Environmental Noise Assessment Report

Byron Community Hub

At 10-12 Shirley Street, Byron Bay

On behalf of Byron Shire Council

21GCA0014 R01_2

About TTM

For 30 years, we've been at the centre of the Australian development and infrastructure industry. Our unique combination of acoustics, data, traffic and waste services is fundamental to the success of any architectural or development project.

We have over 50 staff, with an unrivalled depth of experience. Our industry knowledge, technical expertise and commercial insight allow us to deliver an exceptional and reliable service.

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Revision Record

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3.				

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Executive Summary

TTM conducted an environmental noise assessment of the proposed Byron Community Hub located at 10-12 Shirley Street, Byron Bay.

Noise monitoring was undertaken to establish the existing ambient noise levels and the applicable noise criteria. In accordance with the *NSW Noise Policy for Industry*, the potential noise generated by the development was assessed at the nearest noise sensitive receivers. Acoustic barriers were recommended along the western boundary to reduce noise levels from the car park and loading dock.

Road traffic noise from Shirley Street was assessed at the development and recommendations for acoustic building treatment were made where required.

The development is predicted to comply with the applicable noise criteria with the inclusion of the recommendations as outlined in Section 8 of this report.

Suite 701 Seabank Building, 12-14 Marine Parade, Southport Qld 4215

Contents

Table Index

Figure Index

1. Introduction

1.1. Background

TTM was engaged by Byron Shire Council to undertake an environmental noise assessment of the proposed Byron Community Hub located at 10-12 Shirley Street, Byron Bay. The site is a redevelopment of the Old Byron Hospital. The report will form part of the development application for consideration by Byron Shire Council.

The assessment is based on the following:

- *NSW Noise Policy for Industry*[1] (NPI).
- Development information provided by the client and BKA Architecture.
- Development plans by BKA Architecture dated 01/06/2021, shown in Appendix A.
- Site inspection, noise measurements, analysis and calculations conducted by TTM.

1.2. Scope

The assessment includes the following:

- Description of the development site and proposal.
- Measurement of existing ambient and road traffic noise levels and statement of assessment criteria relating to environmental noise emissions.
- Prediction of noise generated by the development onto the nearest sensitive receivers.
- Prediction of road traffic noise levels onto noise sensitive components of the development.
- Analysis of predicted noise levels.
- Details of noise control recommendations to be incorporated to achieve predicted compliance.

[1] NSW Environment Protection Authority (2017), Noise Policy for Industry (NPI)

2. Site Description

2.1. Site Location

The site is described by the following:

- Lot 1 DP847910
- 10-12 Shirley Street, Byron Bay

The site locality is shown in Figure 1 below.

Figure 1: Site Locality

2.2. Site Surrounds and Acoustic Environment

The site is bound by Shirley Street to the north, Wordsworth Street to the east, Byron Street to the south and privately owned property to the west. The current acoustic environment is primarily comprised of road traffic noise to the north and natural sounds further south of the site.

3. The Proposed Development

3.1. Development Description

The proposal is for redevelopment of the old Byron Hospital at 10-12 Shirley Street, Byron Bay. The proposed development plan is shown in Figure 2 below.

Tertiary education is proposed in Tenancy 1 which will hold up to 155 students and 20 staff on-site at one time. The remainder of tenancies are expected to be used for office purposes. A café is located on the eastern side of the building.

The loading dock will remain in a similar location to the old hospital being located in the north-west part of the site. Onsite parking with 5 spaces is proposed along the western site boundary. The remainder of car parking will occur on the street which will not form part of this assessment.

The hours of operation for the development are summarised below.

