Noise Impact Assessment

Ballina Rugby Clubhouse Activities on Residential Subdivision
Lot 71 DP 628164,
Quays Drive, West Ballina

HEALTH SCIENCE ENVIROMENTAL EDUCATION
ENVIRONMENTAL AUDITOR

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1. Introduction

1.1 Background

The requirement for a Noise Impact Assessment has been triggered by Ballina Shire Council's (BSC) concerns that the noise associated with the existing Ballina Rugby Club and sportsground at the adjoining property to the north may have an unacceptable impact on future occupants of the proposed 36 lot residential subdivision at Lot 71, DP628164, Quays Drive, West Ballina under DA 2016/690.

As a consequence BSC has placed a Deferred Commencement Condition under DA 2016/690 on the proposed development as follows:

1. ***Deferred Commencement***
   The operation of this consent being deferred, pursuant to Section 80(3) of the Environmental Planning and Assessment Act 1979, until:

   A noise impact assessment prepared by a suitably qualified and experienced acoustic consultant is submitted to and approved by Council to ensure noise generated by the use of the Rugby Clubhouse and sportsground do not detrimentally impact on future residents. The noise impact assessment must be carried out in accordance with the NSW EPA Industrial Noise Policy.

   Detailed plans and specifications of proposed noise mitigation measures must be submitted to and approved by Council if the approved noise impact assessment identifies exceedances of accepted project specific noise goals.

   This notice of consent does not commence until the noise impact assessment and details of any required noise mitigation measures are submitted to and approved by Council.

   This deferred commencement consent will lapse if the above requirements are not complied with prior to 25 September 2017 to the satisfaction of Council.

Ambiance Audio was engaged by Ardill Payne and Partners (APP) to address the aforementioned Deferred Commencement Condition. This engagement resulted in the production of two documents by Ambiance Audio:

1. Noise Impact Assessment – Ballina Rugby Clubhouse and Sportsground on Proposed Ballina Quays Residential Subdivision (6 July 2017); and
2. Explanation of why the NSW EPA Industrial Noise Policy is not appropriate for the assessment of noise of activities from the Ballina Rugby Sportsground on the Proposed Ballina Quays Residential Subdivision (13 July 2017).

In July 2017 Tim Fitzroy & Associates (TFA) were engaged by APP to review and the aforementioned documents and prepare a fresh document to address the Deferred Commencement Condition No 1 of DA 2016/690. It was agreed that the Noise Impact Assessment (NIA) will utilise, with due reference, the specific noise monitoring data and resultant project specific noise criteria garnered by Ambiance Audio.

After a series of discussions between the Ballina Rugby Club (BRC) and Ballina Shire Council (BSC) TFA has subsequently been engaged by BSC in December 2017 to revise the NIA to consider noise impacts on sensitive receivers at 36 lot residential subdivision Lot 71, DP628164, Quays Drive, West Ballina under DA 2016/690

specifically with respect to the use of the Ballina Rugby Clubhouse, Kalinga Street West Ballina.

1.2 Purpose

Tim Fitzroy & Associates has been engaged by Ballina Shire Council to

1. Prepare a revised Noise Impact Assessment (NIA) for the existing Ballina Rugby Clubhouse (BRC) activities only inclusive of potential mitigation measures to meet the Project Specific Noise Criteria (PSNC) established in the NIA *Ballina Rugby Club and Sports Ground on Proposed Residential Subdivision Lot 71 DP 628164, Quays Drive, West Ballina* (Tim Fitzroy & Associates (TFA) Ref 57/2017, 8 November 2017);
2. The revised NIA is to consider 3 possible scenarios to reflect potential events/activities and the consideration of any relevant noise mitigation required:
    a. Live Music + patrons
    b. DJ/Recorded Music + patrons
    c. Background Music + patrons
3. Tim Fitzroy will meet and liaise with a reputable air conditioning contractor to seek advice and an estimate of costs to provide air conditioning to the clubhouse. Consideration will be given to options for ceiling treatment and wall locations to minimise the costs of installation and running costs for any future air conditioning system;
4. Tim Fitzroy will meet and liaise with a reputable builder to seek advice and an estimate of costs to undertake recommended alterations and additions (where necessary) to the clubhouse to achieve the PSNC.
5. TFA will provide an indicative estimate of costs for the implementation of proposed noise mitigation measures.
6. TFA will include recommendations for Council considerations including operational noise management measures

This report provides details on the noise assessment and modelling carried out by *Tim Fitzroy & Associates* and *Noise Measurement Services, Brisbane* to establish the acoustic integrity of the BRC via attended monitoring of a series of noise impact scenarios and reconciliation with noise modelling to better predict noise impacts on future residences in the 36 lot residential subdivision at Lot 71, DP628164, Quays Drive, West Ballina under DA 2016/690.

1.3 Applicable Noise Criteria

Protection of the Environment Operations Act 1997 (POEO Act) and the Protection of the Environment Operations (Noise Control) Regulation 2008 (Noise Control Regulation)

The *Protection of the Environment Operations Act 1997 (*POEO Act) and the Protection of the Environment Operations (Noise Control) Regulation 2008 (Noise Control Regulation) provide the main legal framework and basis for managing unacceptable noise.

The POEO Act:

- identifies the authority responsible for regulating noise (s. 6 of the Act)
- defines ‘noise’ and ‘offensive noise’ (Dictionary in the Act)

- provides a range of regulatory tools to manage noise, including Noise Control Notices, Prevention Notices, Noise Abatement Directions and Noise Abatement Orders.

Depending on the circumstances, the Noise Control Regulation may require an assessment of a noise's audibility, time of occurrence, duration or offensiveness. The POEO Act does not always require noise to be measured to determine whether it is offensive. However, noise measurement can help in deciding what action, if any, is necessary.

1.2.1 Offensive Noise

Depending on the type of noise under consideration, noise can be considered as offensive in three ways according to it's:

- audibility
- duration
- inherently offensive characteristics.

Given the nature of the noise complaints, it will be necessary for Council to consider a range of factors to determine whether the noise is offensive, including the following:

- the loudness of the noise, especially compared with other noise in the area
- the character of the noise
- the time and duration of the noise
- whether the noise is typical for the area
- how often the noise occurs
- the number of people affected by the noise.

1.2.2 Intrusive Noise

Noise is identified as 'intrusive' if it is noticeably louder than the background noise and considered likely to disturb or interfere with those who can hear it.

1.2.3 Sleep Disturbance

Specific provisions relate to sleep disturbance and the World Health Organization recommends that a maximum level of 45 dB (A) should not be exceeded inside a bedroom. For practical purposes this is equivalent to a maximum level of 55 dB (A) outside a residence, with an open window to the bedroom (Guidelines for Community Noise WHO 1999).

1.2.4 Industrial Noise Policy

In accordance with the NSW Industrial Noise Policy (NSW EPA 2000) the assessment procedure for a commercial/industrial noise source should comprise of:

- Controlling intrusive noise impacts in the short term for surrounding residences; and
- Maintaining noise level amenity for particular land uses for residences and other land uses.

In assessing the noise impact of the existing Ballina Rugby Club and sports ground on the proposed residential subdivision, both components must be taken into account for suburban receivers, but, in most cases, only one will become the limiting factor forming the project-specific noise level. The intrusiveness of an industrial noise source may be generally considered to be acceptable if the equivalent continuous A-weighted level of noise from the source, measured over a 15 minute period, does not exceed the background noise level by more than 5dB.Therefore, the limiting criteria for the control of intrusive noise impacts is if the $L_{Aeq,15\ minute}$ descriptor is < RBL + 5 dB.

In accordance with the INP (EPA, 1998) the surrounding land use in question is considered to be of Suburban nature. The INP describes suburban noise as *"an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristics:*

- *decreasing noise levels in the evening period (1800–2200); and/or*
- *evening ambient noise levels defined by the natural environment and infrequent human activity.*

This area may be located in either a rural, rural-residential or residential zone, as defined on an LEP or other planning instrument.

To limit continuing increases in noise levels, the maximum noise level within an area from industrial noise sources should not normally exceed the criteria in Table 2.1 of the NSW EPA Industrial Noise Policy. These levels represent current best practice for assessing industrial noise sources, based on research and a review of assessment practices used overseas and within Australia. In accordance with Table 2.1 (NSW EPA, 2000) the amenity criteria for a "suburban receiver" is presented in **Table 1.1** below

Table 1.1 Amenity Criteria for Suburban Receiver

Time Period	*Amenity Criterion*
Daytime (7am-6pm Mon-Sat; 8am-6pm Sun)	55-60 dB(A)
Evening (6pm-10pm)	45-50 dB(A)
Night (remaining periods)	40-45 dB(A)

The Industrial Noise Policy (NSW EPA 2000) provides guidance on the controls and measures to manage industrial noise and the potential impacts on suburban receivers.

1.4 Overview of Noise Assessment

This noise assessment establishes the existing background noise levels within the vicinity of the nearest affected sensitive receiver.

The noise assessment process included the following components:

- Measurement and determination of the existing background and ambient noise at the site*;
- Measurement of amplified music in the Ballina Rugby Clubhouse;
- Noise Modelling to reconcile attended noise monitoring of amplified music in the Ballina Rugby Clubhouse with modelling predictions
- Consideration of potential noise impacts on surrounding residences; and
- Consideration of what feasible and reasonable noise mitigation measures ought to be considered where the project-specific noise levels are exceeded.

*Ambiance Audio (NIA, 6 July 2017)

1.5 Site Description

The site of the proposed residential subdivision is Lot 71 DP 628164, Quays Drive, West Ballina. Lot 71 is an irregular shaped lot with an area of 3.045ha. The subject land is vacant with the exception of four small shelter structures, a set of goal posts, a

number of small concrete slabs and a number of small trees. A site locality diagram is provided in **Illustration 1.1**.

1.5.1 Topography

The subject land is situated on the Richmond River coastal floodplain and is effectively flat. Spot levels were undertaken by APP's Registered Surveyors on the 11th August 2016; indicate that the subject land has elevations in the order of approx. 1.7-2.1m AHD.

1.5.2 Climate

Weather conditions during background noise monitoring (3 to 16 June 2017) undertaken by Ambiance Audio were generally good for the first 5 days, however rain was present for extended periods during the last week of noise monitoring. Data that was affected by wind (in excess of 5m/s) and rain were deleted from background noise level calculations.

1.5.3 Surrounding Land use

The lot is bounded by existing residential to the east, the Ballina Rugby Club and sporting field and residential to the north, Quays Drive and residential opposite to the west and residential to the south.

1.6 Recently Approved Development

Development consent (DA 2016/690) was recently approved by Ballina Shire Council for the subdivision of the land to create 36 residential lots, the construction of one road and the installation of public infrastructure services to service the residential lots. Plans of the proposed lots and road are provided at **Appendix A**.

Illustration 1.1

Site Locality Plan

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2. Instrumentation

2.1 Noise Monitoring Equipment

Ambiance Audio utilised the following equipment in their Noise Impact Assessment (7July 2017):

- Bruel & Kjaer 2250 G4 Sound Level Meter
- Bruel & Kjaer 4231 Calibrator

TFA utilised the following equipment in their attended noise monitoring (16 January 2018):

- A Type 1, 1/3 Octave Band Larson Davis Noise Meter with sound recording and event trigger features.

Calibration of the noise monitoring equipment was undertaken prior to use. To ensure no significant tonal drift occurred over the monitoring period, the calibration was checked before and after each measurement period.

2.2 Monitoring Methodology

2.2.1 Ambiance Audio July 2017)

Measurements by Ambiance Audio were made in general accordance with procedures laid down in:

1. Australian Standard AS 1055.1-1997: *'Acoustics - Description and measurement of environmental noise - General procedures'*

2. The NSW Government Industrial Noise Policy (2000) EPA 00/1 (INP).

According to Ambiance Audio (6 July 2017):

*A calibrated noise logger was located in rear yard of 33 Quays Drive for 13 days from the 3rd of June to the 16th of June 2017. This location was chosen as it adjoins the proposed residential subdivision and rugby sportsground and was a secure location for the equipment (**see Illustration 2.1**). A Bruel & Kjaer outdoor microphone kit was fitted to the noise logger and placed on 1.5m high tripod. A remote cable was connected to the microphone and the noise logger positioned in a secure location. A portable wind and rain meter was located in the rear yard and recorded wind and rain events over the noise monitoring period.*

The noise logger were set to record 15 minute sampling periods with an 'A' frequency weighting and fast response. At the end of the monitoring period, data was downloaded into Bruel & Kjaer 7815 Noise Explorer environmental noise software and Microsoft Excel for analysis.

The noise logger used during the noise survey conforms to Australian Standard 1259 "Acoustics - Sound Level Meters" (1990) as a Type 1 precision sound level meter and has an accuracy suitable for both field and laboratory use.
The logger's calibrations were checked before and after the measurement period with a Brüel and Kjær acoustical calibrator model 4231. No significant system drift occurred over the measurement period.

The noise logger and calibrator have been checked, adjusted and aligned to conform to the Brüel and Kjær factory specifications and issued with conformance certificates. The internal test equipment used is traceable to the National Measurement Laboratory at CSIRO, Lindfield, NSW.

2.2.2 Tim Fitzroy & Associates (16 January 2018)

On 16 January 2018 on site noise measurements were undertaken at the clubhouse with high-level amplified noise running inside. Noise measurements were taken at the source and at 5m, 10m from the clubhouse (with both doors and windows open and doors and windows closed on the eastern side) to the north, south, east and west and the boundary of the subdivision approved under DA 2016/690 (see **Appendix C**).

Due to wind in excess of 5m/s only the 5m offset was utilised in validating noise modelling.

Illustration 2.1 **Noise Monitoring Location (Source: Ambiance Audio, NIA 6 July 2017)**

3. Acoustic Assessment

3.1 The Decibel Scale

The human ear responds to sound pressure levels over a very wide range – the loudest sound pressure level to which the human ear responds is ten million times greater than the quietest. This large ratio is reduced to a more manageable size by the use of logarithms. To avoid scale which is too compressed a factor of ten is introduced, giving rise to the decibel. The following **Table 3.1** provides an indication of typical A-Weighted sound pressure levels measured in decibels with typical noise sources. The table provides a good reference when comparing decibel readings.

Table 3.1 Example noise sources and the corresponding A-weighted decibel levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
140	Long range gun, gunner's ear	Extremely noisy to intolerable
130	Threshold of pain	
120	Jet take-off at 100m	
110	Night club dance floor	
100	Loud car horn at 3 metres	Very noisy
90	Heavy truck at 10m	
80	Curbside of busy street	Loud
70	Car interior	
60	Normal conversation at 1m	Moderate to quiet
50	Office noise	
40	Living room in quiet area	Quiet to very quiet
30	Inside bedroom at night	
20	Unoccupied recording studio	Almost silent

The sensitivity of people to noise level changes varies from person to person. However generally, a change of up to 3 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness.

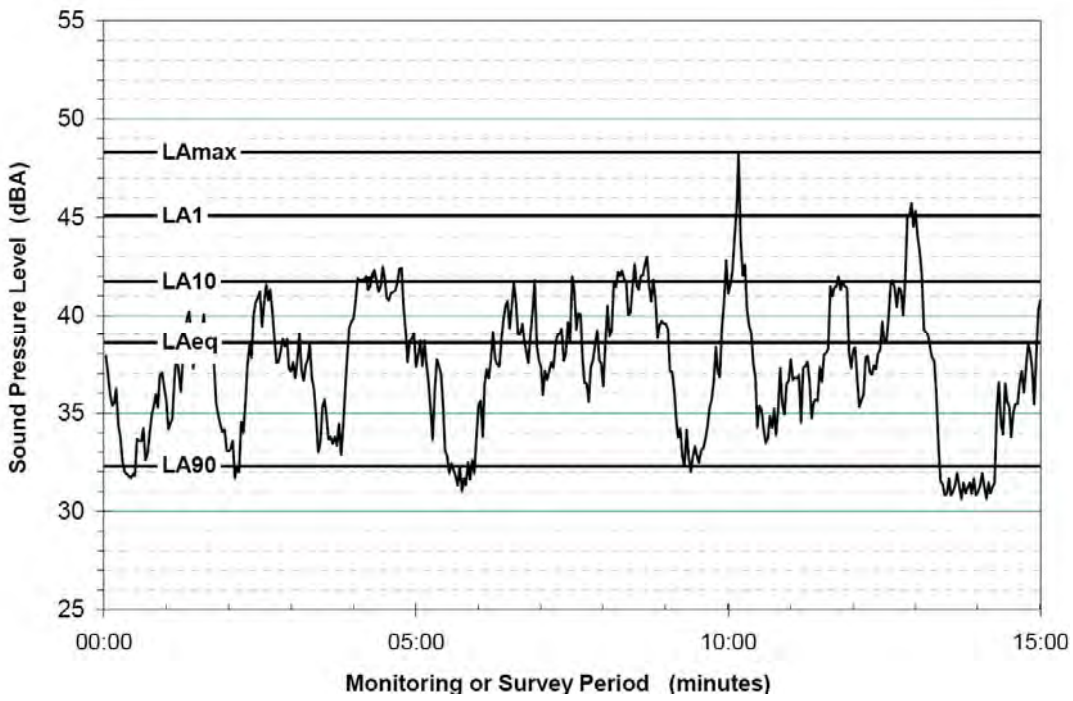
3.2 Acoustical Terms

This report makes reference to a number of different acoustical terms. Particularly the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} descriptors. Each descriptor is briefly explained below.

