000	0.000	7.75
S1_Main_J8_SideHangL_2	124	S1_Amph	L_Acoustics 108P	-1.000	0.000	-0.020	7.40
S1_Main_J8_SideHangL_3	124	S1_Amph	L_Acoustics 108P	-0.998	0.000	-0.070	7.00
S1_Main_J8_SideHangL_4	124	S1_Amph	L_Acoustics 108P	-0.995	0.000	-0.100	6.75
S1_Main_J8_SideHangL_5	124	S1_Amph	L_Acoustics 108P	-0.987	0.000	-0.160	6.30
S1_Main_J8_SideHangL_6	124	S1_Amph	L_Acoustics 108P	-0.975	0.000	-0.221	6.00
S1_Main_J12_SideHangL_1	122	S1_Amph	L_Acoustics 112P	-0.945	0.000	-0.328	5.60
S1_Main_J12_SideHangL_2	122	S1_Amph	L_Acoustics 112P	-0.898	0.000	-0.439	5.25
S1_Main_J12_SideHangL_3	122	S1_Amph	L_Acoustics 112P	-0.876	0.000	-0.483	4.90
S1_Main_J12_SideHangL_4	122	S1_Amph	L_Acoustics 112P	-0.849	0.000	-0.529	4.55
S1_Main_J8_SideHangDelayL_1	124	S1_Amph	L_Acoustics 108P	-0.985	0.172	0.000	13.75
S1_Main_J8_SideHangDelayL_2	124	S1_Amph	L_Acoustics 108P	-0.984	0.171	-0.050	13.50
S1_Main_J8_SideHangDelayL_3	124	S1_Amph	L_Acoustics 108P	-0.980	0.170	-0.100	13.00
S1_Main_J8_SideHangDelayL_4	124	S1_Amph	L_Acoustics 108P	-0.971	0.170	-0.170	12.75
S1_Main_J8_SideHangDelayL_5	124	S1_Amph	L_Acoustics 108P	-0.950	0.170	-0.260	12.40
S1_Main_J8_SideHangDelayL_6	124	S1_Amph	L_Acoustics 108P	-0.914	0.161	-0.372	12.00
S1_Main_J8_SideHangDelayL_7	124	S1_Amph	L_Acoustics 108P	-0.863	0.151	-0.482	11.60
S1_Main_J8_SideHangDelayL_8	124	S1_Amph	L_Acoustics 108P	-0.861	0.152	-0.485	11.20
S2_Main_dV-dosc_BackRight_1	121	S2_Tipi	L_Acoustics 108P	-0.818	-0.568	-0.090	4.40
S2_Main_dV-dosc_BackRight_2	121	S2_Tipi	L_Acoustics 108P	-0.814	-0.573	-0.101	4.20
S2_Main_dV-dosc_BackRight_3	121	S2_Tipi	L_Acoustics 108P	-0.810	-0.570	-0.140	3.90
S2_Main_dV-dosc_BackRight_4	119	S2_Tipi	L_Acoustics 108P	-0.802	-0.562	-0.201	3.70
S2_Main_dV-dosc_BackRight_5	119	S2_Tipi	L_Acoustics 108P	-0.781	-0.541	-0.311	3.50
S2_Main_dV-dosc_BackRight_6	119	S2_Tipi	L_Acoustics 108P	-0.737	-0.518	-0.435	3.30
S2_Main_dV-dosc_BackLeft_1	121	S2_Tipi	L_Acoustics 108P	-0.818	-0.568	-0.090	4.40
S2_Main_dV-dosc_BackLeft_2	121	S2_Tipi	L_Acoustics 108P	-0.814	-0.573	-0.101	4.20
S2_Main_dV-dosc_BackLeft_3	121	S2_Tipi	L_Acoustics 108P	-0.810	-0.570	-0.140	3.90
S2_Main_dV-dosc_BackLeft_4	119	S2_Tipi	L_Acoustics 108P	-0.802	-0.562	-0.201	3.70
S2_Main_dV-dosc_BackLeft_5	119	S2_Tipi	L_Acoustics 108P	-0.781	-0.541	-0.311	3.50
S2_Main_dV-dosc_BackLeft_6	119	S2_Tipi	L_Acoustics 108P	-0.623	-0.690	-0.368	3.30
S2_Main_SB218_BackLeft_1	122	S2_Tipi	D and B J_Woofers	-0.821	-0.571	0.000	1.38
S2_Main_SB218_BackLeft_2	122	S2_Tipi	D and B J_Woofers	-0.821	-0.571	0.000	0.82
S2_Main_SB218_BackLeft_3	122	S2_Tipi	D and B J_Woofers	-0.821	-0.571	0.000	0.28
S2_Main_SB218_BackRight_1	122	S2_Tipi	D and B J_Woofers	-0.821	-0.571	0.000	1.38
S2_Main_SB218_BackRight_2	122	S2_Tipi	D and B J_Woofers	-0.821	-0.571	0.000	0.82
S2_Main_SB218_BackRight_3	122	S2_Tipi	D and B J_Woofers	-0.821	-0.571	0.000	0.28
S2_Main_ARCS_BackCentre_1	119	S2_Tipi	L_Acoustics 108P	-0.821	-0.571	0.000	4.10
S2_Main_ARCS_BackCentre_2	119	S2_Tipi	L_Acoustics 108P	-0.902	-0.200	-0.382	4.10
S2_Main_ARCS_BackCentre_3	119	S2_Tipi	L_Acoustics 108P	-0.499	-0.779	-0.379	4.10
S3_Main_K2_BackRight_1	124	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	7.30