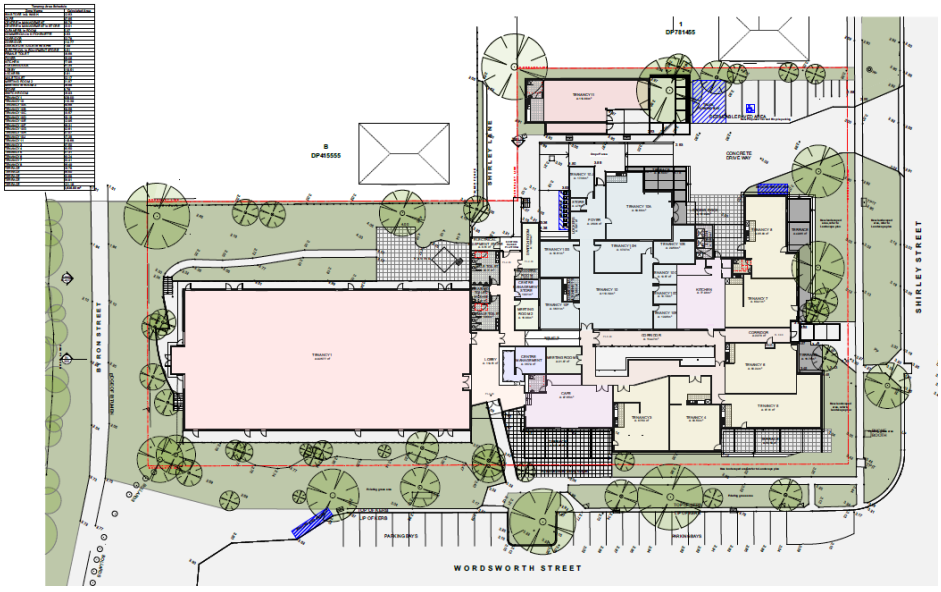
Hours of Operation – Community Hub & Cafe

- Monday to Friday: 8am – 6pm
- Saturday: 8am – 12 noon
- Sunday & Public Holidays: Closed

Hours of Operation – Tenancy 1, Tertiary Education

- Monday to Friday: 8am – 9pm
- Saturday: Closed
- Sunday & Public Holidays: Closed

Figure 2: Proposed Development Plan



4. Measurements

4.1. Equipment

The following equipment was used to measure existing noise levels:

- ARL EL316 environmental noise monitor (SN# 16-707-039).
- Norsonic Nor140 sound level meter (SN# 1406506)
- SVAN SV31 acoustical calibrator (SN# 38174).

All equipment was calibrated by a National Association of Testing Authorities (NATA) accredited laboratory. The equipment was field calibrated before and after the measurement session. No significant drift from the reference signal was recorded.

4.2. Unattended Noise Monitoring

Unattended noise monitoring was undertaken to measure existing ambient and road traffic noise levels between Monday 15th March and Tuesday 30th March 2021. The noise monitoring location is shown in Figure 3. The noise monitor was placed on the site in a position considered representative of the ambient noise environment experienced at the nearest sensitive receivers, with consideration to property access and equipment security.

Figure 3: Noise Monitoring Location

The noise monitor was set to measure statistical noise levels in 'A' weighting, 'Fast' response, over 15 minute intervals. The microphone was in a free-field position approximately 1.5m above ground. Noise levels were measured in accordance with Australian Standard *AS1055*[2].

Weather during the monitoring period was varied with periods of rain on the 15th, 17th, 18th, and 20th-23rd March 2021. Rain affected data was excluded from the analysis. The temperature range during the noise monitoring period was between 12 - 25°C (source: Bureau of Meteorology, Cape Byron).

4.3. Noise Source Measurements

Noise levels associated with typical on-site activities were taken from similar investigations conducted by TTM. All measurements were conducted generally in accordance with Australian Standard AS1055.

4.4. Results of Measurements

4.4.1. Ambient Noise Levels

Table 1 presents the measured ambient noise levels determined in accordance with the procedures of the *Noise Policy for Industry*. The measurement results were used to determine the assessment criteria for the development. Graphical presentation of the unattended noise monitoring is shown in Appendix B.

Table 1: Measured Ambient Noise Levels

Time Period	Rating Background Level (RBL), L_{90} dB(A)	Existing Noise Levels, L_{eq} dB(A)
Daytime (7am – 6pm)	50	59
Evening (6pm – 10pm)	42	59
Night time (10pm – 7am)	35	51

The measured RBL's are typical of a sub-urban environment with higher daytime levels due to traffic flows and evening ambient noise levels defined by the natural environment. The *Noise Policy for Industry* recognises that excursions of noise above the criteria during the daytime would not usually have the same impact as they would during the evening or night.

[2] AS 1055:2018 Acoustics - Description and measurement of environmental noise

4.4.2. Road Traffic Noise Levels

Table 2 presents the measured road traffic noise levels from Shirley Street.