- The L_{Aeq} is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time; varying sound over a defined measurement period.
- The L_{Amax} noise level is the maximum A-weighted noise level.
- The L_{A10} is the A-weighted sound pressure level exceeded 10% of a given measurement period and is utilised normally to characterise typical maximum noise levels.
- The L_{A90} noise level is the A-weighted sound pressure level exceeded 90% of a given measurement period and is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the "background" level.

A graphical display of typical noise indices and the relationship between each noise descriptor is provided below in Figure 3.1.

Figure 3.1 Graphical Display of Typical Noise Indices



3.3 Existing Noise Environment

A summary of the results obtained from analysis of data from the background day, evening and night time noise monitoring by Ambiance Audio (6 July 2017) is provided below in **Table 3.2**.

Full copies of the raw data for the monitoring site can be found in **Appendix B**.

Table 3.2 Background Sound Pressure Levels

Period (1)	RBL* (3)	Amenity Criteria (4)	RBL+5 dB (5)	Project Specific Noise Criteria (PSNC) = lowest of column (4) and (5)
Day	*34*	*55-60*	*39*	***39***
Evening	*34*	*45-50*	*39*	***39***
Night	*32*	*40-45*	*37*	***37***

As can be seen from the above table, the project specific noise criteria are determined by the intrusive noise criteria for each time period.

The representative background noise levels measured at ML1 over a 24 monitoring period (non weather affected) are presented in **Figure 3.2.**

The representative Laeq noise levels measured at ML1 over a 24 monitoring period (non weather affected) are presented in **Figure 3.3.**

Figure 3.2 Background Noise Levels (24 hr non weather affected) (Source Ambiance Audio 6 July 2017)

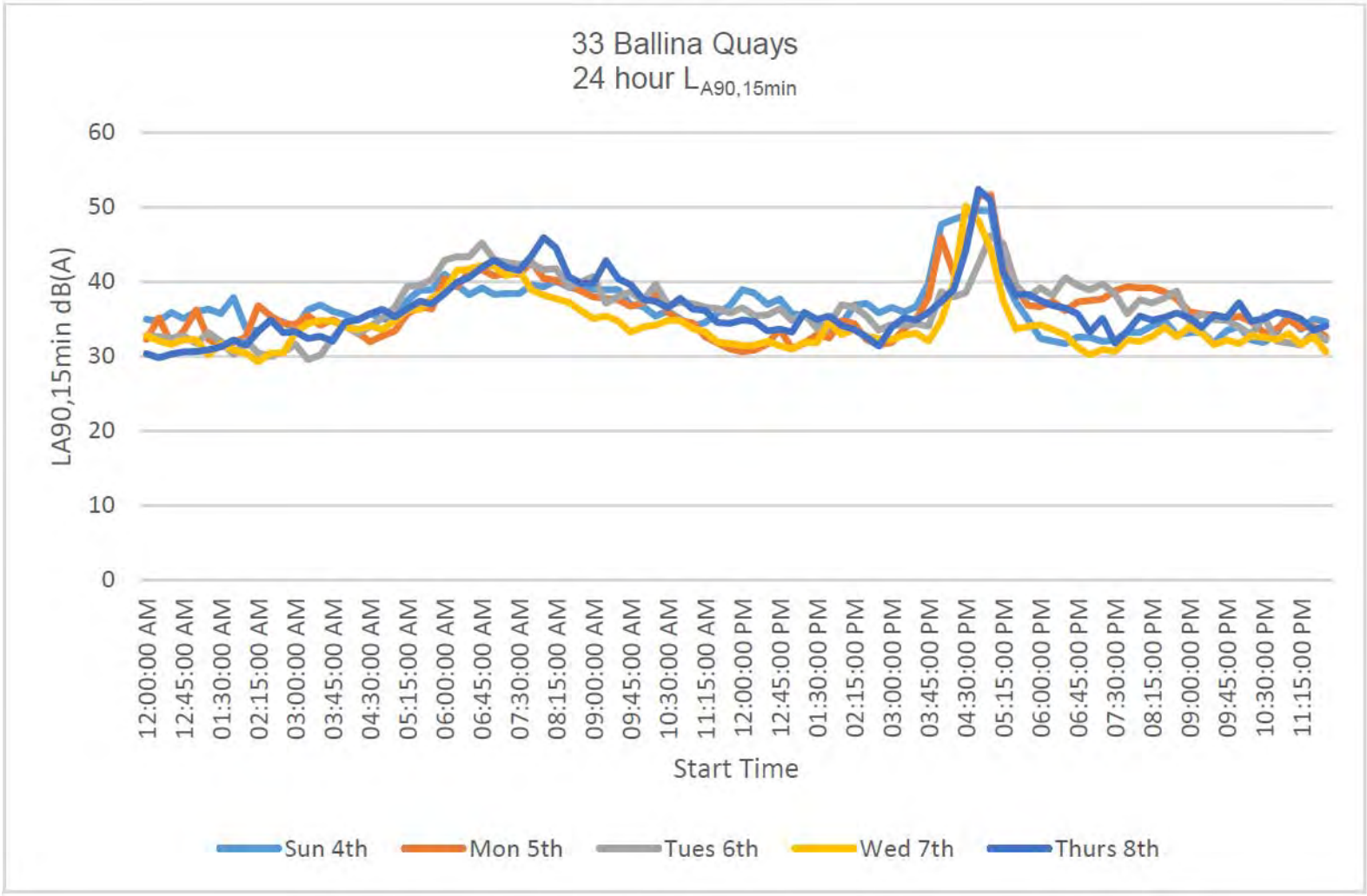
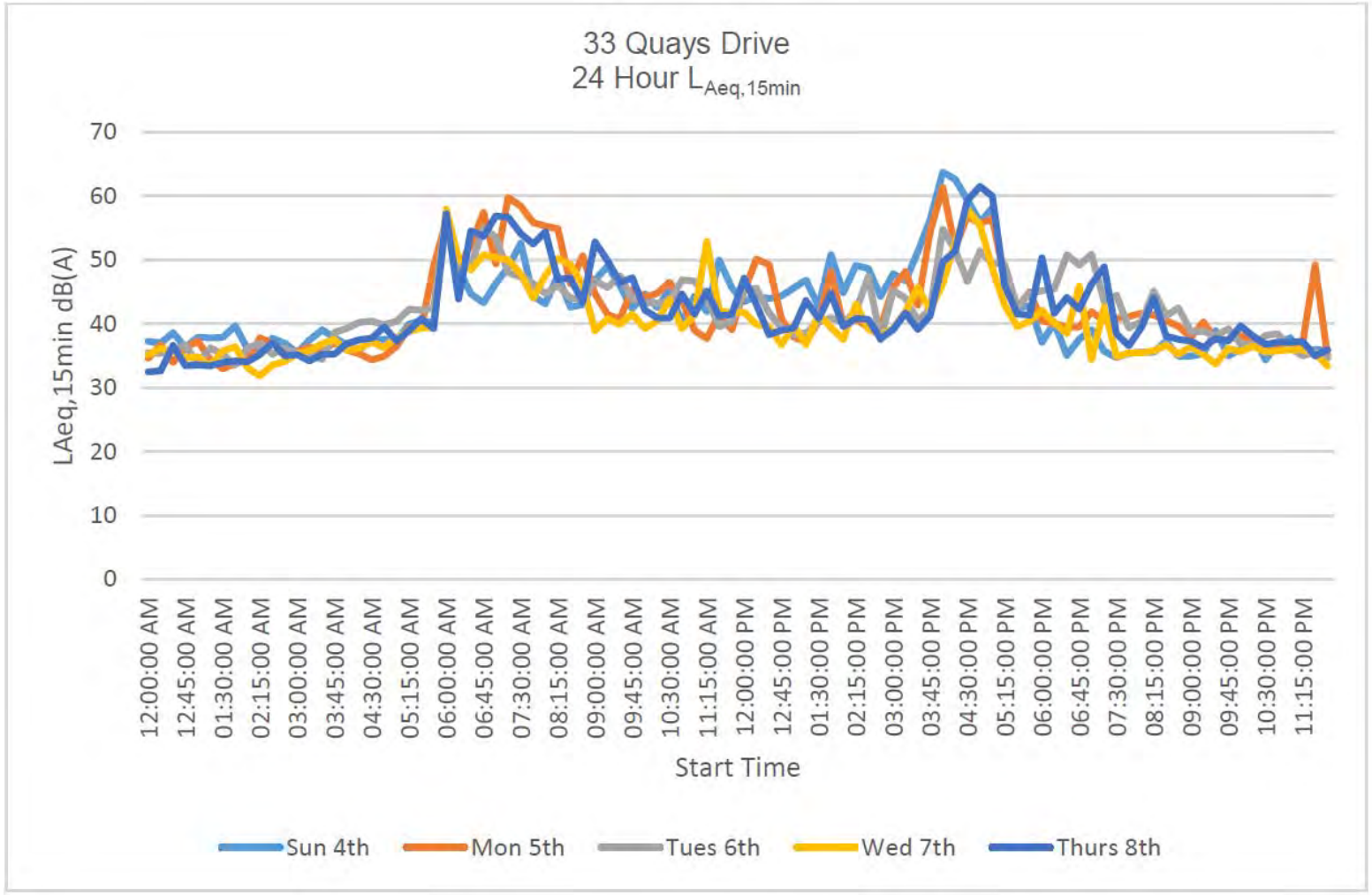


Figure 3.3 Laeq Noise Levels (24 hr non weather affected) (Source Ambiance Audio 6 July 2017)



3.4 Impact of Ballina Rugby Club and Sports Ground on Proposed Development

3.4.1 Ballina Rugby Club

The Rugby clubhouse is a single storey building located on the western side of the field towards the northern end of the field. The building is of concrete block construction, Colorbond roof and full length glass on the northern end of the eastern side that looks onto the field of play. The change rooms and equipment storeroom are located on the southern end of the building with a bar area and canteen on the northern end. The car park is located on the north western end of the ground.

The rear of the clubhouse is approximately 15 metres to the nearest adjoining residential boundary to the west and 25 metres to the nearest residential dwelling. The clubhouse is approximately 80 metres to the nearest adjoining boundary of the proposed residential subdivision.

3.4.2 Noise Modelling

Noise level predictions from the sporting field to the proposed residential development have been made using SoundPLAN v8.0 and the prediction methodology *ISO9613-2: 1996.* Noise levels from the Ballina Rugby Clubhouse are modelled as an area source that is validated to the loudest on-site measured level of amplified music at 5m offset as measured on 16 January 2018 by TFA.

All prediction models have limits to their accuracy of prediction. This is due to the inherent nature of the calculation algorithms that go into the design of the models, the assumptions made in the implementation of the model, and the availability of good source sound power data. Various researchers have suggested that an un-calibrated model has an accuracy of ±5 dB while a calibrated model has an accuracy of ±2 dB. ISO 9613-2 has an estimated accuracy for broadband noise of ±3 dB at 1000 metres. Calibration means that the model has been established with reference to measured sound levels at a receiver, known source levels and tightly defined propagation variables (wind speed and direction, for example). Alternatively, a series of predictions with different programs but the same assumption variables can be used for verification purposes.

3.4.3 Noise Source Levels

Source levels for each noise source used in the model are presented in **Table 3.3**. All sources operate simultaneously and are positioned as shown in **Plate 3.1**.

Table 3.3 Noise Sources

Description	Source Level	Notes
Clubhouse	75, 90 and 100 dB(A) SPL	Various internal noise levels (SPL) are propagated through opened and closed doors and windows on the eastern side of the building. Windows and Doors “Opened” and “Closed” scenarios incorporate the measured transmission loss through each façade (N, S, E, W) of the building.
Vehicle Movement	94 dB(A) SWL	Modelled as a line source at a speed of 10km/hr

Plate 3.1 Location of noise sources within the model

3.4.4 Sensitive Receptors

Receptors have been positioned at the most exposed property boundary of each proposed dwelling. The receptor locations are presented in **Plate 3.2.**

Plate 3.2 Location of sensitive receptors

3.4.5 Weather Conditions

Noise modeling has been made using the prediction methodology *ISO9613-2: 1996* which, by default, presents noise levels at the receiver for meteorological conditions which are favourable for propagation from the sound source to the receiver.

The predicted noise levels are considered to represent the average propagation under meteorological conditions including wind and temperature inversion.

3.4.6 Clubhouse

On site noise measurements were undertaken at the clubhouse with high-level amplified noise running inside. Noise measurements were taken at the source and at 5m from the clubhouse to the north, south, east and west. A validation model has been constructed using the measured internal source level and spectra to determine the transmission loss through each direction of the clubhouse. The model is validated to the four measurement locations as presented in **Table 3.4** and the source level is then adjusted for each of the prediction scenarios.

Table 3.4 Model validation – Clubhouse. Levels are in dB(A) Leq

Receptor	SoundPLAN	Measured	Difference
Doors and Windows Opened (DWO)			
5m East	81.5	81.5	0
5m North	63.7	63.7	0
5m South	66.7	66.7	0
5m West	71.0	71.0	0
Doors and Windows Closed (DWC)			
5m East	72.9	72.9	0
5m North	69.2	69.2	0
5m South	70.3	70.3	0
5m West	79.9	79.9	0

Vehicle Movements:
No on-site measurements of vehicle movements are available for validation purposes; therefore, library source data is used and these predictions are considered to be un-validated.

3.4.7 Calculation of Noise Levels

Noise levels from the subject site are predicted at each receptor for expected the expected activities during a function at the clubhouse, and for vehicle movements at the carpark. Predicted noise levels and assessment are presented in **Tables 3.5** to **3.7**. Visual noise contours are presented in **Plates 3.3** to **3.16.**

Table 3.5 Predicted noise levels for various internal sound pressure levels at the clubhouse, Doors and Windows Opened. Levels are in dB(A), free-field

Lot	Internal Noise Level 100dBA Leq					Internal Noise Level 90dBA Leq					Internal Noise Level 75dBA Leq				
	Forecast dBA Leq		Day	Evening	Night	Forecast dBA Leq		Day	Evening	Night	Forecast dBA Leq		Day	Evening	Night
	Ground Floor	First Floor	39	39	37	Ground Floor	First Floor	39	39	37	Ground Floor	First Floor	39	39	37
1	59	59	+20	+20	+22	49	49	+10	+10	+12	34	34	PASS	PASS	PASS
2	57	58	+19	+19	+21	47	48	+9	+9	+11	32	33	PASS	PASS	PASS
3	59	59	+20	+20	+22	49	49	+10	+10	+12	34	34	PASS	PASS	PASS
4	59	59	+20	+20	+22	49	49	+10	+10	+12	34	34	PASS	PASS	PASS
5	58	59	+20	+20	+22	48	49	+10	+10	+12	33	34	PASS	PASS	PASS
6	58	58	+19	+19	+21	48	48	+9	+9	+11	33	33	PASS	PASS	PASS
7	57	57	+18	+18	+20	47	47	+8	+8	+10	32	32	PASS	PASS	PASS
8	56	56	+17	+17	+19	46	46	+7	+7	+9	31	31	PASS	PASS	PASS
9	54	54	+15	+15	+17	44	44	+5	+5	+7	29	29	PASS	PASS	PASS
10	53	54	+15	+15	+17	43	44	+5	+5	+7	28	29	PASS	PASS	PASS
11	53	53	+14	+14	+16	43	43	+4	+4	+6	28	28	PASS	PASS	PASS
12	52	52	+13	+13	+15	42	42	+3	+3	+5	27	27	PASS	PASS	PASS
13	51	51	+12	+12	+14	41	41	+2	+2	+4	26	26	PASS	PASS	PASS
14	50	50	+11	+11	+13	40	40	+1	+1	+3	25	25	PASS	PASS	PASS
15	49	49	+10	+10	+12	39	39	PASS	PASS	+2	24	24	PASS	PASS	PASS
16	49	49	+10	+10	+12	39	39	PASS	PASS	+2	24	24	PASS	PASS	PASS
17	51	50	+12	+12	+14	41	40	+2	+2	+4	26	25	PASS	PASS	PASS
18	52	50	+13	+13	+15	42	40	+3	+3	+5	27	25	PASS	PASS	PASS
19	52	50	+13	+13	+15	42	40	+3	+3	+5	27	25	PASS	PASS	PASS
20	53	50	+14	+14	+16	43	40	+4	+4	+6	28	25	PASS	PASS	PASS
21	52	50	+13	+13	+15	42	40	+3	+3	+5	27	25	PASS	PASS	PASS
22	52	50	+13	+13	+15	42	40	+3	+3	+5	27	25	PASS	PASS	PASS
23	52	52	+13	+13	+15	42	42	+3	+3	+5	27	27	PASS	PASS	PASS
24	53	53	+14	+14	+16	43	43	+4	+4	+6	28	28	PASS	PASS	PASS
25	54	54	+15	+15	+17	44	44	+5	+5	+7	29	29	PASS	PASS	PASS
26	55	55	+16	+16	+18	45	45	+6	+6	+8	30	30	PASS	PASS	PASS
27	53	55	+16	+16	+18	43	45	+6	+6	+8	28	30	PASS	PASS	PASS
28	54	55	+16	+16	+18	44	45	+6	+6	+8	29	30	PASS	PASS	PASS
29	54	55	+16	+16	+18	44	45	+6	+6	+8	29	30	PASS	PASS	PASS
30	55	54	+16	+16	+18	45	44	+6	+6	+8	30	29	PASS	PASS	PASS
31	52	53	+14	+14	+16	42	43	+4	+4	+6	27	28	PASS	PASS	PASS
32	51	52	+13	+13	+15	41	42	+3	+3	+5	26	27	PASS	PASS	PASS
33	50	51	+12	+12	+14	40	41	+2	+2	+4	25	26	PASS	PASS	PASS
34	51	52	+13	+13	+15	41	42	+3	+3	+5	26	27	PASS	PASS	PASS
35	51	52	+13	+13	+15	41	42	+3	+3	+5	26	27	PASS	PASS	PASS
36	53	53	+14	+14	+16	43	43	+4	+4	+6	28	28	PASS	PASS	PASS