S3_Main_K2_BackRight_2	124	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	7.00
S3_Main_K2_BackRight_3	124	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	6.60
S3_Main_K2_BackRight_4	124	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	6.30
S3_Main_K2_BackRight_5	123	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	5.90
S3_Main_K2_BackRight_6	123	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	5.60
S3_Main_K2_BackRight_7	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	5.20
S3_Main_K2_BackRight_8	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	4.90
S3_Main_K2_BackLeft_1	124	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	7.30
S3_Main_K2_BackLeft_2	124	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	7.00
S3_Main_K2_BackLeft_3	124	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	6.60
S3_Main_K2_BackLeft_4	124	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	6.30
S3_Main_K2_BackLeft_5	123	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	5.90
S3_Main_K2_BackLeft_6	123	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	5.60
S3_Main_K2_BackLeft_7	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	5.20
S3_Main_K2_BackLeft_8	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	4.90
S3_Main_SB28_BackLeft_1	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_BackLeft_2	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_BackLeft_3	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_BackLeft_4	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_CentrerLeft_1	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_CentrerLeft_2	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_CentrerLeft_3	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_CentrerLeft_4	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_CenterRight_1	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_CenterRight_2	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_CenterRight_3	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_CenterRight_4	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_BackRight_1	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_BackRight_2	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_BackRight_3	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65
S3_Main_SB28_BackRight_4	125	S3_Forest	S1_Amph_SUB_Array	-0.617	0.787	0.000	0.65

Table B9: Point Source Descriptors … continued

Source	Adjusted PWL (dB(A))	Reference Value	Direct.	Directivity X	Directivity Y	Directivity Z	Height
S3_Main_ARCS_BackLeft_1	121	S3_Forest	L_Acoustics 108P	-0.731	0.661	-0.170	1.41
S3_Main_ARCS_BackLeft_2	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_BackLeft_3	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_BackLeft_4	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_CenterLeft_1	121	S3_Forest	L_Acoustics 108P	-0.731	0.661	-0.170	1.41
S3_Main_ARCS_CenterLeft_2	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_CenterLeft_3	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_CenterLeft_4	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_CenterRight_1	121	S3_Forest	L_Acoustics 108P	-0.731	0.661	-0.170	1.41