Table 2: Measured Road Traffic Noise Levels

Day and Date	Road Traffic Noise Descriptor	Time Period	Measured Level, dB(A)
Average of weekday measurement days, 16th, 19th, 24th-26th, and 29th March 2021	$L_{A10,18\ hour}$	6am to midnight	59
	$L_{A10,1\ hour\ (maximum\ during\ opening\ hours)}$	7am to 8am	63
	$L_{Aeq,1\ hour\ (maximum\ during\ opening\ hours)}$	3pm to 4pm	62

Graphical presentation of the measured levels is shown in Appendix B.

5. Noise Criteria

5.1. NSW Noise Policy for Industry (NPI)

The NSW Noise Policy for Industry (2017) sets out the procedure to determine the Project Noise Trigger Levels (PNTLs) relevant to assess operational noise from industrial developments. The PNTL applies to existing NSRs.

The policy sets out the procedure to determine the project noise trigger levels relevant to assess noise from developments. The project noise trigger level applies to existing noise-sensitive receivers.

The project noise trigger level provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response; for example, further investigation of mitigation measures.

The project noise trigger level is the lower (that is, the more stringent) value of the project intrusiveness noise level and project amenity noise level.

5.1.1. Project Intrusiveness Noise Level

The Noise Policy for Industry states:

> *The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.*

The intrusiveness noise level is determined as follows:

$$L_{Aeq,15min} \leq \text{Rating Background Noise Level} + 5\ dB$$

5.1.2. Amenity Noise Levels and Project Amenity Noise Level

To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 of the *Noise Policy for Industry* where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance. The noise amenity area for the noise sensitive land uses in the area are given in Table 3.

Table 3: Amenity Noise Levels (Suburban)

Receiver/ Noise amenity area	Assessment period	Recommended amenity noise level, L_{eq} dB(A)
Residential – Suburban	Day	55
	Evening	45
	Night	40

Note:
- Day-time period is from 0700 to 1800 (Monday to Saturday) and 0800 to 1800 (Sundays and Public Holidays)
- Evening period is from 1800 to 2200
- Night-time period is from 2200 to 0700 (Monday to Saturday) and 2200 to 0800h (Sundays and Public Holidays)

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

Project amenity noise level ($L_{Aeq,15min}$) for industrial developments = Recommended amenity noise level minus 5 dB(A) plus the '$L_{Aeq,\ period}$ + 3' decibel correction.

5.1.3. Project Noise Trigger Level

The project noise trigger level (PNTL) for noise sensitive receivers has been determined in Table 4. The PNTL is the most stringent of the intrusiveness and project amenity noise level.

Table 4: NSW Noise Policy for Industry – Evaluated criteria

Assessment period	Project Intrusiveness Noise Level, $L_{eq,15min}$ dB(A)	Project Amenity Noise Level, $L_{eq,15min}$ dB(A)	Project Noise Trigger Level, $L_{eq,15min}$ dB(A)
Daytime (7am – 6pm)	55	53	**53**
Evening (6pm – 10pm)	47	43	**43**
Night (10pm – 7am)	40	38	**38**

Note:
- Day-time period is from 0700 to 1800 (Monday to Saturday) and 0800 to 1800 (Sundays and Public Holidays)
- Evening period is from 1800 to 2200
- Night-time period is from 2200 to 0700 (Monday to Saturday) and 2200 to 0800h (Sundays and Public Holidays)

Table 4 shows that the Project Amenity Noise Level criterion is the most stringent level for residential receivers. By meeting the PNTLs at the identified noise sensitive areas, all other noise sensitive areas located further away from the development site are expected to comply with the criteria derived in this report.

5.1.4. Noise-Enhancing Weather Conditions

Noise sensitive receivers are located within 100m of the site. In accordance with the *Noise Policy for Industry,* the effect of meteorological/weather conditions does not need to be considered in this instance.

5.1.5. Maximum Noise Level Event Assessment

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered.

The NSW Noise Policy for Industry states that a detailed maximum noise level assessment should be undertaken where the subject developments night-time noise levels at a residential location exceed the following:

- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.

The night time RBL is 35dB and therefore the noise limit by this methodology is 35+15=50dB. Therefore, the limit of 52dB is greater and is applicable.