Plate 3.3 Noise contours with 100dBA SPL in the clubhouse, 1.8m above ground, Doors and Windows Opened. Levels are in dB(A), free-field

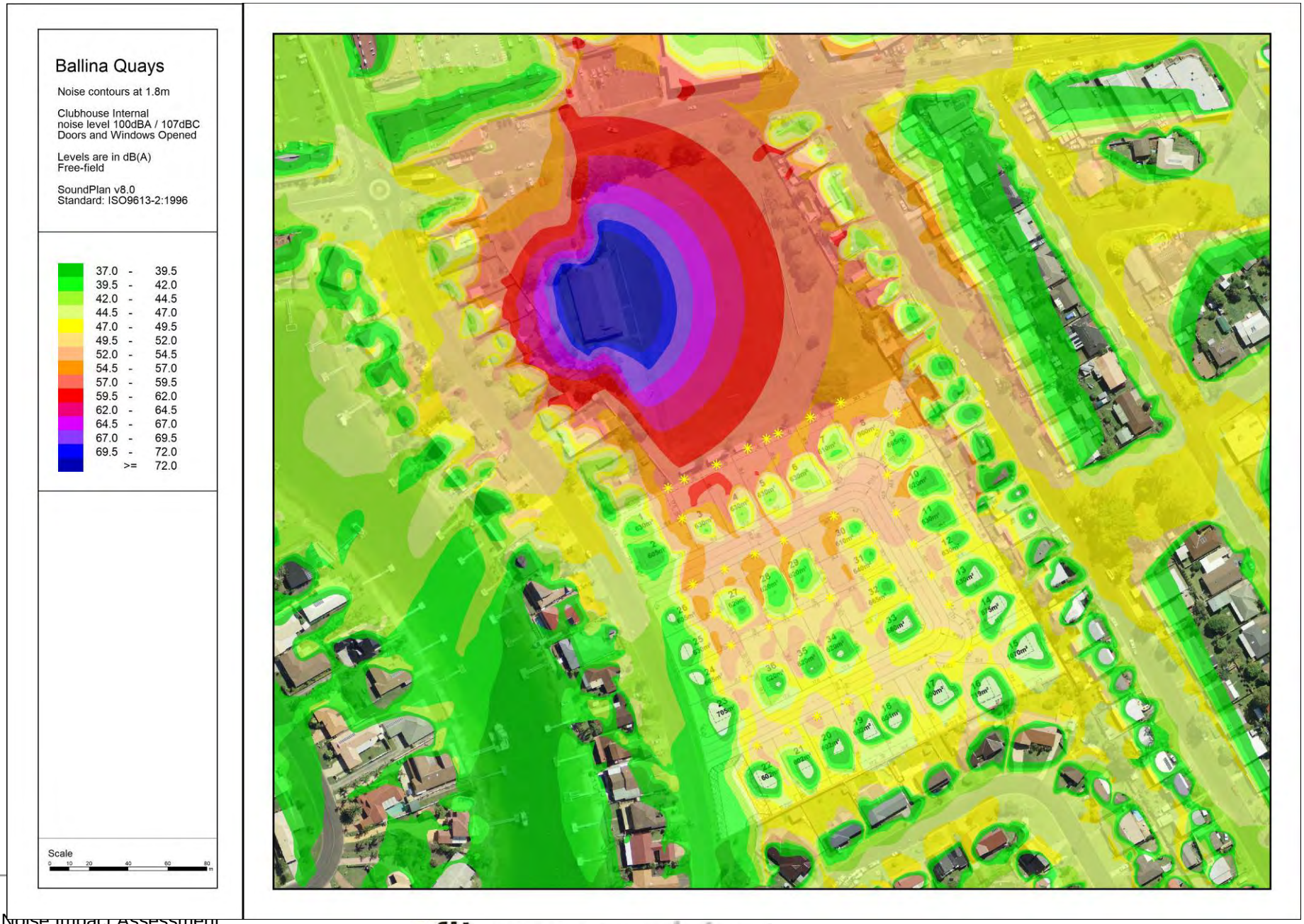


Plate 3.4Noise contours with 100dBA SPL in the clubhouse, 4.6m above ground, Doors and Windows Opened. Levels are in dB(A), free-field.

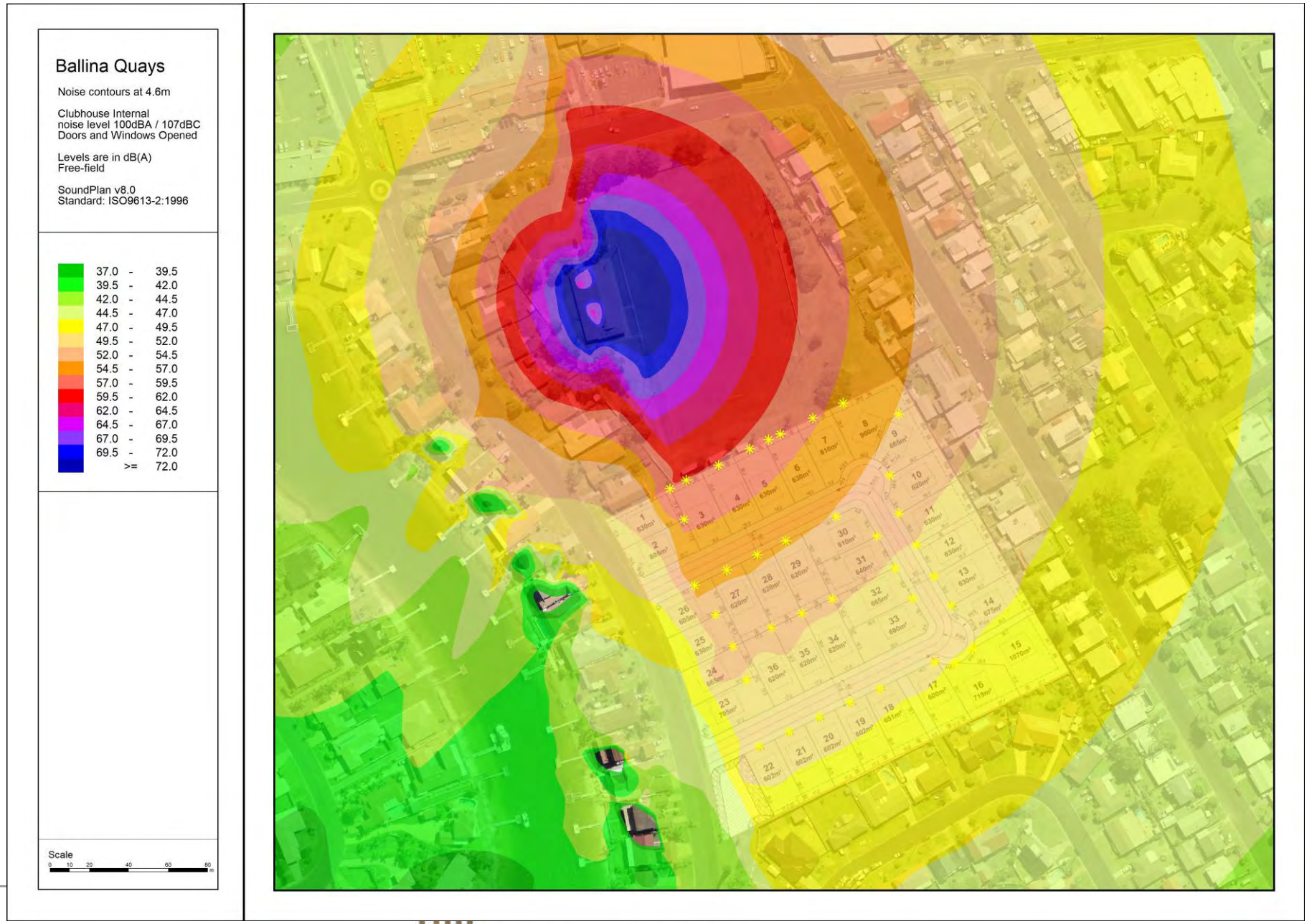


Plate 3.5 Noise contours with 90dBA SPL in the clubhouse, 1.8m above ground, Doors and Windows Opened. Levels are in dB(A), free-field.

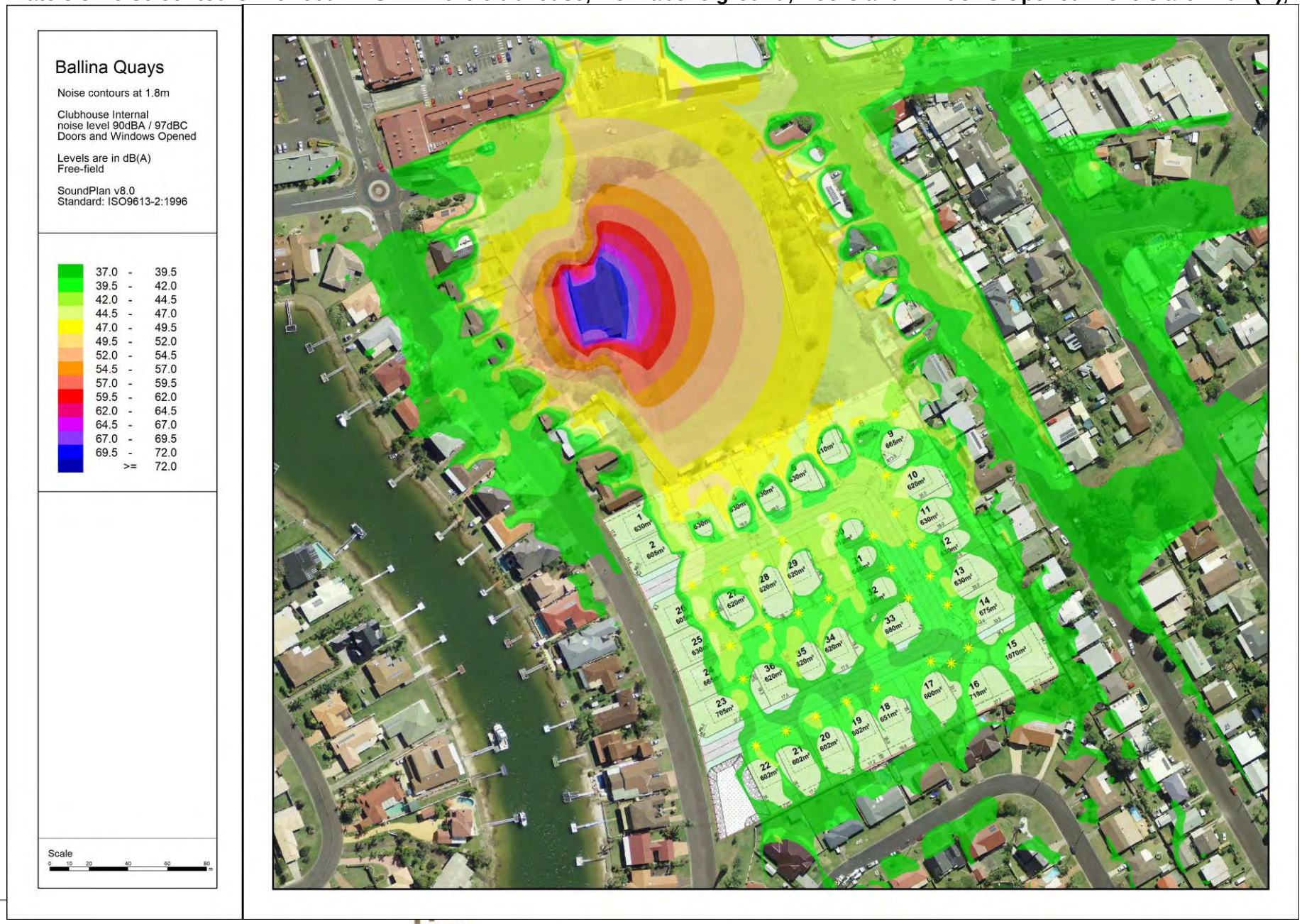


Plate 3.6 Noise contours with 90dBA SPL in the clubhouse, 4.6m above ground, Doors and Windows Opened. Levels are in dB(A), free-field.

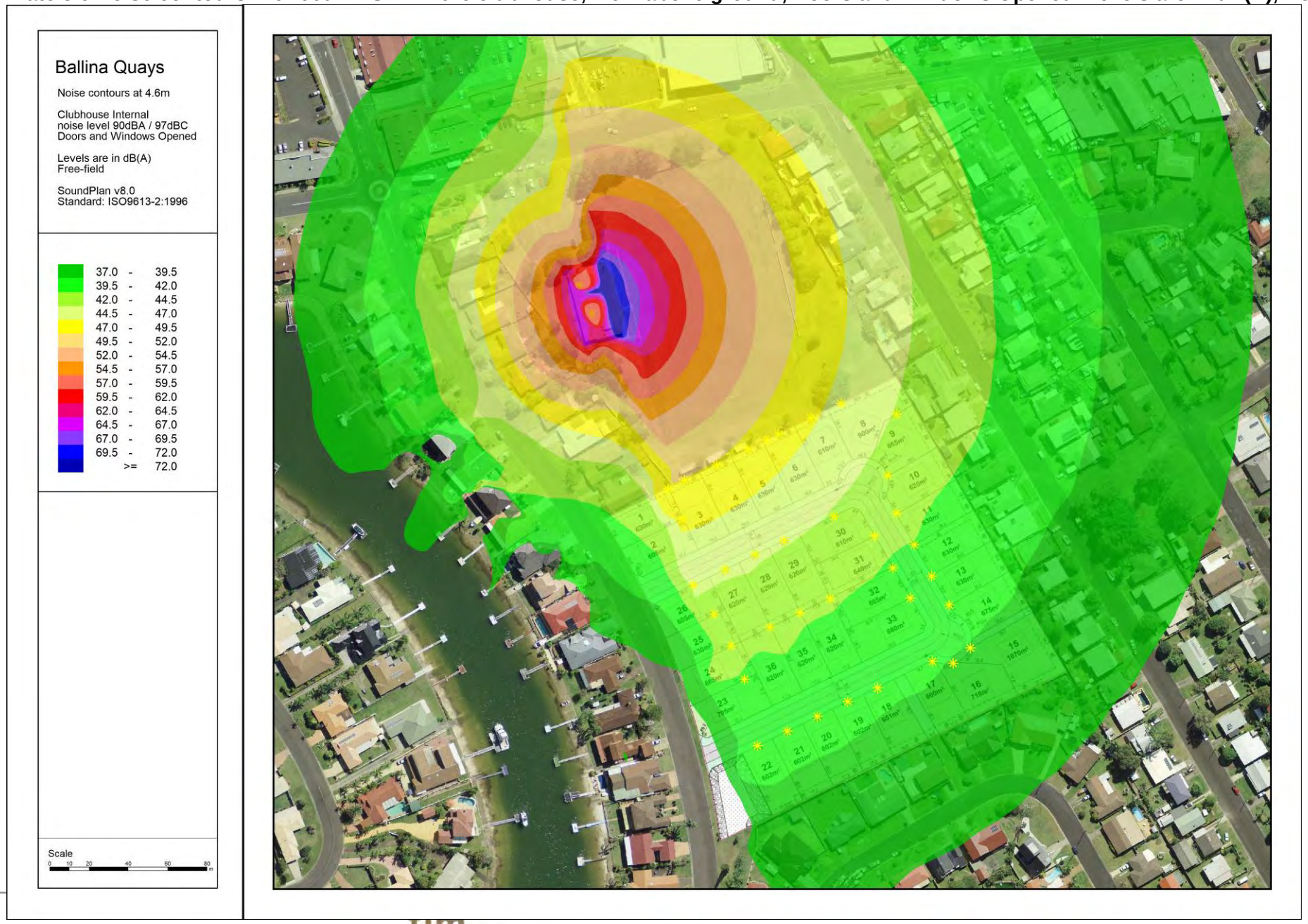


Plate 3.7 Noise contours with 75dBA SPL in the clubhouse, 1.8m above ground, Doors and Windows Opened. Levels are in dB(A), free-field