S3_Main_ARCS_CenterRight_2	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_CenterRight_3	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_CenterRight_4	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_BackRight_1	121	S3_Forest	L_Acoustics 108P	-0.731	0.661	-0.170	1.41
S3_Main_ARCS_BackRight_2	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_BackRight_3	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_BackRight_4	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	1.41
S3_Main_ARCS_BackBackRight_1	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	2.39
S3_Main_ARCS_BackBackRight_2	121	S3_Forest	L_Acoustics 108P	-0.250	0.890	-0.380	2.39
S3_Main_ARCS_BackBackRight_3	121	S3_Forest	L_Acoustics 108P	-0.250	0.890	-0.380	2.39
S3_Main_ARCS_BackBackRight_4	121	S3_Forest	L_Acoustics 108P	-0.250	0.890	-0.380	2.39
S3_Main_ARCS_BackBackLeft_1	121	S3_Forest	L_Acoustics 108P	-0.617	0.787	0.000	2.39
S3_Main_ARCS_BackBackLeft_2	121	S3_Forest	L_Acoustics 108P	-0.805	0.453	-0.385	2.39
S3_Main_ARCS_BackBackLeft_3	121	S3_Forest	L_Acoustics 108P	-0.805	0.453	-0.385	2.39
S3_Main_ARCS_BackBackLeft_4	121	S3_Forest	L_Acoustics 108P	-0.805	0.453	-0.385	2.39
S3_Main_dV-dosc_MiddleDelayRight_1	124	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	7.40
S3_Main_dV-dosc_MiddleDelayRight_2	124	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	7.20
S3_Main_dV-dosc_MiddleDelayRight_3	123	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	6.90
S3_Main_dV-dosc_MiddleDelayRight_4	123	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	6.70
S3_Main_dV-dosc_MiddleDelayRight_5	122	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	6.50
S3_Main_dV-dosc_MiddleDelayRight_6	122	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	6.30
S3_Main_dV-dosc_MiddleDelayLeft_1	124	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	7.40
S3_Main_dV-dosc_MiddleDelayLeft_2	124	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	7.20
S3_Main_dV-dosc_MiddleDelayLeft_3	123	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	6.90
S3_Main_dV-dosc_MiddleDelayLeft_4	123	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	6.70
S3_Main_dV-dosc_MiddleDelayLeft_5	122	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	6.50
S3_Main_dV-dosc_MiddleDelayLeft_6	122	S3_Forest	L_Acoustics 108P	-0.616	0.788	0.000	6.30
S4_Main_V-dosc_BackStageRight_1	128	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	7.30
S4_Main_V-dosc_BackStageRight_2	128	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	6.90
S4_Main_V-dosc_BackStageRight_3	128	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	6.40
S4_Main_V-dosc_BackStageRight_4	124	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	6.00
S4_Main_V-dosc_BackStageRight_5	124	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	5.50
S4_Main_V-dosc_BackStageRight_6	124	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	5.10
S4_Main_dV-dosc_BackStageLeft_1	128	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	7.30
S4_Main_dV-dosc_BackStageLeft_2	128	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	6.90
S4_Main_dV-dosc_BackStageLeft_3	128	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	6.40
S4_Main_dV-dosc_BackStageLeft_4	124	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	6.00