Further, the *NSW Road Noise Policy* states that from research on sleep disturbance to date it can be concluded that:

- maximum internal noise levels below 50–55 dB(A) are unlikely to awaken people from sleep;
- one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly.

5.2. Road Traffic Noise

No specific noise criteria is stated in the relevant NSW guidelines for road traffic noise onto an office development, being the *NSW Road Noise Policy* and *Development Near Rail Corridors and Busy Roads – Interim Guideline*. Therefore, it is good practice to achieve the indoor sound levels for office building described in Australian Standard AS2107[3].

The internal sound levels for relevant office spaces are outlined in Table 1 of AS2107 and are reproduced in Table 5 below.

Table 5: Recommended Internal Noise Levels for Office Spaces

Room Type	Recommended Internal Noise Level, L_{eq} dB(A)
Board and conference rooms	30 to 40
Call centres	40 to 45
Executive office	35 to 40
General office areas	40 to 45
Meeting room (small)	40 to 45
Open plan office	40 to 45

Based on the above, 40 dB(A) is considered as the target design level for all office spaces exposed to road traffic noise from Shirley Street.

[3] Australian Standard AS2107:2016 Acoustics – Recommended Design Noise Levels and Reverberation Times for Building Interiors

6. Assessment of Noise from the Development to Noise Sensitive Receivers

An assessment of on-site activities associated with the proposed development was conducted to determine the potential impacts at the nearest sensitive receivers.

6.1. Noise Sensitive Receivers

The nearest noise sensitive receivers are described below and are identified in Figure 4:

- Receiver 1: Residential accommodation to the north-west
- Receiver 2: Residential accommodation to the north
- Receiver 3: Byron Bay Police Station and Byron Aged Care to the east
- Receiver 4: Residential accommodation to the south-west.

Figure 4: Noise Sensitive Receivers

Receivers 1 to 4 are the nearest and most exposed noise sensitive locations in proximity to the proposed development. If compliance can be achieved at Receivers 1 to 4 then compliance is predicted at all other noise sensitive locations.

6.2. Noise Source Levels

Table 6 presents the noise sources with the potential to impact noise sensitive receivers. The noise source levels were calculated to one metre and include corrections for tonality and impulsiveness as per the NPI.

Table 6: Typical Transient Noise Source Levels

Noise Source Description	Noise Level at 1m, dB(A)		Measured Duration (sec)
	$L_{Aeq,T}$	L_{Amax}	
Car door closure	78*	86*	2
Car bypass @ 5km/h	69	75	6
Car engine ignition	72	74	3
Conversations	65	72	Long term avg.
Alfresco dining (café)[1]	78	89	Long term avg.
Truck passby	89	93	13
Unloading a delivery vehicle	80	88	60
Glass disposal	93*	105*	4

Refer to section below for description of modifying factors used.

* Includes 5 dB(A) adjustment to account for the impulsiveness characteristic of noise produced.

Includes 5 dB(A) adjustment to account for the tonal noise characteristic of noise produced.

[1] Source levels for a defined crowd size (30 patrons) were determined from technical paper named 'Prediction of Noise from Small to Medium Sized Crowds' (Hayne, Taylor, Rumble, Mee, 2011). Calculation of sound pressure level from sound power level is based on quarter sphere propagation (DI = 6dB) to account for reflections from ground and adjacent walls.

6.3. Assumptions for Expected Onsite Activity

Table 7 presents the assumptions used for noise calculations:

Table 7: Noise Activity Assumptions used for Noise Calculations

Noise Source Description	Noise Source Location	Daytime/Evening/Night Period
		Events per 15min or % of period
Car door closure	Site car parking area	10 events (2 door closures per car)
Car bypass @ 5km/h	Site car parking area	5 events (number of car parks turning over once in a 15-minute period)
Car engine ignition	Site car parking area	5 events
Conversations	Nearest tenancy outdoor terrace	80% of the time
Alfresco dining (café)	Café outdoor terrace	100% of the time
Truck passby	Loading dock	2 events (1 in: 1 out)
Unloading a delivery vehicle	Loading dock	1 event
Glass disposal	Inside waste room	2 events

6.4. Predicted Noise Levels

Predicted noise levels are based on the noise source levels presented in Table 6, calculation assumptions listed in Section 6.3 and Table 7, distance loss to each receiver, and screening from recommended acoustic barriers where applicable. Sample calculations without and with recommended acoustic barriers are provided in Appendix C.