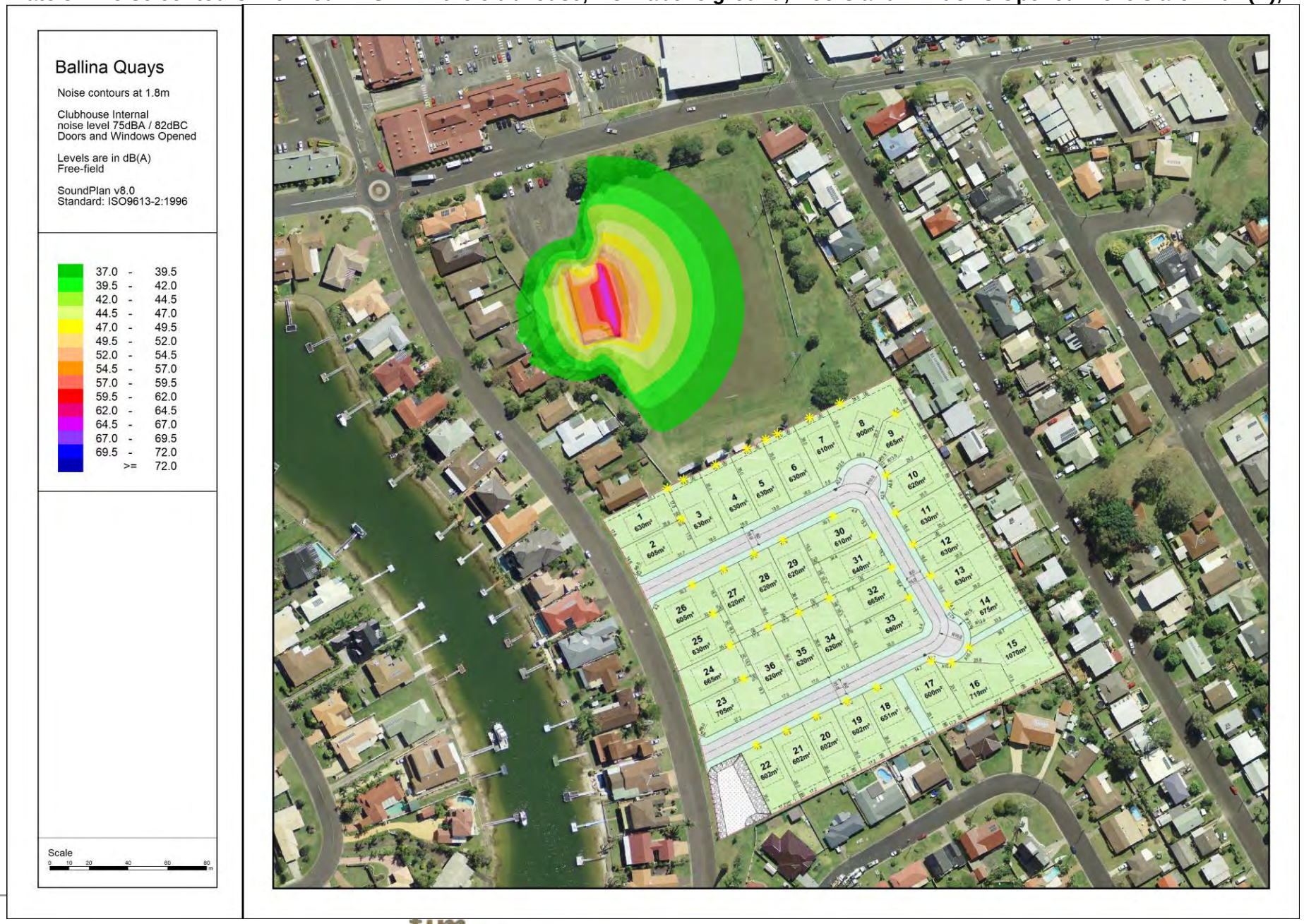


Plate 3.8: Noise contours with 75dBA SPL in the clubhouse, 4.6m above ground, Doors and Windows Opened. Levels are in dB(A), free-field.

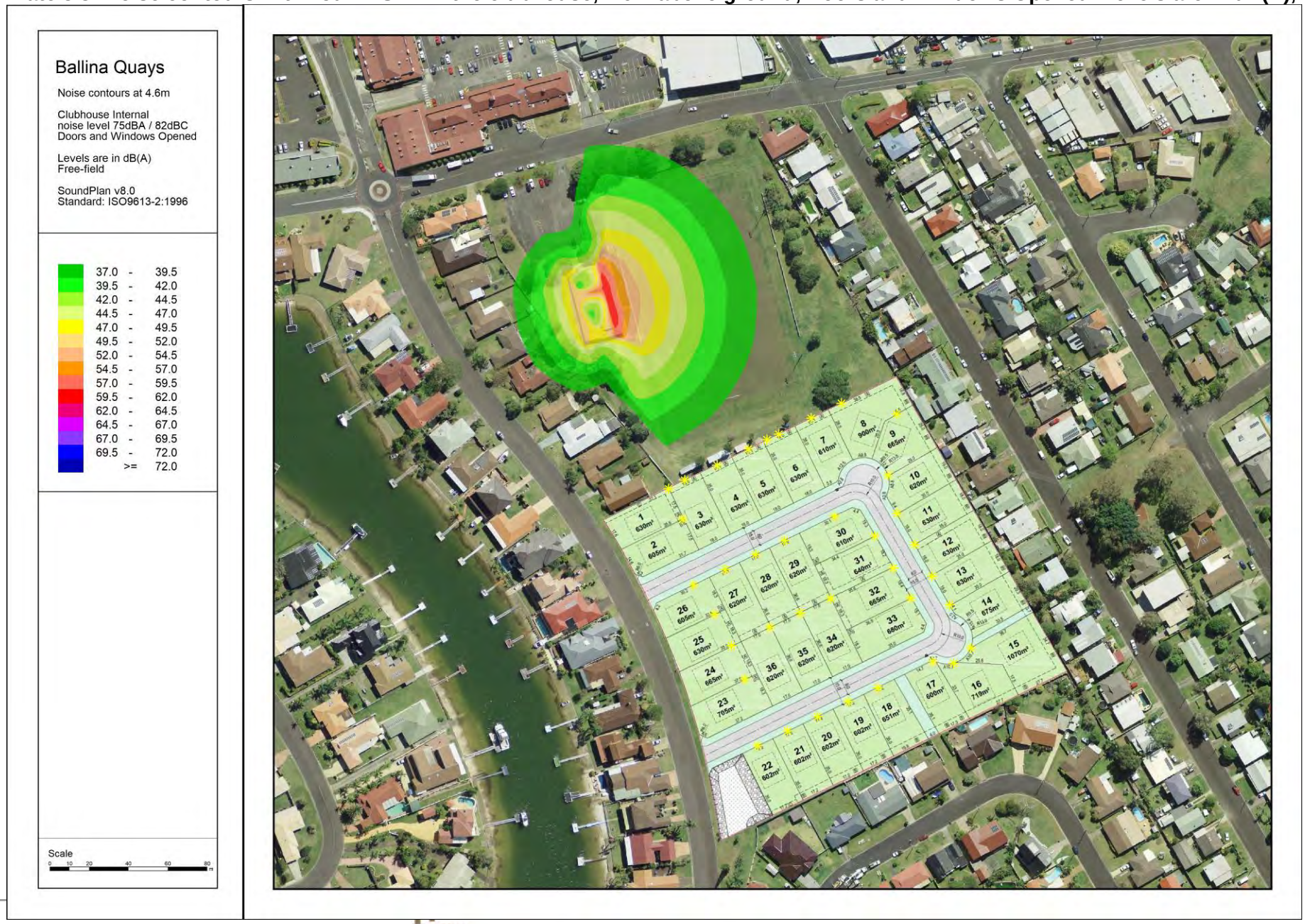


Table 3.6 Predicted noise levels for various internal sound pressure levels at the clubhouse, Doors and Windows Closed. Levels are in dB(A), free-field.

Lot	Internal Noise Level 100dBA Leq					Internal Noise Level 90dBA Leq					Internal Noise Level 75dBA Leq				
	Forecast dBA Leq		Day	Evening	Night	Forecast dBA Leq		Day	Evening	Night	Forecast dBA Leq		Day	Evening	Night
	Ground Floor	First Floor	39	39	37	Ground Floor	First Floor	39	39	37	Ground Floor	First Floor	39	39	37
1	53	54	+15	+15	+17	43	44	+5	+5	+7	28	29	PASS	PASS	PASS
2	51	52	+13	+13	+15	41	42	+3	+3	+5	26	27	PASS	PASS	PASS
3	53	54	+15	+15	+17	43	44	+5	+5	+7	28	29	PASS	PASS	PASS
4	52	53	+14	+14	+16	42	43	+4	+4	+6	27	28	PASS	PASS	PASS
5	52	53	+14	+14	+16	42	43	+4	+4	+6	27	28	PASS	PASS	PASS
6	51	52	+13	+13	+15	41	42	+3	+3	+5	26	27	PASS	PASS	PASS
7	50	51	+12	+12	+14	40	41	+2	+2	+4	25	26	PASS	PASS	PASS
8	49	50	+11	+11	+13	39	40	+1	+1	+3	24	25	PASS	PASS	PASS
9	47	48	+9	+9	+11	37	38	PASS	PASS	+1	22	23	PASS	PASS	PASS
10	46	47	+8	+8	+10	36	37	PASS	PASS	PASS	21	22	PASS	PASS	PASS
11	46	47	+8	+8	+10	36	37	PASS	PASS	PASS	21	22	PASS	PASS	PASS
12	45	46	+7	+7	+9	35	36	PASS	PASS	PASS	20	21	PASS	PASS	PASS
13	44	45	+6	+6	+8	34	35	PASS	PASS	PASS	19	20	PASS	PASS	PASS
14	43	44	+5	+5	+7	33	34	PASS	PASS	PASS	18	19	PASS	PASS	PASS
15	43	44	+5	+5	+7	33	34	PASS	PASS	PASS	18	19	PASS	PASS	PASS
16	42	44	+5	+5	+7	32	34	PASS	PASS	PASS	17	19	PASS	PASS	PASS
17	44	44	+5	+5	+7	34	34	PASS	PASS	PASS	19	19	PASS	PASS	PASS
18	45	44	+6	+6	+8	35	34	PASS	PASS	PASS	20	19	PASS	PASS	PASS
19	45	45	+6	+6	+8	35	35	PASS	PASS	PASS	20	20	PASS	PASS	PASS
20	46	45	+7	+7	+9	36	35	PASS	PASS	PASS	21	20	PASS	PASS	PASS
21	46	45	+7	+7	+9	36	35	PASS	PASS	PASS	21	20	PASS	PASS	PASS
22	46	46	+7	+7	+9	36	36	PASS	PASS	PASS	21	21	PASS	PASS	PASS
23	46	47	+8	+8	+10	36	37	PASS	PASS	PASS	21	22	PASS	PASS	PASS
24	47	48	+9	+9	+11	37	38	PASS	PASS	+1	22	23	PASS	PASS	PASS
25	48	49	+10	+10	+12	38	39	PASS	PASS	+2	23	24	PASS	PASS	PASS
26	49	50	+11	+11	+13	39	40	+1	+1	+3	24	25	PASS	PASS	PASS
27	47	49	+10	+10	+12	37	39	PASS	PASS	+2	22	24	PASS	PASS	PASS
28	48	49	+10	+10	+12	38	39	PASS	PASS	+2	23	24	PASS	PASS	PASS
29	48	49	+10	+10	+12	38	39	PASS	PASS	+2	23	24	PASS	PASS	PASS
30	49	48	+10	+10	+12	39	38	PASS	PASS	+2	24	23	PASS	PASS	PASS
31	45	47	+8	+8	+10	35	37	PASS	PASS	PASS	20	22	PASS	PASS	PASS
32	44	46	+7	+7	+9	34	36	PASS	PASS	PASS	19	21	PASS	PASS	PASS
33	43	45	+6	+6	+8	33	35	PASS	PASS	PASS	18	20	PASS	PASS	PASS
34	44	47	+8	+8	+10	34	37	PASS	PASS	PASS	19	22	PASS	PASS	PASS
35	44	47	+8	+8	+10	34	37	PASS	PASS	PASS	19	22	PASS	PASS	PASS
36	46	47	+8	+8	+10	36	37	PASS	PASS	PASS	21	22	PASS	PASS	PASS

Plate 3.9: Noise contours with 100dBA SPL in the clubhouse, 1.8m above ground, Doors and Windows Closed. Levels are in dB(A), free-field.

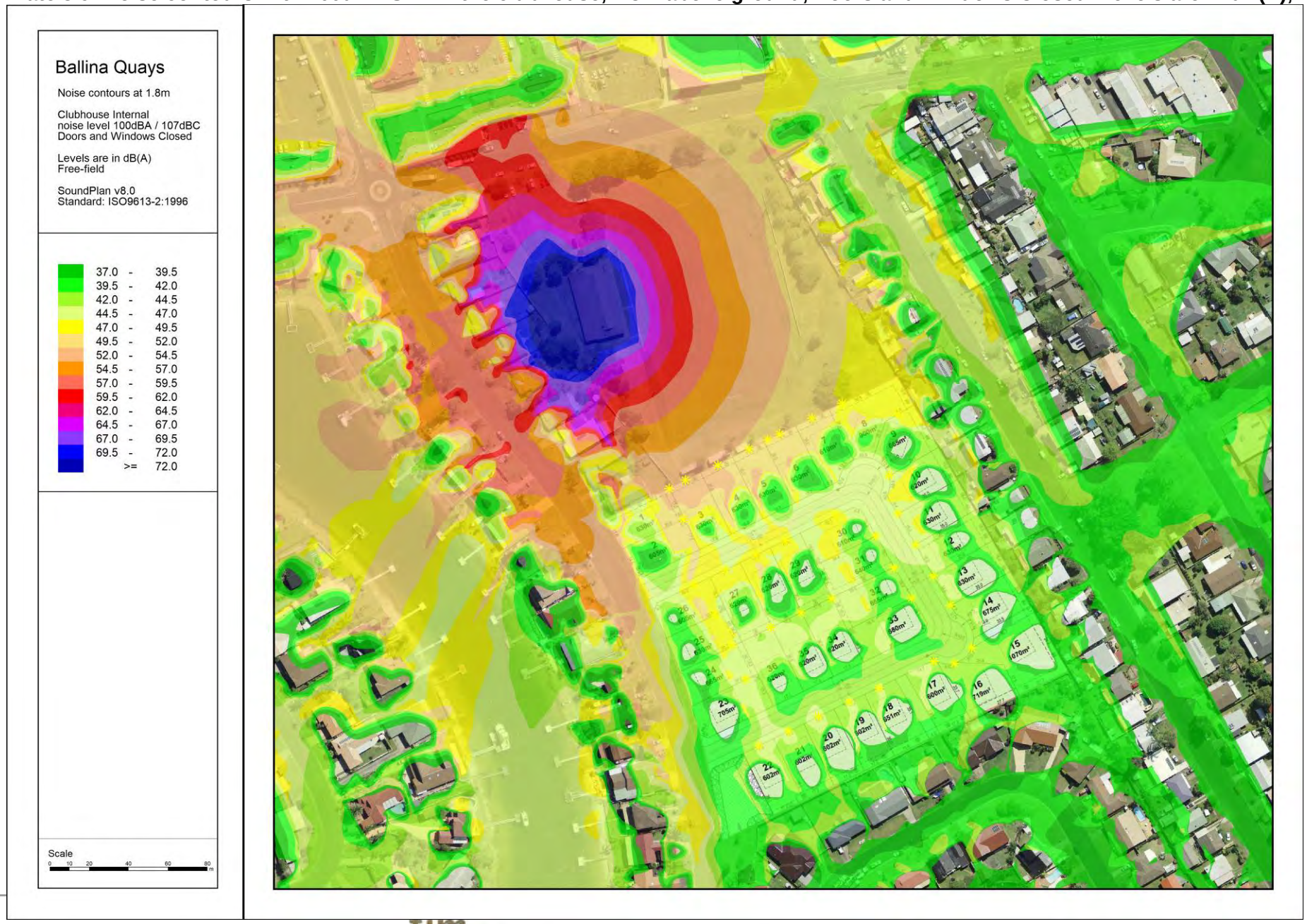


Plate 3.10: Noise contours with 100dBA SPL in the clubhouse, 4.6m above ground, Doors and Windows Closed. Levels are in dB(A), free-field.

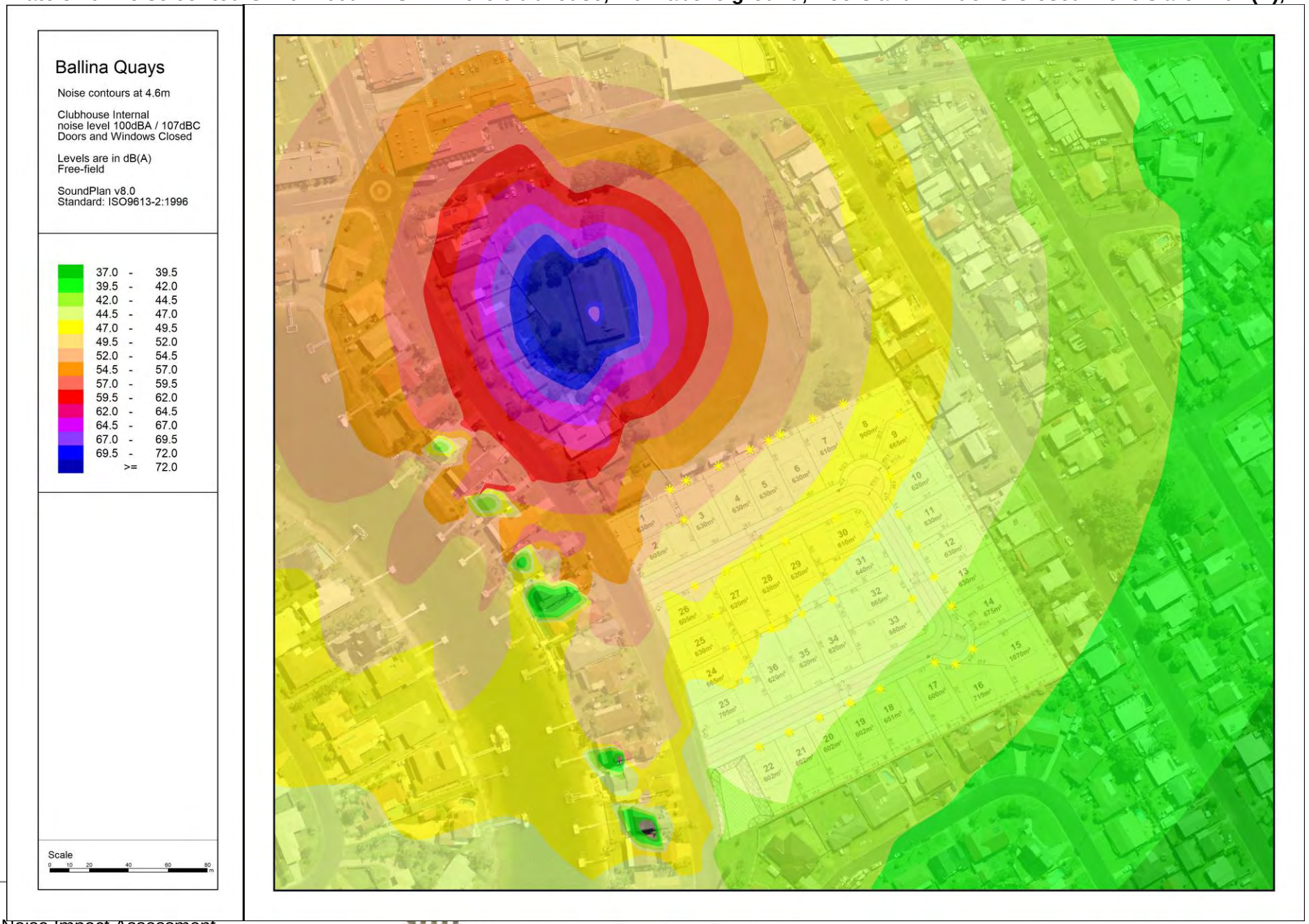


Plate 3.11: Noise contours with 90dBA SPL in the clubhouse, 1.8m above ground, Doors and Windows Closed. Levels are in dB(A), free-field.