S4_Main_dV-dosc_BackStageLeft_5	124	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	5.50
S4_Main_dV-dosc_BackStageLeft_6	124	S4_McLennan	L_Acoustics 108P	-0.419	-0.908	0.000	5.10
S4_Main_SB28_OnStageRight_1	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_SB28_OnStageRight_2	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_SB28_OnStageRight_3	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_SB28_OnStageRight_4	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_SB28_OnStageLeft_1	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_SB28_OnStageLeft_2	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_SB28_OnStageLeft_3	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_SB28_OnStageLeft_4	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_SB28_OnStageCenter_1	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_SB28_OnStageCenter_2	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_SB28_OnStageCenter_3	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_SB28_OnStageCenter_4	128	S4_McLennan	S1_Amph_SUB_Array	-0.419	-0.908	0.000	0.65
S4_Main_ARCS_FrontStageFill_CenterLeft_1	123	S4_McLennan	L_Acoustics 108P	-0.339	-0.937	-0.089	1.60
S4_Main_ARCS_FrontStageFill_CenterLeft_2	122	S4_McLennan	L_Acoustics 108P	-0.339	-0.937	-0.089	1.90
S4_Main_ARCS_FrontStageFill_CenterRight_1	123	S4_McLennan	L_Acoustics 108P	-0.501	-0.861	-0.090	1.60
S4_Main_ARCS_FrontStageFill_CenterRight_2	122	S4_McLennan	L_Acoustics 108P	-0.501	-0.861	-0.090	1.90
S4_Main_ARCS_FrontStageFill_BackRight_3	128	S4_McLennan	L_Acoustics 108P	-0.711	-0.410	-0.571	2.12
S4_Main_ARCS_FrontStageFill_BackRight_4	128	S4_McLennan	L_Acoustics 108P	-0.711	-0.410	-0.571	2.12
S4_Main_ARCS_FrontStageFill_BackLeft_3	128	S4_McLennan	L_Acoustics 108P	0.140	-0.810	-0.570	2.12
S4_Main_ARCS_FrontStageFill_BackLeft_4	128	S4_McLennan	L_Acoustics 108P	0.140	-0.810	-0.570	2.12
S4_Main_dV-dosc_DelayRight_1	125	S4_McLennan	L_Acoustics 108P	-0.482	-0.873	-0.071	7.40
S4_Main_dV-dosc_DelayRight_2	125	S4_McLennan	L_Acoustics 108P	-0.508	-0.856	-0.099	7.20
S4_Main_dV-dosc_DelayRight_3	125	S4_McLennan	L_Acoustics 108P	-0.529	-0.839	-0.130	7.00
S4_Main_dV-dosc_DelayLeft_1	125	S4_McLennan	L_Acoustics 108P	-0.360	-0.930	-0.070	7.40
S4_Main_dV-dosc_DelayLeft_2	125	S4_McLennan	L_Acoustics 108P	-0.330	-0.939	-0.100	7.20
S4_Main_dV-dosc_DelayLeft_3	125	S4_McLennan	L_Acoustics 108P	-0.299	-0.946	-0.129	7.00
S5_Main_dV-dosc_OnStageRight_1	120	S5_World	L_Acoustics 108P	-0.497	-0.865	-0.069	4.90
S5_Main_dV-dosc_OnStageRight_2	120	S5_World	L_Acoustics 108P	-0.451	-0.892	-0.020	4.70
S5_Main_dV-dosc_OnStageRight_3	114	S5_World	L_Acoustics 108P	-0.497	-0.864	-0.080	4.40
S5_Main_dV-dosc_OnStageRight_4	114	S5_World	L_Acoustics 108P	-0.519	-0.849	-0.100	4.20
S5_Main_dV-dosc_OnStageRight_5	111	S5_World	L_Acoustics 108P	-0.548	-0.827	-0.129	4.00
S5_Main_dV-dosc_OnStageRight_6	111	S5_World	L_Acoustics 108P	-0.548	-0.827	-0.129	3.80

Table B9: Point Source Descriptors … continued

Source	Adjusted PWL (dB(A))	Reference Value	Direct.	Directivity X	Directivity Y	Directivity Z	Height
S5_Main_dV-dosc_OnStageLeft_1	120	S5_World	L_Acoustics 108P	-0.381	-0.922	-0.070	4.90
S5_Main_dV-dosc_OnStageLeft_2	120	S5_World	L_Acoustics 108P	-0.419	-0.908	-0.020	4.70