6.4.1. Predicted L_{Aeq} Transient Noise Levels at Receivers

Table 8 presents the predicted $L_{Aeq\ (15\ minute)}$ noise levels at nearby receivers.

Table 8: Predicted $L_{Aeq\ (15\ minute)}$ Noise Levels at Sensitive Receivers

Receiver	Noise Source	Predicted External Noise Level at Receiver, L_{Aeq} dB(A) Free-field	Complies with Criteria (PNTL): (Yes/No)		
			Day 53 dB(A)	Evening 43 dB(A)	Night 38 dB(A)
1	Car door closure	37	✓	✓	✓
	Car bypass @ 5km/h	25	✓	✓	✓
	Car engine ignition	30	✓	✓	✓
	Conversations	30	✓	✓	✓
	Alfresco dining (café)	22	✓	✓	✓
	Truck passby	44	✓	× (+1)	× (+6)
	Unloading a delivery vehicle	33	✓	✓	✓
	Glass disposal	37	✓	✓	✓
2	Car door closure	30	✓	✓	✓
	Car bypass @ 5km/h	25	✓	✓	✓
	Car engine ignition	23	✓	✓	✓
	Conversations	33	✓	✓	✓
	Alfresco dining (café)	36	✓	✓	✓
	Truck passby	43	✓	✓	× (+5)
	Unloading a delivery vehicle	29	✓	✓	✓
	Glass disposal	33	✓	✓	✓
3	Car door closure	<10	✓	✓	✓
	Car bypass @ 5km/h	<10	✓	✓	✓
	Car engine ignition	<10	✓	✓	✓
	Conversations	32	✓	✓	✓
	Alfresco dining (café)	45	✓	× (+2)	× (+7)
	Truck passby	21	✓	✓	✓
	Unloading a delivery vehicle	16	✓	✓	✓
	Glass disposal	20	✓	✓	✓
4	Car door closure	27	✓	✓	✓
	Car bypass @ 5km/h	26	✓	✓	✓
	Car engine ignition	20	✓	✓	✓

Receiver	Noise Source	Predicted External Noise Level at Receiver, L_{Aeq} dB(A) Free-field	Complies with Criteria (PNTL): (Yes/No)		
			Day 53 dB(A)	Evening 43 dB(A)	Night 38 dB(A)
	Conversations	38	✓	✓	✓
	Alfresco dining (café)	25	✓	✓	✓
	Truck passby	38	✓	✓	✓
	Unloading a delivery vehicle	27	✓	✓	✓
	Glass disposal	31	✓	✓	✓

The summary of noise predictions is as follows:

- All noise sources are predicted to comply during daytime hours.
- Minor exceedances are predicted from alfresco dining and truck passby at Receivers 1 -3 during the evening and night period. The 2dB exceedance of alfresco dining during the evening period is considered reasonable as a 1-2dB change in noise level is not detectable by the human ear in an environmental setting. Recommendations will be made to limit the hours of alfresco dining and deliveries to suitable hours.

6.4.2. Predicted L_{Amax} Transient Noise Levels at Receivers

Table 9 presents the predicted L_{Amax} noise levels at nearby receivers.

Table 9: Predicted L_{Amax} Noise Levels at Sensitive Receivers

Receiver	Noise Source	Predicted External Noise Level at Receiver, L_{Amax} dB(A) Free-field	Complies with Criteria: 52dB (Yes/No)
1	Car door closure	62	×
	Car bypass @ 5km/h	46	✓
	Car engine ignition	50	✓
	Conversations	38	✓
	Alfresco dining (café)	34	✓
	Truck passby	58	×
	Unloading a delivery vehicle	58	×
	Glass disposal	69	×
2	Car door closure	54	×
	Car bypass @ 5km/h	45	✓
	Car engine ignition	42	✓
	Conversations	41	✓
	Alfresco dining (café)	48	✓
	Truck passby	59	×
	Unloading a delivery vehicle	52	✓
	Glass disposal	65	×
3	Car door closure	32	✓