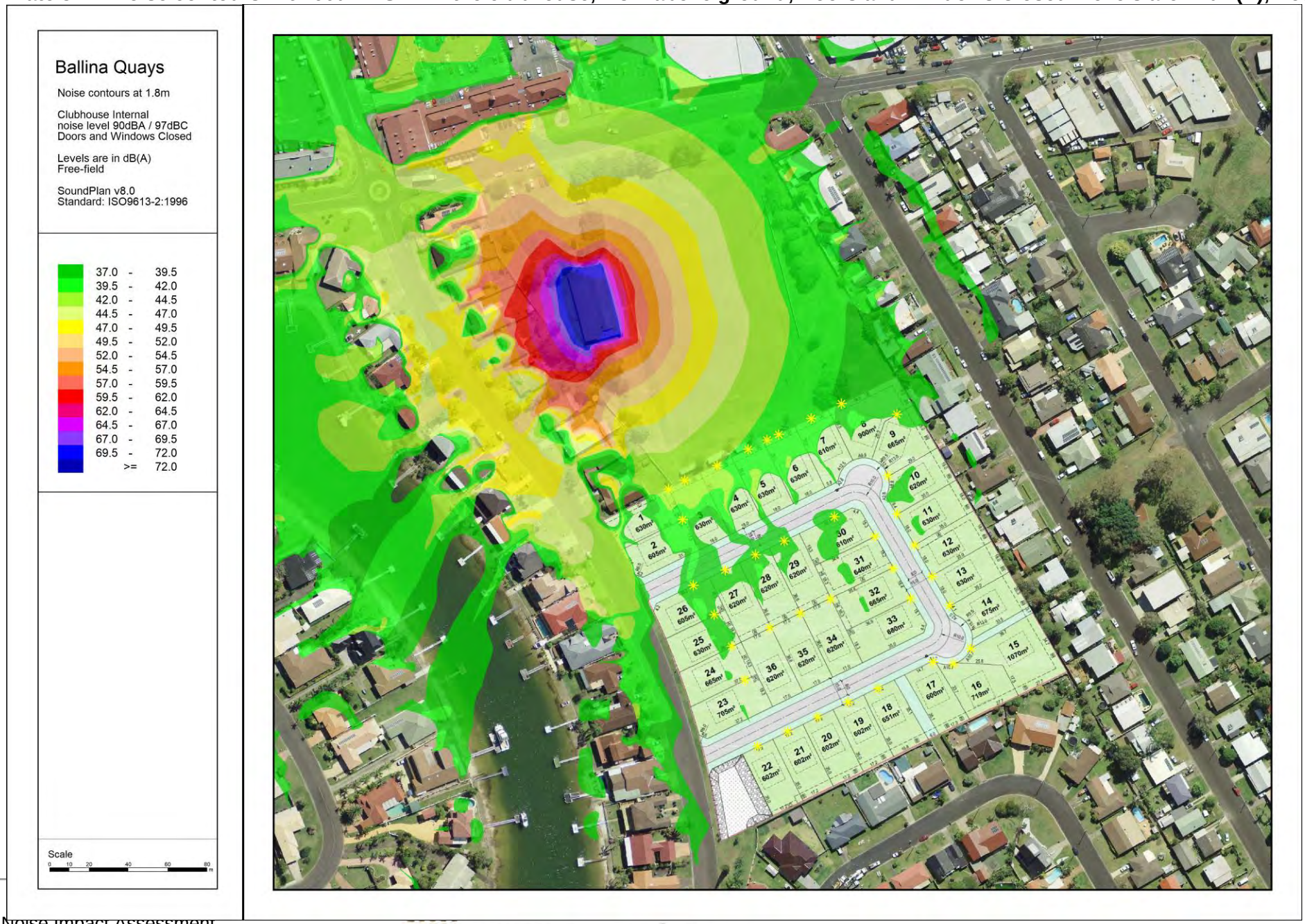


Plate 3.12: Noise contours with 90dBA SPL in the clubhouse, 4.6m above ground, Doors and Windows Closed. Levels are in dB(A), free-field.

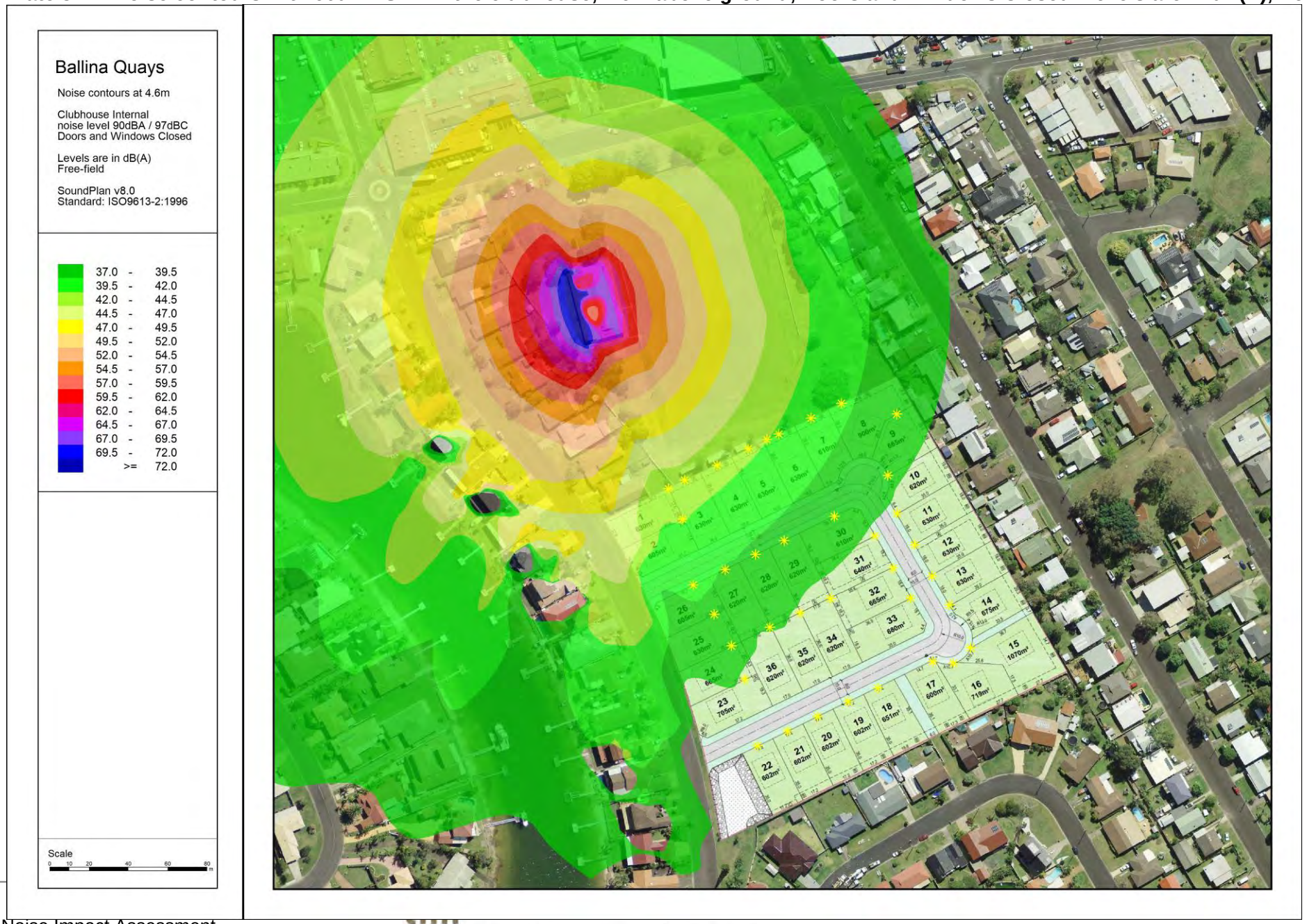


Plate 3.13: Noise contours with 75dBA SPL in the clubhouse, 1.8m above ground, Doors and Windows Closed. Levels are in dB(A), free-field.

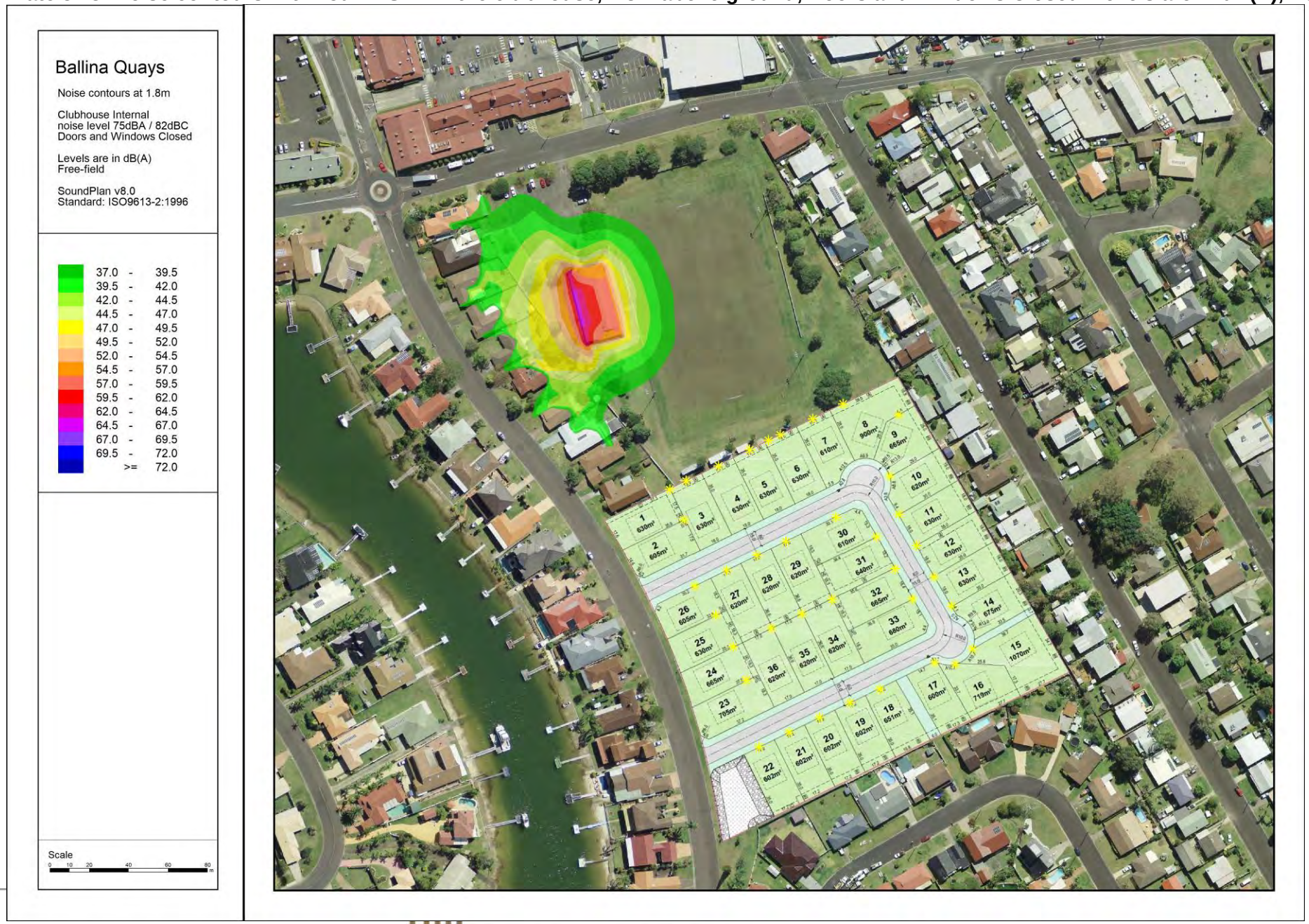


Plate 3.14: Noise contours with 75dBA SPL in the clubhouse, 4.6m above ground, Doors and Windows Closed. Levels are in dB(A), free-field.

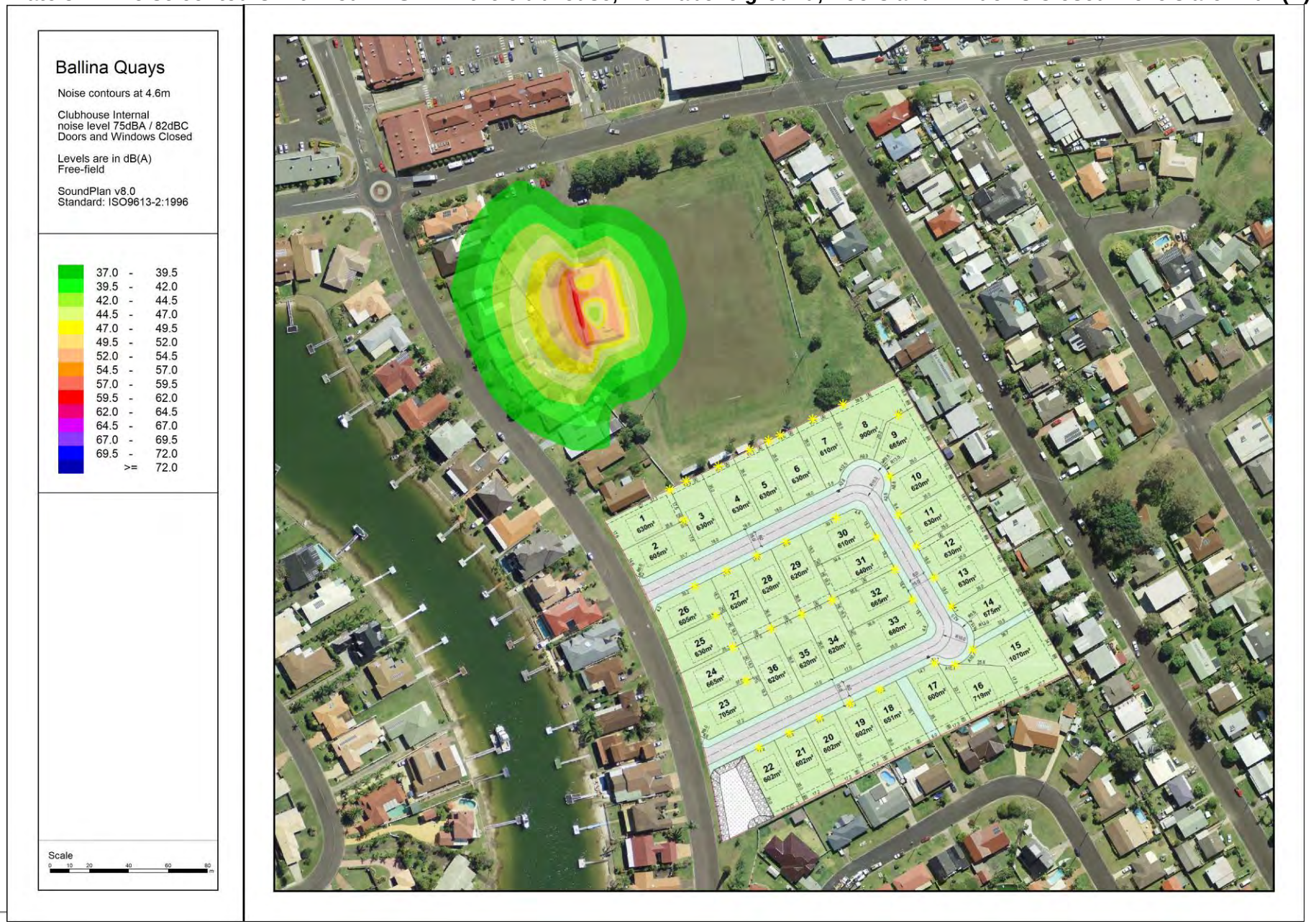


Table 3.7 Predicted noise levels for vehicle movements. Levels are in dB(A), free-field.