S5_Main_dV-dosc_OnStageLeft_3	114	S5_World	L_Acoustics 108P	-0.379	-0.917	-0.122	4.40
S5_Main_dV-dosc_OnStageLeft_4	114	S5_World	L_Acoustics 108P	-0.340	-0.902	-0.266	4.20
S5_Main_dV-dosc_OnStageLeft_5	111	S5_World	L_Acoustics 108P	-0.310	-0.940	-0.140	4.00
S5_Main_dV-dosc_OnStageLeft_6	111	S5_World	L_Acoustics 108P	-0.310	-0.940	-0.140	3.80
S5_Main_SB218_MidStageLeft_1	119	S5_World	D and B J_Woofers	-0.438	-0.899	0.000	0.70
S5_Main_SB218_MidStageLeft_2	119	S5_World	D and B J_Woofers	-0.438	-0.899	0.000	0.70
S5_Main_SB218_MidStageLeft_3	119	S5_World	D and B J_Woofers	-0.438	-0.899	0.000	0.70
S5_Main_SB218_MidStageRight_1	119	S5_World	D and B J_Woofers	-0.438	-0.899	0.000	0.70
S5_Main_SB218_MidStageRight_2	119	S5_World	D and B J_Woofers	-0.438	-0.899	0.000	0.70
S5_Main_SB218_MidStageRight_3	119	S5_World	D and B J_Woofers	-0.438	-0.899	0.000	0.70
S5_Main_108p_MidStageLeft_1	119	S5_World	L_Acoustics 108P	-0.438	-0.899	0.000	1.40
S5_Main_108p_MidStageRight_1	119	S5_World	L_Acoustics 108P	-0.438	-0.899	0.000	1.40
S6_Main_KUDO_BackStageLeft_1	130	S6_Tiny	L_Acoustics 108P	-0.218	-0.727	-0.651	4.80
S6_Main_KUDO_BackStageLeft_2	130	S6_Tiny	L_Acoustics 108P	-0.120	-0.993	0.000	4.50
S6_Main_KUDO_BackStageLeft_3	130	S6_Tiny	L_Acoustics 108P	-0.100	-0.995	-0.020	4.10
S6_Main_KUDO_BackStageLeft_4	130	S6_Tiny	L_Acoustics 108P	-0.070	-0.996	-0.050	3.80
S6_Main_KUDO_BackStageLeft_5	125	S6_Tiny	L_Acoustics 108P	-0.030	-0.996	-0.089	3.40
S6_Main_KUDO_BackStageLeft_6	125	S6_Tiny	L_Acoustics 108P	0.000	-0.993	-0.121	3.00
S6_Main_KUDO_BackStageRight_1	130	S6_Tiny	L_Acoustics 108P	-0.211	-0.973	-0.091	4.80
S6_Main_KUDO_BackStageRight_2	130	S6_Tiny	L_Acoustics 108P	-0.120	-0.993	0.000	4.50
S6_Main_KUDO_BackStageRight_3	130	S6_Tiny	L_Acoustics 108P	-0.140	-0.988	-0.070	4.10
S6_Main_KUDO_BackStageRight_4	130	S6_Tiny	L_Acoustics 108P	-0.171	-0.984	-0.050	3.80
S6_Main_KUDO_BackStageRight_5	125	S6_Tiny	L_Acoustics 108P	-0.211	-0.973	-0.091	3.40
S6_Main_KUDO_BackStageRight_6	125	S6_Tiny	L_Acoustics 108P	-0.241	-0.963	-0.121	3.00
S6_Main_SB28_BackStageRight_1	131	S6_Tiny	D and B J_Woofers	-0.120	-0.993	0.000	0.65
S6_Main_SB28_BackStageRight_2	131	S6_Tiny	D and B J_Woofers	-0.120	-0.993	0.000	0.65
S6_Main_SB28_BackStageRight_3	131	S6_Tiny	D and B J_Woofers	-0.120	-0.993	0.000	0.65
S6_Main_SB28_BackStageRight_4	131	S6_Tiny	D and B J_Woofers	-0.120	-0.993	0.000	0.65
S6_Main_SB28_BackStageLeft_1	131	S6_Tiny	D and B J_Woofers	-0.120	-0.993	0.000	0.65
S6_Main_SB28_BackStageLeft_2	131	S6_Tiny	D and B J_Woofers	-0.120	-0.993	0.000	0.65
S6_Main_SB28_BackStageLeft_3	131	S6_Tiny	D and B J_Woofers	-0.120	-0.993	0.000	0.65
S6_Main_SB28_BackStageLeft_4	131	S6_Tiny	D and B J_Woofers	-0.120	-0.993	0.000	0.65
S7_Main_K2_BehindStageRight_1	126	S7_MixUp	L_Acoustics 108P	-0.971	0.220	-0.090	7.30
S7_Main_K2_BehindStageRight_2	126	S7_MixUp	L_Acoustics 108P	-0.987	0.160	-0.020	7.00
S7_Main_K2_BehindStageRight_3	125	S7_MixUp	L_Acoustics 108P	-0.985	0.171	-0.030	6.60
S7_Main_K2_BehindStageRight_4	125	S7_MixUp	L_Acoustics 108P	-0.971	0.220	-0.090	6.30
S7_Main_K2_BehindStageRight_5	124	S7_MixUp	L_Acoustics 108P	-0.971	0.220	-0.090	5.90
S7_Main_K2_BehindStageRight_6	124	S7_MixUp	L_Acoustics 108P	-0.971	0.220	-0.090	5.60