Receiver	Noise Source	Predicted External Noise Level at Receiver, L_{Amax} dB(A) Free-field	Complies with Criteria: 52dB (Yes/No)
	Car bypass @ 5km/h	21	✓
	Car engine ignition	20	✓
	Conversations	40	✓
	Alfresco dining (café)	57	×
	Truck passby	41	✓
	Unloading a delivery vehicle	35	✓
	Glass disposal	53	×
4	Car door closure	52	✓
	Car bypass @ 5km/h	47	✓
	Car engine ignition	40	✓
	Conversations	46	✓
	Alfresco dining (café)	37	✓
	Truck passby	57	×
	Unloading a delivery vehicle	47	✓
	Glass disposal	64	×

Noise levels are predicted to exceed the L_{max} night criteria in some instances. Noise associated with deliveries and waste is generally predicted to exceed the L_{max} criteria and will therefore be recommended to occur during daytime hours to minimise annoyance. Alfresco dining is predicted to exceed the criteria at Receiver 3 and will be recommended to occur during day and evening hours. Car door closures from the north-western corner of the site are predicted to exceed the criteria at Receiver 1 and 2. Use of these car parks during the night period is expected to be low as generally, it is not expected that tenancies will be open during night time hours. An acoustic barrier along the western boundary is recommended to reduce noise levels as far as practical. Refer to the recommendations detailed in Section 8.

6.4.3. Preliminary Mechanical Plant Advice

A reverse calculation was conducted to determine the allowable noise source level of onsite mechanical equipment prior to the inclusion of acoustic treatment. This type of assessment was conducted as plant has not been selected during DA stage, and it provides guidance around the design of mechanical equipment.

Based on the established PNTL and distance attenuation from two of the worst-case locations, the allowable mechanical noise levels are presented in Table 10.

Table 10: Mechanical Plant Noise Limits for Compliance Without Acoustic Treatment

Plant location	Allowable noise level at 1m from the nearest plant to the receiver, to achieve compliance, L_{eq} dB(A)		
	Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
Western façade of Tenancy 11	72	62	57

Plant location	Allowable noise level at 1m from the nearest plant to the receiver, to achieve compliance, L_{eq} dB(A)		
	Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
Western façade of Tenancy 8 or 10A	77	67	62

Acoustic treatment or screening of the plant may allow a higher noise limit. Compliance with the noise limits and design criteria should be checked once plant selections for the development are finalised.

7. Road Traffic Noise Assessment

An assessment of road traffic noise from Shirley Street was conducted to determine the extent of acoustic treatments necessary for compliance with the assessment criteria.

7.1. Measured Noise Levels

Noise monitoring was conducted to determine the existing road traffic noise levels. The measured road traffic noise levels at the noise monitoring location are presented in Section 4.4.2.

7.2. Noise Model

7.2.1. Noise Modelling Parameters

Road traffic noise predictions were conducted using 'SoundPLAN v8.2', a CoRTN based modelling program. The basis of the 'SoundPLAN' model is as follows:

Table 11: Road Traffic Noise Modelling Parameters

Description	Value
Noise modelling standard	CoRTN
Angle increment	1^{O}
Road surface type	Impervious (+0dB(A))
Ground contours	Assumed to be flat
Shirley Street speed limit	50km/h
Noise source height above grade	0.5m
Receiver heights	1.8m above floor level
Façade correction	+2.5dB(A)

7.2.2. Noise Model Verification

To verify the road traffic noise model, the $L_{A10,\ 18\ Hour}$ noise level was modelled and compared to the measured levels presented in Table 2. As the noise monitor was in a free-field location, the predicted noise levels are also shown as free-field.

Table 12: Comparison between measured and modelled road traffic noise level

Logger Location	Measured $L_{A10,\ 18\ Hour}$	Predicted $L_{A10,\ 18\ Hour}$	Required Correction
31m from Shirley Street	58.5	59.6	0

As the modelled levels are within the allowable tolerance of 2dB(A) of the measured level, no correction is required to the model.

7.3. Predicted Road Traffic Noise Levels

Modelling was conducted to determine the road traffic noise levels at the development in the 10-year planning horizon to 2032. Noise modelling outputs are shown in Appendix D.