Receptor	Noise Level (dB(A))		Within Criteria?		
	Ground Floor	First Floor	Day (39dB(A))	Evening (39dB(A))	Night (37dB(A))
1	16	18	PASS	PASS	PASS
2	15	17	PASS	PASS	PASS
3	14	16	PASS	PASS	PASS
4	17	18	PASS	PASS	PASS
5	18	19	PASS	PASS	PASS
6	18	19	PASS	PASS	PASS
7	19	19	PASS	PASS	PASS
8	17	19	PASS	PASS	PASS
9	18	18	PASS	PASS	PASS
10	14	15	PASS	PASS	PASS
11	10	11	PASS	PASS	PASS
12	11	10	PASS	PASS	PASS
13	12	12	PASS	PASS	PASS
14	11	13	PASS	PASS	PASS
15	10	11	PASS	PASS	PASS
16	7	9	PASS	PASS	PASS
17	7	9	PASS	PASS	PASS
18	8	9	PASS	PASS	PASS
19	8	10	PASS	PASS	PASS
20	9	10	PASS	PASS	PASS
21	10	12	PASS	PASS	PASS
22	9	10	PASS	PASS	PASS
23	11	13	PASS	PASS	PASS
24	12	14	PASS	PASS	PASS
25	13	15	PASS	PASS	PASS
26	14	16	PASS	PASS	PASS
27	10	14	PASS	PASS	PASS
28	11	13	PASS	PASS	PASS
29	13	13	PASS	PASS	PASS
30	11	12	PASS	PASS	PASS
31	13	14	PASS	PASS	PASS
32	10	11	PASS	PASS	PASS
33	8	10	PASS	PASS	PASS
34	8	11	PASS	PASS	PASS

35	9	11	PASS	PASS	PASS
36	10	13	PASS	PASS	PASS

Plate 3.15 Noise contours for vehicle movements at 1.8m above ground. Levels are in dB(A), free-field.

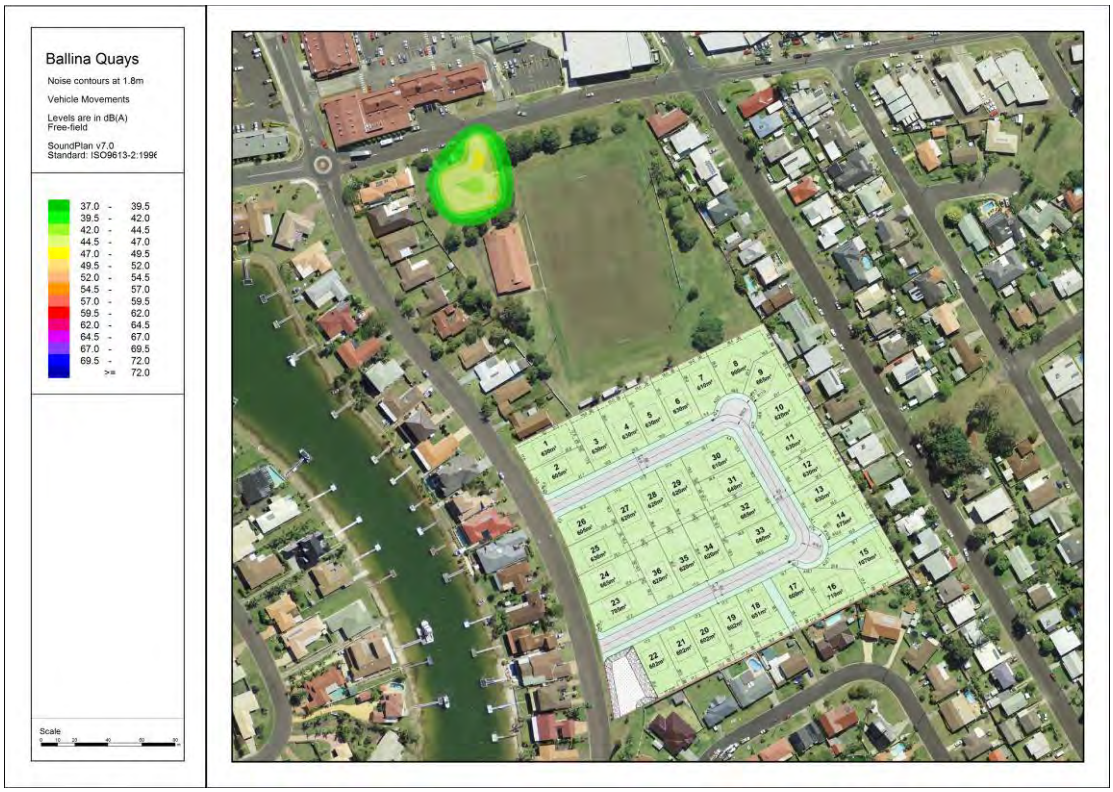


Plate 3.16 Noise contours for vehicle movements at 4.6m above ground. Levels are in dB(A), free-field.

4 Discussion

The industrial noise source criteria set down in Section 1 are best regarded as planning tools. They are not mandatory, and an application for a noise producing development is not determined purely on the basis of compliance or otherwise with the noise criteria. Numerous other factors need to be taken into account in the determination. These factors include economic consequences, other environmental effects and the social worth of the development.

The criteria help to determine consent/licence conditions because they provide information on the likely effect of any environmental noise associated with the development. Whilst it is our considered view that the Industrial Noise Policy does not apply to the existing sportsground which is utilised by an amateur Rugby Club and not for commercial or industrial use we understand that BSC requires consideration of the noise impacts of the said activities on the future occupants of the subject development in accordance with the INP.

The Noise Impact Assessment and modelling has illustrated that:

- Noise levels from the clubhouse have been modelled at various intensities, with scenarios for windows and doors both opened and closed.
- With an internal noise level of 75dB(A) (equivalent to background music + patron noise), noise from the clubhouse is predicted to comply with the PSNC during all time periods, regardless of the position of windows and doors.
- With an internal noise level of 90dB(A) (equivalent to a small band (bass, drums , guitar or medium level DJ including patron noise), with windows and doors closed, noise from the clubhouse is predicted to comply with the PSNC at most receptors. Exceedances of up to 7dB(A) are predicted for the closest receptors.
- With an internal noise level of 100dB(A) (equivalent to heavy band, including patron noise), exceedances are predicted at all receptors, regardless of the position of windows and doors. Exceedances of up to 22dB(A) are predicted with windows and doors opened, and 17dB(A) with windows and doors closed.
- If compliance is required at all sensitive receptors, noise inside the clubhouse should be limited to 78dB(A).

Noise Mitigation: Club house
Attended noise monitoring with amplified music has confirmed that noise emissions at 90dB are noticeable through the existing 4mm windows and gaps around the external doors on the eastern side of the Clubhouse. Noise emission through the ceiling and roof was not evident during attended noise monitoring.

Should the Rugby Club or any other tenant wish to hold events involving amplified music (at levels between 75dB (A) and 90dB (A) at source):

- ❖ window replacement and sealing around existing doors are to be installed as per mitigation measures listed below;
- ❖ doors and windows on the eastern side are to remain closed (except when patrons entering and leaving); and
- ❖ air conditioning is to be operational as per mitigation measures listed below.

The following recommended mitigation measures, if installed within the Ballina Rugby Club (for events involving amplified music (at levels between 75dB (A) and 90dB (A) at source) should result in compliance with the PSNC at the nearest affected residence within approved 36 lot residential subdivision at Lot 71, DP628164, Quays Drive, West Ballina under DA 2016/690.

1. **Window Replacement (Eastern side of BRC)** (see Quotation **Appendix D)**

- Remove the six existing aluminium framed glass windows from the eastern side (main entrance) of the Ballina Rugby Clubhouse.
- Replace the windows in existing openings, 1800W x 1500H with
  - o anodised 246 doors, 3 Track Res Inside Slider with 6.38 clear laminate glass including subhead, subsill and angle.
- The doors/windows will have fixed glass on one side and sliding on the opposite side. They will have key locks and be keyed alike.

2. **Door Seals for External Doors (Eastern Side of BRC) (see Quotation Appendix D)**

- Supply and install weather seal to bottom of timber doors and felt strip around door jambs to reduce noise.

3. **Air conditioning**

- Install 4 x 10.0kW High Wall Console Inverter Split Systems (see Quotation **Appendix D**)

4. **Noise Management Plan**

In order to ensure that the BRC operates with the least noise impact, a Noise Management Plan is to be prepared and implemented that addresses the operations associated with the function activities to minimise noise impacts on the nearest affected dwellings. The NMP should include:

a) identification of nearby residences and other sensitive land uses;
b) an assessment of expected noise impacts;
c) a detailed examination of all feasible and reasonable management practices that will be implemented to minimise noise impacts;
d) strategies to promptly deal with and address noise complaints;
e) details of performance evaluating procedures (for example, sound checks on amplified music or public address systems);
f) contact details for the manager for complaints and queries to be made, and responded to;
g) reference to all relevant consent conditions including hours of operation;
h) operational details about the use of any noise monitoring equipment to record sound pressure levels around the property; and

j) the name and qualifications of the person who prepared the Noise Management Plan.

4. Conclusion

The Noise Impact Assessment has concluded:

- Noise levels from functions at the clubhouse (with doors and windows open) are predicted to exceed the daytime and evening PSNC by up to 7dB(A) at some of the closest proposed dwellings. If compliance is required at all sensitive receptors, noise inside the clubhouse (with doors and windows open) should be limited to 75dB(A). Further exceedances of up to 9dB(A) are predicted at the closest proposed dwellings during night-time.

Should the Rugby Club or any other tenant wish to hold events involving amplified music (at levels between 75dB (A) and 90dB (A) at source):

- ❖ window replacement and sealing around existing doors are to be installed as per mitigation measures listed below;
- ❖ doors and windows on the eastern side are to remain closed (except when patrons entering and leaving); and
- ❖ air conditioning is to be operational as per mitigation measures listed below.

The following recommended mitigation measures, if installed within the Ballina Rugby Club (for events involving amplified music (at levels between 75dB (A) and 90dB (A) at source) should result in compliance with the PSNC at the nearest affected residence within approved 36 lot residential subdivision at Lot 71, DP628164, Quays Drive, West Ballina under DA 2016/690.

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- The doors/windows will have fixed glass on one side and sliding on the opposite side. They will have key locks and be keyed alike.

2 **Door Seals for External Doors (Eastern Side of BRC)**

- Supply and install weather seal to bottom of timber doors and felt strip around door jambs to reduce noise.

3 Air conditioning

- Install 4 x 10.0kW High Wall Console Inverter Split Systems

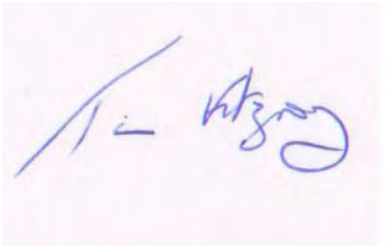
4 Noise Management Plan

In order to ensure that the BRC operates with the least noise impact, a Noise Management Plan is to be prepared and implemented that addresses the operations

associated with the function activities to minimise noise impacts on the nearest affected dwellings. The NMP should include:

a) identification of nearby residences and other sensitive land uses;
b) an assessment of expected noise impacts;
c) a detailed examination of all feasible and reasonable management practices that will be implemented to minimise noise impacts;
d) strategies to promptly deal with and address noise complaints;
e) details of performance evaluating procedures (for example, sound checks on amplified music or public address systems);
f) contact details for the manager for complaints and queries to be made, and responded to;
g) reference to all relevant consent conditions including hours of operation;
h) operational details about the use of any noise monitoring equipment to record sound pressure levels around the property; and
j) the name and qualifications of the person who prepared the Noise Management Plan.

This report has been prepared by Tim Fitzroy of *Tim Fitzroy & Associates* and Matt Dever of *Noise Measurement Services, Brisbane.* Attended Monitoring was undertaken by TFA (16 January 2018). Background and attended noise monitoring was undertaken by Garry Hall, *Ambiance Audio (NIA, 5 July 2017).*



Tim Fitzroy
Environmental Health Scientist
Environmental Auditor

References

Ambiance Audio 2017 Noise Impact Assessment – Ballina Rugby Clubhouse and Sportsground on Proposed Ballina Quays Residential Subdivision

NSW EPA 2000 Industrial Noise Policy, Environment Protection Authority, Sydney

NSW DECC, 2009 Noise Guide for Local Government, Department of Environment, Climate Change & Water, Sydney

A/NZ Standards, 1987 Internal noise limits from Australian/New Zealand Standard AS/NZS 2107:1987.

World Health Organisation 1999 Guidelines for Community Noise (Editor B Berglund et al Geneva Switzerland 1999)

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A Development Plan

Issue	Date	Description	Appr'd
A	14.02.2017	Addition of Detention Basin	DR

Client: Burleigh Heads Nominee P/L

Project: 36 Lot Residential Subdivision
Lot 71 DP 628164
Quays Drive, West Ballina

Title: Plan of Subdivision

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ARDILL PAYNE
ENGINEERS PLANNERS SURVEYORS
ENVIRONMENTAL PROJECT MANAGEMENT

Designed: ME | Drawn: ME | Checked | Approved
Scale: 1:500 @ A1, 1:1000 @ A3
Date: 28/11/2016 | Datum: AHD
Job No. 8208 | Dwg No. POS-1 | Issue A

B Noise Data

	3rd		4th		5th		6th		7th	
Start time	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90
12:00:00 AM			37.2	35.0	34.6	32.3	35.5	32.9	35.1	32.8
12:15:00 AM			37.0	34.7	36.7	35.2	35.4	32.6	36.1	32.1
12:30:00 AM			38.6	35.9	34.0	31.7	36.0	32.5	35.7	31.6
12:45:00 AM			36.4	35.1	36.2	33.4	36.7	32.7	34.7	32.2
01:00:00 AM			37.9	36.0	37.3	36.2	33.7	31.8	34.8	32.3
01:15:00 AM			37.8	36.3	34.4	32.2	36.2	33.2	33.4	30.2
01:30:00 AM			37.9	35.8	33.0	31.5	35.2	32.0	35.7	31.7
01:45:00 AM			39.7	37.9	33.8	31.9	33.5	30.3	36.4	30.8
02:00:00 AM			36.0	33.8	34.3	32.6	36.2	32.1	33.1	30.4
02:15:00 AM			36.2	33.4	37.8	36.8	36.9	30.4	31.8	29.3
02:30:00 AM			37.8	34.9	36.9	35.4	35.3	30.0	33.5	30.4
02:45:00 AM			36.9	34.6	35.3	34.4	36.2	30.6	34.1	30.4
03:00:00 AM			35.5	33.8	35.7	34.3	35.4	31.6	35.3	33.2
03:15:00 AM			37.4	36.2	36.4	35.5	35.1	29.6	35.8	34.4
03:30:00 AM			39.1	36.9	35.7	34.2	34.5	30.2	36.9	34.8
03:45:00 AM			37.9	36.0	37.1	34.9	38.6	32.5	37.5	34.7
04:00:00 AM			36.7	35.6	35.9	34.0	39.3	34.4	35.9	34.0
04:15:00 AM			36.0	34.8	35.3	33.2	40.2	33.0	36.1	33.6
04:30:00 AM			37.4	35.7	34.4	31.9	40.4	34.0	37.2	34.1
04:45:00 AM			37.6	35.0	34.9	32.7	39.8	35.1	36.3	33.6
05:00:00 AM			37.5	35.0	36.5	33.4	40.4	36.6	37.8	34.8
05:15:00 AM			40.0	37.5	39.4	35.7	42.3	39.4	38.8	36.2
05:30:00 AM			40.5	38.8	39.4	36.7	42.1	39.5	39.3	36.3
05:45:00 AM			40.2	38.9	49.0	36.4	42.4	40.3	39.4	37.8
06:00:00 AM			56.1	41.0	56.1	40.5	57.6	42.9	57.9	38.7
06:15:00 AM			48.6	39.6	49.0	39.3	49.3	43.3	50.2	41.5
06:30:00 AM			44.7	38.3	52.3	41.3	49.1	43.4	48.5	41.7
06:45:00 AM			43.3	39.2	57.4	41.6	55.0	45.2	50.8	42.2
07:00:00 AM			46.4	38.3	49.4	40.8	53.6	43.0	50.4	42.1
07:15:00 AM			48.9	38.4	59.8	41.1	48.0	42.6	50.1	40.8
07:30:00 AM			52.6	38.4	58.4	41.0	47.4	42.3	47.8	41.6
07:45:00 AM			44.4	39.6	55.9	42.6	46.3	42.5	44.1	38.9
8:00:00 AM			43.1	39.3	55.3	40.4	44.7	41.6	47.6	38.2
08:15:00 AM			47.5	40.1	54.9	40.2	46.1	41.7	50.2	37.7
08:30:00 AM			42.6	39.3	46.3	39.6	44.0	39.3	49.3	37.2
08:45:00 AM			43.0	38.9	50.7	38.8	43.9	40.0	46.1	36.1
09:00:00 AM			46.9	39.0	44.7	38.0	46.7	40.7	38.9	35.1
09:15:00 AM			49.0	38.9	41.4	37.8	45.7	37.1	40.8	35.4
09:30:00 AM			45.9	38.9	40.8	37.6	47.6	38.1	39.9	34.7
09:45:00 AM			42.4	37.0	45.4	36.7	43.9	38.6	41.5	33.3
10:00:00 AM			44.7	36.7	44.2	37.2	43.3	37.5	39.3	34.0
10:15:00 AM			42.5	35.4	44.8	38.5	43.2	39.7	40.4	34.2
10:30:00 AM			45.4	36.1	46.5	36.0	43.6	36.9	43.8	34.8
10:45:00 AM			40.2	35.0	43.8	34.7	46.9	37.2	39.3	34.8
11:00:00 AM			44.3	34.0	39.0	34.5	46.7	37.1	41.3	33.7
11:15:00 AM			41.9	34.5	37.7	32.6	44.1	36.6	52.8	33.3
11:30:00 AM			50.0	35.8	41.5	31.8	39.6	36.4	42.1	31.9
11:45:00 AM			45.7	36.9	39.1	31.0	40.4	35.8	41.7	31.7