S7_Main_K2_BehindStageRight_7	122	S7_MixUp	L_Acoustics 108P	-0.957	0.259	-0.129	5.30
S7_Main_K2_BehindStageRight_8	122	S7_MixUp	L_Acoustics 108P	-0.939	0.300	-0.170	5.00
S7_Main_K2_BehindStageLeft_1	126	S7_MixUp	L_Acoustics 108P	-0.995	0.050	-0.091	7.30
S7_Main_K2_BehindStageLeft_2	126	S7_MixUp	L_Acoustics 108P	-0.993	0.120	-0.020	7.00
S7_Main_K2_BehindStageLeft_3	125	S7_MixUp	L_Acoustics 108P	-0.994	0.100	-0.030	6.60
S7_Main_K2_BehindStageLeft_4	125	S7_MixUp	L_Acoustics 108P	-0.995	0.070	-0.074	6.30
S7_Main_K2_BehindStageLeft_5	124	S7_MixUp	L_Acoustics 108P	-0.995	0.070	-0.074	5.90
S7_Main_K2_BehindStageLeft_6	124	S7_MixUp	L_Acoustics 108P	-0.995	0.050	-0.091	5.60
S7_Main_K2_BehindStageLeft_7	122	S7_MixUp	L_Acoustics 108P	-0.991	0.010	-0.130	5.30
S7_Main_K2_BehindStageLeft_8	122	S7_MixUp	L_Acoustics 108P	-0.985	-0.030	-0.172	5.00
S7_Main_SB28_BehindStageCenterRight_1	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	1.40
S7_Main_SB28_BehindStageCenterRight_2	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.80
S7_Main_SB28_BehindStageCenterRight_3	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.30
S7_Main_SB28_BehindStageCenterRight_4	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	1.40
S7_Main_SB28_BehindStageCenterRight_5	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.80
S7_Main_SB28_BehindStageCenterRight_6	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.30
S7_Main_SB28_BehindStageCenterLeft_1	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	1.40
S7_Main_SB28_BehindStageCenterLeft_2	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.80
S7_Main_SB28_BehindStageCenterLeft_3	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.30
S7_Main_SB28_BehindStageCenterLeft_4	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	1.40
S7_Main_SB28_BehindStageCenterLeft_5	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.80
S7_Main_SB28_BehindStageCenterLeft_6	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.30
S7_Main_SB28_BehindStageBackRight_1	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	1.40
S7_Main_SB28_BehindStageBackRight_2	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.80
S7_Main_SB28_BehindStageBackRight_3	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.30
S7_Main_SB28_BehindStageBackRight_4	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	1.40
S7_Main_SB28_BehindStageBackRight_5	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.80
S7_Main_SB28_BehindStageBackRight_6	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.30
S7_Main_SB28_BehindStageBackleft_1	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	1.40
S7_Main_SB28_BehindStageBackleft_2	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.80
S7_Main_SB28_BehindStageBackleft_3	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.30
S7_Main_SB28_BehindStageBackleft_4	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	1.40
S7_Main_SB28_BehindStageBackleft_5	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.80
S7_Main_SB28_BehindStageBackleft_6	125	S7_MixUp	S1_Amph_SUB_Array	-0.990	0.140	0.000	0.30
S7_Main_108p_BehindStageCenterCenterRight_1	125	S7_MixUp	L_Acoustics 108P	-0.921	0.390	0.000	1.80
S7_Main_108p_BehindStageCenterCenterRight_2	125	S7_MixUp	L_Acoustics 108P	-0.370	0.929	0.000	1.80
S7_Main_108p_BehindStageCenterCenterLeft_1	125	S7_MixUp	L_Acoustics 108P	-0.993	-0.120	0.000	1.80
S7_Main_108p_BehindStageCenterCenterLeft_2	125	S7_MixUp	L_Acoustics 108P	-0.617	-0.787	0.000	1.80

Table B9: Point Source Descriptors … continued

Source	Adjusted PWL (dB(A))	Reference Value	Direct.	Directivity X	Directivity Y	Directivity Z	Height
S7_Main_dV-dosc_DelayLeft_1	125	S7_MixUp	L_Acoustics 108P	-0.963	0.196	-0.186	7.40
S7_Main_dV-dosc_DelayLeft_2	125	S7_MixUp	L_Acoustics 108P	-0.968	0.150	-0.200	7.20
S7_Main_dV-dosc_DelayLeft_3	125	S7_MixUp	L_Acoustics 108P	-0.952	0.178	-0.249	6.90
S7_Main_dV-dosc_DelayLeft_4	125	S7_MixUp	L_Acoustics 108P	-0.930	0.188	-0.315	6.70
S7_Main_dV-dosc_DelayLeft_5	125	S7_MixUp	L_Acoustics 108P	-0.892	0.206	-0.402	6.50
S7_Main_dV-dosc_DelayLeft_6	125	S7_MixUp	L_Acoustics 108P	-0.830	0.225	-0.510	6.50
S7_Main_dV-dosc_DelayRight_1	125	S7_MixUp	L_Acoustics 108P	-0.978	0.071	-0.194	7.40
S7_Main_dV-dosc_DelayRight_2	125	S7_MixUp	L_Acoustics 108P	-0.971	0.134	-0.200	7.20
S7_Main_dV-dosc_DelayRight_3	125	S7_MixUp	L_Acoustics 108P	-0.953	0.186	-0.239	6.90
S7_Main_dV-dosc_DelayRight_4	125	S7_MixUp	L_Acoustics 108P	-0.931	0.190	-0.313	6.70
S7_Main_dV-dosc_DelayRight_5	125	S7_MixUp	L_Acoustics 108P	-0.888	0.213	-0.407	6.50
S7_Main_dV-dosc_DelayRight_6	125	S7_MixUp	L_Acoustics 108P	-0.822	0.228	-0.522	6.30
S9_CabaretTent_Right_1	112	DJ_StagesDAY	DJ_15inch_PA	-0.995	0.105	0.000	2.50
S9_CabaretTent_Right_1	112	DJ_StagesDAY	DJ_15inch_PA	-0.995	0.105	0.000	2.50
V1_Minor_Left_1	118	DJ_StagesDAY	DJ_15inch_PA	0.794	-0.608	0.000	2.50
V1_Minor_Right_1	118	DJ_StagesDAY	DJ_15inch_PA	0.794	-0.608	0.000	2.50
V2_Minor_Right_1	118	DJ_StagesDAY	DJ_15inch_PA	-0.707	0.707	0.000	2.50
V2_Minor_Left_1	118	DJ_StagesDAY	DJ_15inch_PA	-0.707	0.707	0.000	2.50
V3_Minor_Right_1	118	DJ_StagesDAY	DJ_15inch_PA	-0.677	-0.736	0.000	2.50
V3_Minor_Left_1	118	DJ_StagesDAY	DJ_15inch_PA	-0.677	-0.736	0.000	2.50
V4_Minor_Right_1	117	DJ_StagesDAY	DJ_15inch_PA	-0.729	0.685	0.000	2.50
V4_Minor_Left_1	117	DJ_StagesDAY	DJ_15inch_PA	-0.729	0.685	0.000	2.50
V5_Minor_Left_1	117	DJ_StagesDAY	DJ_15inch_PA	0.925	-0.381	0.000	2.50
V5_Minor_Right_1	117	DJ_StagesDAY	DJ_15inch_PA	0.925	-0.381	0.000	2.50
V6_Minor_Right_1	117	DJ_StagesDAY	DJ_15inch_PA	-0.949	-0.316	0.000	2.50
V6_Minor_Left_1	117	DJ_StagesDAY	DJ_15inch_PA	-0.949	-0.316	0.000	2.50
V7_Minor_Left_1	117	DJ_StagesDAY	DJ_15inch_PA	-0.949	-0.316	0.000	2.50
V7_Minor_Right_1	117	DJ_StagesDAY	DJ_15inch_PA	-0.949	-0.316	0.000	2.50
V8_Minor_Left_1	118	DJ_StagesDAY	DJ_15inch_PA	-0.822	0.569	0.000	2.50
V8_Minor_Right_1	118	DJ_StagesDAY	DJ_15inch_PA	-0.822	0.569	0.000	2.50
V9_Minor_left_1	118	DJ_StagesDAY	DJ_15inch_PA	0.173	0.985	0.000	2.50
V9_Minor_Right_1	118	DJ_StagesDAY	DJ_15inch_PA	0.173	0.985	0.000	2.50
V10_Minor_Right_1	117	DJ_StagesDAY	DJ_15inch_PA	-0.423	-0.906	0.000	2.50
V10_Minor_Left_1	117	DJ_StagesDAY	DJ_15inch_PA	-0.423	-0.906	0.000	2.50
V10_Minor_Right_1_Elevated	110	DJ_StagesDAY	DJ_15inch_PA	-0.423	-0.906	0.000	7.50
V10_Minor_Left_1_Elevated	110	DJ_StagesDAY	DJ_15inch_PA	-0.423	-0.906	0.000	7.50