	3rd		4th		5th		6th		7th	
Start time	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90
12:00:00 PM			43.5	39.0	45.2	30.6	45.3	36.5	41.8	31.5
12:15:00 PM			44.3	38.5	50.1	30.8	45.6	35.4	39.9	31.5
12:30:00 PM			44.0	37.0	49.3	31.7	41.7	35.6	39.5	32.0
12:45:00 PM			44.4	37.7	40.8	33.6	39.4	36.4	36.7	31.4
01:00:00 PM			45.6	35.7	37.9	31.0	38.2	34.8	39.8	31.0
01:15:00 PM			46.8	35.5	37.2	31.8	38.6	35.7	36.8	31.9
01:30:00 PM			42.7	34.6	40.3	32.9	40.2	33.7	41.5	31.8
01:45:00 PM			50.8	33.3	48.2	32.5	40.9	34.4	39.5	34.6
02:00:00 PM			44.9	34.3	39.8	34.8	40.2	36.9	37.6	32.9
02:15:00 PM			49.1	36.9	40.7	34.4	42.0	36.6	43.1	33.6
02:30:00 PM			48.6	37.1	39.4	32.3	47.3	35.4	39.2	32.7
02:45:00 PM			44.3	35.9	39.4	31.6	37.5	33.5	38.3	32.4
03:00:00 PM			47.8	36.6	45.8	31.8	45.2	34.3	39.3	32.3
03:15:00 PM			46.8	35.9	48.1	33.6	44.0	34.1	41.9	32.8
03:30:00 PM			51.3	36.7	42.9	35.0	40.5	34.4	45.7	33.1
03:45:00 PM			56.3	39.8	54.4	37.9	42.3	34.0	42.1	32.1
04:00:00 PM	54.3	45.2	63.7	47.7	61.4	45.9	54.8	38.7	46.3	34.7
04:15:00 PM	55.1	47.3	62.6	48.3	51.9	41.2	51.6	38.0	52.7	39.8
04:30:00 PM	58.2	48.7	59.4	48.9	56.8	45.1	46.7	38.5	57.9	50.2
04:45:00 PM	60.6	51.0	55.9	49.6	55.7	51.5	51.4	42.4	55.4	48.2
05:00:00 PM	55.3	49.9	58.1	49.5	56.4	51.6	49.5	46.2	48.7	44.4
05:15:00 PM	51.0	44.9	46.3	41.0	47.1	42.3	49.2	45.2	42.9	37.5
05:30:00 PM	46.4	39.9	42.5	37.3	42.6	39.3	42.5	39.6	39.6	33.7
05:45:00 PM	47.0	37.9	42.8	35.0	45.0	36.8	44.8	37.9	40.4	34.0
06:00:00 PM	45.5	35.7	37.1	32.4	40.4	36.7	45.1	39.2	42.1	34.2
06:15:00 PM	47.1	36.3	40.1	32.0	40.0	37.4	45.5	38.2	40.2	33.6
06:30:00 PM	43.7	37.2	35.1	31.7	39.5	36.2	50.8	40.5	38.5	32.9
06:45:00 PM	43.1	35.8	37.5	32.6	39.5	37.3	49.2	39.5	45.9	31.2
07:00:00 PM	45.9	36.0	39.1	32.5	41.9	37.5	50.9	38.9	34.4	30.2
07:15:00 PM	44.9	37.4	35.7	32.0	40.5	37.7	43.5	39.7	42.6	30.9
07:30:00 PM	44.7	37.1	34.8	32.2	40.9	38.8	44.5	38.4	34.9	30.7
07:45:00 PM	38.6	37.2	35.4	33.2	41.1	39.3	39.4	35.7	35.4	32.2
08:00:00 PM	38.9	37.1	35.6	33.2	41.7	39.2	40.3	37.6	35.5	32.0
08:15:00 PM	38.0	36.7	35.6	34.1	41.4	39.2	45.1	37.1	35.8	32.7
08:30:00 PM	39.0	36.5	37.3	34.8	40.5	38.7	41.3	37.8	36.7	33.9
08:45:00 PM	44.3	37.5	34.9	32.9	39.6	37.7	42.5	38.7	35.3	32.6
09:00:00 PM	37.5	36.0	35.0	33.2	37.9	36.0	38.8	34.7	36.4	33.9
09:15:00 PM	38.6	36.8	35.3	33.2	40.3	35.7	38.8	35.7	35.2	33.1
09:30:00 PM	38.0	36.0	39.0	31.8	37.5	35.5	38.2	34.9	33.7	31.6
09:45:00 PM	39.4	35.6	35.0	33.5	37.5	35.0	39.2	34.9	36.2	32.2
10:00:00 PM	38.6	34.5	36.0	34.0	38.2	35.4	36.9	33.9	35.7	31.7
10:15:00 PM	39.6	36.0	38.2	32.2	37.1	34.6	36.6	32.9	36.5	32.8
10:30:00 PM	36.3	35.2	34.4	31.9	36.5	33.2	38.2	35.4	35.6	32.5
10:45:00 PM	35.6	34.0	37.0	33.1	35.9	33.7	38.4	32.1	35.7	32.2
11:00:00 PM	37.2	35.0	37.8	35.6	37.1	34.9	36.3	31.8	35.9	33.1
11:15:00 PM	37.0	35.7	35.5	33.6	36.9	33.8	35.0	31.5	36.0	31.6
11:30:00 PM	40.7	35.8	36.0	35.0	49.2	34.0	35.6	33.3	35.3	32.6
11:45:00 PM	36.6	34.9	35.8	34.6	35.0	32.6	34.6	32.2	33.4	30.6

	11th		12th		8th		9th		10th	
Start time	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90
12:00:00 AM	37.4	34.2	38.3	36.8	32.5	30.4	37.8	35.2	38.5	35.5
12:15:00 AM	35.7	32.5	39.9	38.0	32.6	29.8	43.5	34.2	39.5	37.6
12:30:00 AM	35.7	32.1	39.3	37.8	36.6	30.3	36.2	34.4	39.8	38.4
12:45:00 AM	34.2	31.8	39.4	37.9	33.5	30.6	36.7	35.0	41.1	37.1
01:00:00 AM	34.5	32.6	39.1	38.0	33.6	30.6	35.8	34.7	47.6	36.7
01:15:00 AM	35.2	32.8	38.9	37.5	33.4	30.9	36.4	35.1	39.1	36.2
01:30:00 AM	35.8	33.8	37.2	34.6	34.0	31.3	37.2	35.8	37.1	35.2
01:45:00 AM	35.9	33.1	37.4	35.1	34.2	32.2	35.4	34.1	36.4	34.5
02:00:00 AM	33.4	31.9	41.4	38.5	34.1	31.5	36.0	34.2	33.1	31.0
02:15:00 AM	37.3	31.5	39.2	36.3	35.2	33.3	36.5	35.0	32.4	30.5
02:30:00 AM	32.9	31.1	41.9	37.1	37.1	34.9	36.0	34.5	68.2	34.6
02:45:00 AM	34.3	30.5	40.8	33.6	35.0	33.2	36.5	35.2	63.9	51.5
03:00:00 AM	31.1	29.5	37.3	34.9	35.2	33.3	38.7	36.7	59.9	46.1
03:15:00 AM	33.2	30.7	38.1	35.2	34.2	32.4	36.7	35.5	52.9	45.7
03:30:00 AM	43.5	36.5	35.2	33.5	35.2	32.7	37.6	36.1	56.4	49.0
03:45:00 AM	38.6	36.2	35.7	33.6	35.2	32.1	37.2	35.5	53.2	46.8
04:00:00 AM	39.3	37.6	36.9	34.4	36.9	34.6	37.0	35.1	54.3	49.0
04:15:00 AM	38.9	37.2	35.7	34.6	37.5	34.9	36.8	34.7	54.3	48.0
04:30:00 AM	37.5	36.4	37.2	35.0	37.7	35.7	36.6	34.7	52.7	47.7
04:45:00 AM	37.3	35.2	44.9	33.9	39.5	36.3	37.1	35.0	53.5	47.4
05:00:00 AM	35.2	33.3	37.2	35.2	37.4	35.3	38.7	35.8	51.6	45.8
05:15:00 AM	42.9	34.3	36.1	34.6	38.9	36.4	39.3	36.8	50.5	42.5
05:30:00 AM	43.4	35.6	39.5	35.5	40.8	37.4	39.7	37.8	45.4	40.3
05:45:00 AM	41.1	34.1	40.8	36.8	39.3	37.0	42.6	38.8	47.5	41.3
06:00:00 AM	55.5	38.6	49.8	38.2	57.2	38.4	56.9	40.6	54.7	45.7
06:15:00 AM	54.9	42.9	52.5	42.5	43.9	39.9	50.1	41.8	53.3	45.2
06:30:00 AM	48.8	44.0	44.8	40.3	54.6	40.6	46.5	40.6	50.7	45.2
06:45:00 AM	44.9	42.0	48.6	39.1	53.7	41.9	63.4	49.9	50.0	43.1
07:00:00 AM	58.3	43.3	51.6	43.5	56.9	42.9	62.9	42.3	47.9	42.8
07:15:00 AM	51.1	43.3	44.8	41.8	56.7	42.0	56.1	42.6	48.8	41.1
07:30:00 AM	56.4	41.8	45.6	39.2	54.1	41.5	60.1	46.1	49.1	39.0
07:45:00 AM	48.1	43.7	43.3	37.3	52.5	43.5	63.2	46.7	52.7	46.0
8:00:00 AM	46.1	41.8	42.8	36.7	54.4	45.9	54.1	42.4	53.0	46.5
08:15:00 AM	48.4	40.6	42.8	37.4	47.0	44.5	46.8	42.4	53.2	47.4
08:30:00 AM	47.1	41.7	41.0	36.6	47.1	40.7	47.2	41.8	57.3	51.1
08:45:00 AM	47.9	41.9	41.6	36.4	43.4	39.8	44.4	39.4	53.9	45.8
09:00:00 AM	45.2	41.5	42.9	35.3	52.8	39.8	55.1	39.8	52.7	47.3
09:15:00 AM	56.3	43.4	45.7	35.7	49.8	42.8	45.7	39.5	54.0	47.8
09:30:00 AM	45.3	42.7	47.1	35.0	46.5	40.4	43.0	39.3	56.4	49.7
09:45:00 AM	53.6	43.7	43.1	35.0	47.2	39.6	42.6	39.2	53.5	47.5
10:00:00 AM	59.8	48.9	42.0	35.5	42.1	37.6	44.7	38.1	56.9	51.5
10:15:00 AM	50.5	42.3	41.0	35.4	40.9	37.4	44.4	37.0	57.5	52.1
10:30:00 AM	47.5	43.0	43.3	36.9	40.9	36.5	40.7	37.3	52.7	49.2
10:45:00 AM	48.2	43.6	45.7	37.4	44.7	37.8	40.6	36.5	52.6	46.5
11:00:00 AM	54.0	43.7	46.4	36.3	41.6	36.3	42.0	37.0	44.7	42.3
11:15:00 AM	46.4	42.1	40.6	35.5	45.1	36.2	41.9	36.7	45.5	41.7
11:30:00 AM	53.8	45.1	39.5	34.8	41.2	34.5	44.0	38.5	46.9	43.5
11:45:00 AM	58.5	45.7	45.6	34.7	41.5	34.4	44.9	38.9	46.7	42.9

	11th		12th		8th		9th		10th	
Start time	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90
12:00:00 PM	57.7	42.9	40.9	34.4	47.2	34.9	43.1	37.4	46.7	43.3
12:15:00 PM	56.0	44.1	44.9	35.3	43.0	34.7	45.9	37.7	50.6	42.9
12:30:00 PM	50.5	43.2	42.0	34.6	38.3	33.4	44.7	40.4	47.7	42.4
12:45:00 PM	43.6	38.5	39.9	34.0	39.0	33.7	44.9	37.5	54.0	41.9
01:00:00 PM	50.9	40.6	40.3	34.3	39.3	33.3	43.7	40.3	44.5	41.1
01:15:00 PM	46.2	41.5	46.0	36.6	43.7	35.9	45.5	39.5	44.8	42.2
01:30:00 PM	56.8	44.6	39.7	34.7	40.8	35.0	43.6	38.9	45.1	42.1
01:45:00 PM	55.5	52.0	43.1	34.1	44.8	35.4	45.1	40.2	45.4	42.2
02:00:00 PM	53.3	45.1	44.4	36.1	39.5	34.1	46.3	41.2	45.3	42.0
02:15:00 PM	56.4	42.3	41.5	37.4	40.9	33.6	45.8	39.8	46.2	41.7
02:30:00 PM	55.5	45.6	44.8	39.5	40.7	32.6	42.8	37.7	48.7	45.4
02:45:00 PM	46.8	44.2	42.6	39.6	37.7	31.4	47.9	39.1	47.1	44.5
03:00:00 PM	49.3	46.7	42.9	39.2	39.1	33.9	52.8	42.8	51.2	45.0
03:15:00 PM	51.2	46.9	43.2	38.3	41.7	35.2	45.2	37.3	63.2	45.5
03:30:00 PM	50.3	46.9	42.6	35.7	39.1	34.9	56.4	37.5	46.0	42.0
03:45:00 PM	52.0	45.2	43.2	36.2	41.2	35.9	59.9	44.4	51.6	46.4
04:00:00 PM	50.7	43.9	44.0	36.4	49.7	37.4	51.2	41.4	61.8	47.4
04:15:00 PM	54.3	48.7	45.3	37.9	51.3	38.9	48.8	40.7	55.1	46.3
04:30:00 PM	48.5	45.2	47.5	41.3	59.4	44.2	47.1	40.8	52.2	49.7
04:45:00 PM	51.5	47.9	50.1	43.6	61.5	52.4	49.1	45.3	52.2	49.9
05:00:00 PM	49.2	45.4	46.2	41.3	60.0	50.9	47.9	44.7	52.3	50.6
05:15:00 PM	49.5	40.8	45.1	40.5	46.0	41.3	44.6	38.2	56.0	48.6
05:30:00 PM	46.8	39.6	59.8	47.7	41.6	38.2	43.6	38.9	54.4	44.8
05:45:00 PM	42.0	40.3	50.5	42.1	41.4	38.3	45.4	38.8	53.7	47.3
06:00:00 PM	41.6	39.5	48.3	40.3	50.3	37.5	38.7	34.7	50.9	47.5
06:15:00 PM	41.3	39.3	42.6	36.4	41.6	36.8	39.4	36.7	52.4	47.9
06:30:00 PM	44.2	39.1	47.4	39.2	44.2	36.5	40.7	37.7	50.5	45.5
06:45:00 PM	47.0	41.0	51.0	45.3	42.3	35.7	43.4	37.2	47.3	43.2
07:00:00 PM	42.9	39.1	52.5	45.6	46.3	33.3	38.6	34.8	48.0	43.3
07:15:00 PM	49.2	38.3	54.5	50.7	48.9	35.1	38.6	32.8	45.6	41.7
07:30:00 PM	51.1	40.5	57.6	49.3	38.4	31.7	40.9	35.8	46.2	40.9
07:45:00 PM	39.7	38.1	49.6	42.7	36.6	33.4	38.5	36.7	44.1	40.1
08:00:00 PM	41.3	37.1	53.6	48.9	39.5	35.4	38.2	36.1	46.4	42.7
08:15:00 PM	41.6	37.5	51.8	48.4	44.1	34.9	39.1	36.6	45.2	41.7
08:30:00 PM	44.8	40.5	49.2	45.0	38.1	35.2	38.2	36.4	44.8	39.9
08:45:00 PM	43.5	40.0	47.0	44.6	37.6	35.9	46.7	36.9	42.8	38.4
09:00:00 PM	41.6	38.9	46.5	43.0	37.3	35.1	38.7	34.8	41.7	36.9
09:15:00 PM	40.0	38.0	45.1	39.9	36.3	33.9	38.8	35.9	40.2	37.5
09:30:00 PM	39.4	37.9	43.9	40.4	37.7	35.6	42.4	37.4	39.4	34.9
09:45:00 PM	39.2	37.4	45.1	38.1	37.3	35.2	38.2	35.0	41.2	37.8
10:00:00 PM	38.3	35.7	45.7	40.5	39.7	37.2	37.4	33.9	43.7	33.1
10:15:00 PM	35.8	33.7	43.9	40.2	38.1	34.7	36.4	32.9	41.3	34.0
10:30:00 PM	35.6	33.2	54.4	48.0	36.8	35.1	35.1	32.2	38.3	36.2
10:45:00 PM	36.7	35.0	51.5	46.5	37.1	35.9	37.3	34.0	36.7	33.8
11:00:00 PM	40.1	36.7	54.4	48.1	37.1	35.6	34.6	31.6	35.6	33.8
11:15:00 PM	36.5	35.3	51.9	43.1	37.2	35.0	32.0	29.3	40.7	31.7
11:30:00 PM	37.1	36.1	48.5	41.3	35.0	33.5	42.0	32.6	37.7	32.2
11:45:00 PM	36.3	34.9	48.1	42.6	35.9	34.1	39.8	35.2	36.9	33.0

	13th		14th		15th		16th	
Start time	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90
12:00:00 AM	50.7	36.7	52.8	46.2	32.5	29.9	41.4	39.5
12:15:00 AM	42.3	32.7	52.1	46.3	32.1	29.3	42.0	40.5
12:30:00 AM	40.4	31.8	52.1	46.6	30.7	29.1	40.6	39.3
12:45:00 AM	42.0	32.5	52.2	45.5	34.0	29.9	42.1	38.1
01:00:00 AM	42.3	36.5	52.7	45.8	33.8	29.5	42.4	40.4
01:15:00 AM	44.0	32.4	54.6	48.3	38.4	30.6	43.3	41.9
01:30:00 AM	49.9	46.5	52.2	46.1	32.9	31.0	40.6	38.0
01:45:00 AM	53.9	47.8	53.1	47.6	34.4	32.0	39.1	36.2
02:00:00 AM	51.4	44.4	52.0	46.5	36.3	34.8	37.5	36.2
02:15:00 AM	47.9	37.8	54.0	47.5	38.0	36.8	37.7	35.7
02:30:00 AM	39.8	34.3	49.5	42.2	36.9	34.1	38.6	37.1
02:45:00 AM	44.3	38.4	51.3	45.9	35.3	33.4	39.9	37.8
03:00:00 AM	61.4	43.3	50.2	43.9	35.2	34.2	39.2	37.0
03:15:00 AM	57.8	45.7	51.0	45.2	36.0	34.9	41.2	39.7
03:30:00 AM	55.7	49.4	49.7	44.6	40.2	35.8	41.6	40.1
03:45:00 AM	49.8	43.4	50.2	44.1	37.9	36.0	39.9	37.4
04:00:00 AM	47.4	42.3	49.8	41.1	39.7	38.3	37.1	35.5
04:15:00 AM	44.5	39.8	49.4	41.8	40.4	39.0	37.4	35.7
04:30:00 AM	43.8	38.7	49.6	44.3	40.9	39.2	38.1	36.6
04:45:00 AM	44.4	36.8	49.6	43.3	40.1	38.2	39.4	36.8
05:00:00 AM	41.9	37.9	50.3	42.9	39.8	38.6	39.2	37.8
05:15:00 AM	60.0	43.6	52.0	45.8	41.1	39.5	39.5	37.8
05:30:00 AM	42.9	38.7	47.2	41.1	41.8	40.2	40.7	38.1
05:45:00 AM	44.1	37.5	51.3	45.2	41.4	40.0	40.8	39.0
06:00:00 AM	49.0	43.9	51.6	45.6	52.5	39.9	53.7	38.7
06:15:00 AM	55.0	45.9	50.6	45.1	51.5	41.5	46.7	40.3
06:30:00 AM	53.3	47.8	53.4	46.4	45.9	41.6	45.1	40.1
06:45:00 AM	49.5	44.6	48.9	42.7	51.7	41.9	50.5	39.5
07:00:00 AM	50.9	45.7	55.5	41.3	56.2	42.2	43.0	39.6
07:15:00 AM	52.1	45.4	50.0	44.3	59.9	41.6	44.5	39.9
07:30:00 AM	52.1	46.6	47.8	41.3	50.6	41.3	49.2	40.0
07:45:00 AM	53.9	48.3	49.7	43.9	45.4	41.7	51.2	39.7
8:00:00 AM	53.7	48.2	50.0	44.7	46.7	41.6	54.9	40.3
08:15:00 AM	52.1	47.5	50.8	41.8	45.5	40.7	51.0	40.5
08:30:00 AM	52.9	48.4	52.6	44.7	46.5	39.6	48.4	39.8
08:45:00 AM	53.8	48.3	49.6	43.9	43.8	39.8	43.9	38.9
09:00:00 AM	52.9	48.0	50.3	44.4	43.2	39.6	44.0	38.7
09:15:00 AM	49.8	44.7	50.6	44.2	47.3	39.3	43.9	38.2
09:30:00 AM	50.9	44.9	53.4	47.1	43.4	39.4	45.2	38.1
09:45:00 AM	58.3	45.9	49.4	44.7	43.6	40.4	47.3	37.5
10:00:00 AM	58.4	45.0	50.4	42.8	46.3	40.9	54.4	39.4
10:15:00 AM	50.5	43.9	54.5	45.5	43.2	39.8		
10:30:00 AM	52.1	46.3	55.5	48.5	42.9	37.2		
10:45:00 AM	50.9	45.6	50.5	43.4	51.2	36.7		
11:00:00 AM	53.4	45.9	48.0	41.4	45.2	35.4		
11:15:00 AM	51.7	45.3	48.8	41.7	46.3	35.0		
11:30:00 AM	54.2	47.8	53.5	43.6	40.8	35.1		
11:45:00 AM	54.6	47.1	44.1	40.6	41.7	34.8		

	13th		14th		15th		16th	
Start time	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90	LAeq	LAF90
12:00:00 PM	54.4	48.2	48.6	43.3	42.6	35.3		
12:15:00 PM	55.8	47.3	47.6	41.6	46.7	34.6		
12:30:00 PM	53.7	44.4	46.1	41.9	40.0	33.9		
12:45:00 PM	54.1	47.3	52.0	42.4	40.3	34.7		
01:00:00 PM	51.6	45.3	46.4	40.4	40.3	34.6		
01:15:00 PM	53.8	47.2	48.2	43.3	50.0	35.5		
01:30:00 PM	54.9	50.1	66.9	41.6	44.6	37.0		
01:45:00 PM	53.2	47.3	58.7	43.6	40.8	34.2		
02:00:00 PM	52.8	47.9	47.2	42.8	39.4	33.1		
02:15:00 PM	54.3	48.5	47.9	41.8	45.3	32.9		
02:30:00 PM	54.5	48.7	45.9	41.4	40.7	35.3		
02:45:00 PM	54.7	49.1	46.8	41.2	39.8	34.9		
03:00:00 PM	57.7	49.9	46.9	41.9	41.9	35.4		
03:15:00 PM	56.3	51.2	47.6	42.3	46.1	35.1		
03:30:00 PM	51.1	46.6	47.9	43.3	42.9	35.0		
03:45:00 PM	51.8	47.5	48.1	42.2	40.3	34.2		
04:00:00 PM	53.0	47.7	48.8	41.1	44.3	36.3		
04:15:00 PM	54.1	48.4	46.9	41.7	46.9	38.1		
04:30:00 PM	52.7	47.1	47.9	43.1	46.3	40.0		
04:45:00 PM	53.7	47.1	48.2	44.2	48.5	42.1		
05:00:00 PM	53.5	48.4	48.0	45.1	48.0	45.0		
05:15:00 PM	53.1	47.5	46.3	42.7	44.4	41.2		
05:30:00 PM	53.4	47.7	43.5	39.3	43.6	39.6		
05:45:00 PM	53.3	46.5	47.8	38.9	42.2	38.5		
06:00:00 PM	53.6	47.4	44.1	39.2	47.5	38.0		
06:15:00 PM	53.8	48.6	43.2	38.6	47.9	41.1		
06:30:00 PM	61.9	45.9	43.2	39.0	53.1	42.9		
06:45:00 PM	50.1	42.8	42.5	38.3	49.8	42.5		
07:00:00 PM	50.6	43.2	43.8	39.2	47.8	39.9		
07:15:00 PM	52.4	47.0	40.8	37.4	50.0	39.2		
07:30:00 PM	50.8	45.6	39.9	35.2	45.0	40.7		
07:45:00 PM	53.2	45.5	37.4	34.9	41.6	39.4		
08:00:00 PM	51.8	46.1	38.7	35.1	40.1	38.6		
08:15:00 PM	49.7	43.7	39.4	35.6	40.0	38.6		
08:30:00 PM	51.2	43.6	37.1	33.7	40.8	39.1		
08:45:00 PM	51.7	46.4	42.6	34.0	39.7	37.8		
09:00:00 PM	47.6	42.8	50.6	34.1	38.6	36.2		
09:15:00 PM	51.1	44.3	35.6	32.8	37.0	33.9		
09:30:00 PM	50.4	43.3	35.0	32.3	36.1	33.5		
09:45:00 PM	50.2	43.1	35.9	32.7	37.5	35.8		
10:00:00 PM	51.2	45.7	35.2	31.3	39.6	36.2		
10:15:00 PM	51.6	45.4	32.6	30.9	38.5	35.1		
10:30:00 PM	50.2	45.8	35.8	32.7	39.8	38.0		
10:45:00 PM	50.4	45.5	35.3	32.5	40.4	38.6		
11:00:00 PM	51.4	46.3	34.6	30.5	41.2	39.5		
11:15:00 PM	51.4	46.4	32.7	30.3	41.7	38.9		
11:30:00 PM	51.4	45.6	34.5	29.8	40.3	38.8		
11:45:00 PM	50.3	43.3	34.4	29.1	38.9	37.3		

C Noise Monitoring Locations

Appendix A

Noise Monitoring Locations

Disclaimer: This report has been generated by various sources and is provided for information purposes only. Spatial Services does not warrant or represent that the information is free from errors or omission, or th Services gives no warranty in relation to the information, especially material supplied by third parties. Spatial Services accepts no liability for loss, damage, or costs that you may incur relating to any use or reliance upon the information in this report.

D Building and Air Conditioning Quotes

Jim Barnes Building

ABN 42 253 232 155
Lic. No. 268508C

22 Livotto Drive, Richmond Hill NSW 2480
Ph: (02) 66244288 – Mob: 0415308456 – Fax: (02) 66247428

9th February 2018

Tim Fitzroy and Associates
61 Pine Avenue
Ballina NSW 2478

Re: Ballina Rugby Club
I am pleased to submit this quotation for work to be carried out at Ballina Rugby Club, Kalinga Street, West Ballina. The quote includes the following:

- Remove six existing aluminium framed glass windows from the eastern side (main entrance) of the rugby club.

- Replace the windows in existing openings, 1800W x 1500H with one of the following two options

Option 1

- Supply and install clear anodised 131 Series Sliding Windows XO with 6.38mm clear laminate glass including subhead, subsill and angle.

Option 2

- Supply and install clear anodised 246 doors, 3 Track Res Inside Slider with 6.38 clear laminate glass including subhead, subsill and angle.

- The doors/windows will have fixed glass on one side and sliding on the opposite side. They will have key locks and be keyed alike.

- Supply and install weather seal to bottom of timber doors and felt strip around door jambs to reduce noise.

- All rubbish will be removed from site.

TOTAL PRICE (inc GST) = $14,400.00

NOTE: Both options are acceptable but option 2 is commercial standard and in my opinion the better option.
The 6.38 laminate glass will give you a RW rating of 30 and acoustic glass has a RW rating of 32. Acoustic glass is an extra $1200.00

If you have any questions please call me on 0415308456
Quotation is valid for 90 days.

Regards
Jim Barnes

Subject: FW: Ballina Rugby Club - Air Conditioning
From: "Graham Steel" <gbsteel@bigpond.net.au>
Date: 25/01/2018 11:09 AM
To: <tim@timfitzroy.com.au>

From: jack@aircompliance.com.au [mailto:jack@aircompliance.com.au]
Sent: Wednesday, 27 September 2017 7:57 AM
To: gbsteel@bigpond.net.au
Subject: Ballina Rugby Club - Air Conditioning

Graham, Re: Ballina Rugby Club – Trading Area Air Conditioning
As discussed on-site, I suggest the following options for cooling of Bar Trading & Adjoining Area.
i) 1 x 24.0kW Ducted Split System to the Main Bar Area + 1 x 10.0kW High Wall Console Split System to the rear Adjoining Area
The internal Fan Coil Unit would be installed in the southern end ceiling space above the female toilets and coupled to an exposed metal spiral duct generally as shown on the attached layout sketch.
The internal FCU would be coupled by insulated refrigeration piping run through the ceiling space to the Outdoor Condensing Unit.
As the ceiling design makes running the exposed ducting to the Rear Adjoining Area not practical, I suggest installing a High Wall Split System to provide conditions to this area.
Estimated Cost $50 – 55,000.00

ii) 4 x 10.0kW High Wall Console Inverter Split Systems
As discussed, the indoor Consoles would be located generally as shown on our attached layout sketch and coupled by insulated refrigeration piping to the outdoor Condensing Units located high on galvanised steel wall brackets – the piping would pass out through penetrations cored in the wall & run enclosed in pvc trunking along the outside wall to the Condensing Units.
The condensate drains would run down the inside wall from the indoor Console and pass out through a cored penetration, then under the pavers to the adjacent stormwater drainage.
Estimated Cost $22 - 25,000.00 (Commercial Grade Equipment) $17 - 20,000.00 (Residential Grade Equipment) * Recommend option.

I have included estimates for Electrical Wiring (Three Phase & Single Phase) from the switchboard, Security Cages, Concrete Coring & installing the condensate drainage under the pavers for option (ii).
I have not included estimates for Upgrade of the Switchboard or Provision of Three Phase Power, Roof Truss alterations to accommodate the Ducted System internal FCU if required, any issues in cutting in the return air for the ducted system through the block wall above the entry to the toilets from the Bar Area & Painting.
Hoping this is of assistance to you.

Kind Regards

Jack

JACK STAC
AIRCOMPLIANCE AIRCONDITIONING PTY LTD
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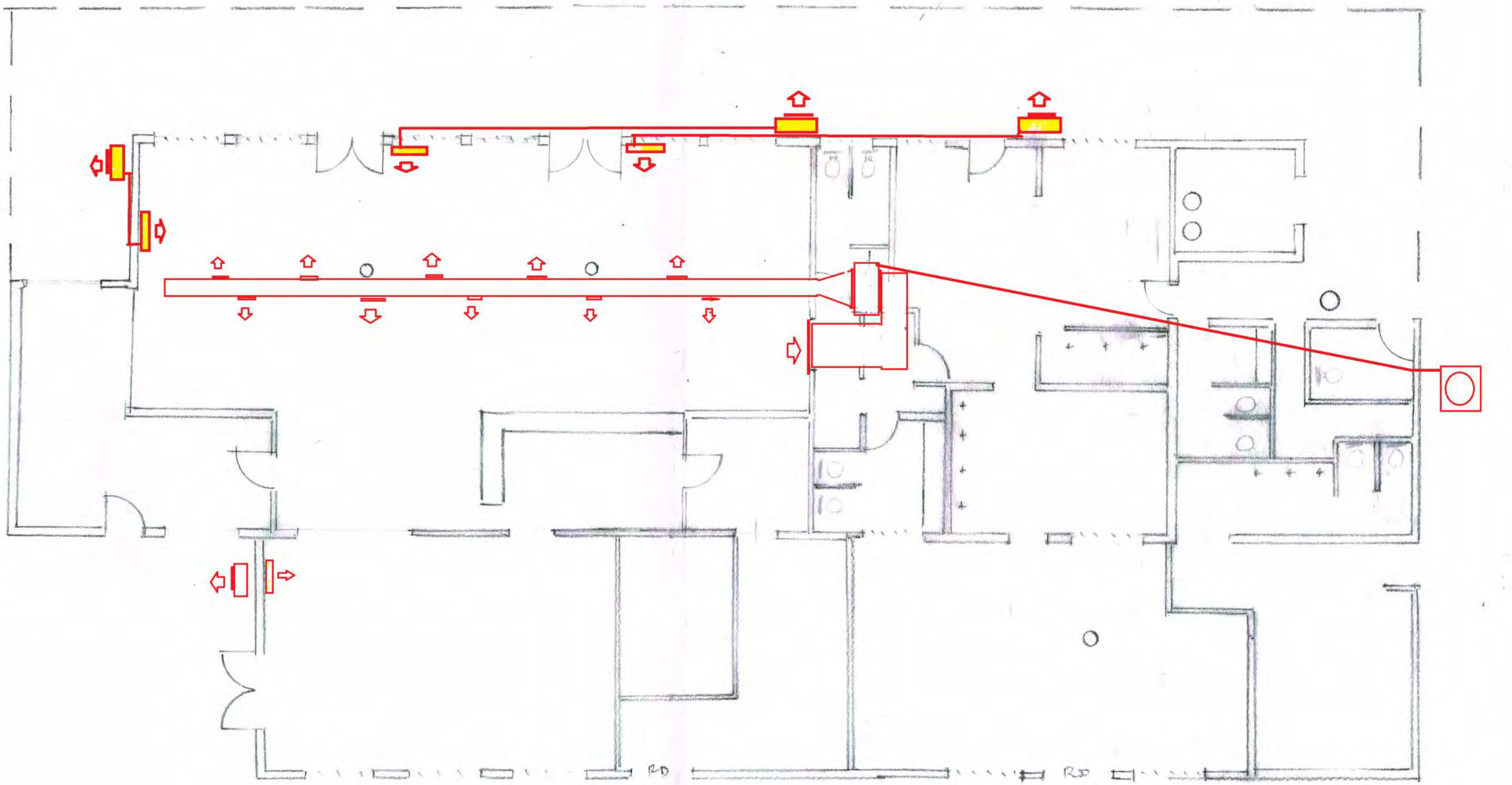
F: 02 6686 9733
E: jack@aircompliance.com.au



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