Table 13 presents the predicted road traffic noise levels at the locations identified in Figure 5 below.

Figure 5: Road Traffic Noise Modelling Locations

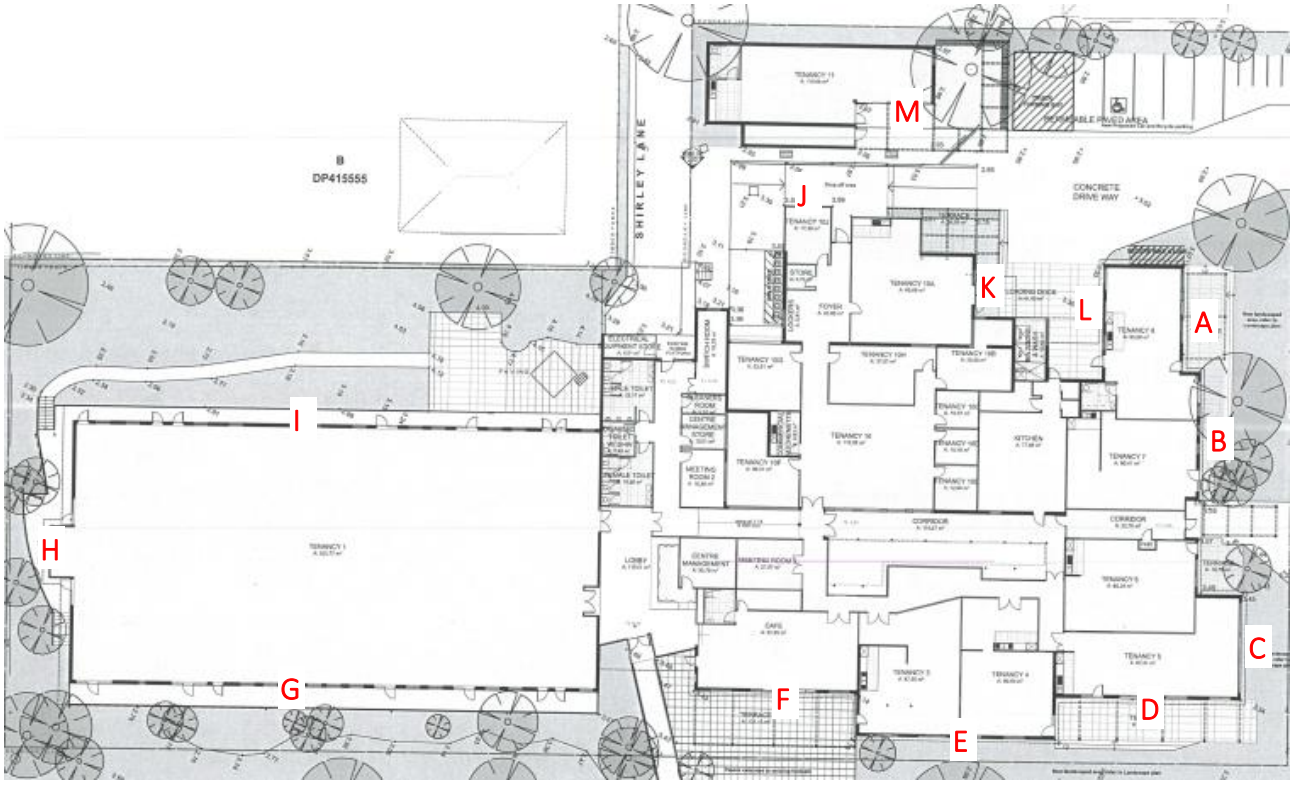


Table 13: Predicted Road Traffic Noise Levels at the Development

Prediction Location	Predicted Road Traffic Noise Level, dB(A) Façade Corrected	
	$L_{A10\ (18\ hour)}$	$L_{Aeq\ (1\ hour)}$
A	69	72
B	69	72
C	71	74
D	65	68
E	62	65
F	58	61
G	55	58
H	47	50
I	51	54

Prediction Location	Predicted Road Traffic Noise Level, dB(A) Façade Corrected	
	$L_{A10\ (18\ hour)}$	$L_{Aeq\ (1\ hour)}$
J	57	60
K	60	63
L	53	56
M	59	62

Calculations were conducted for noise affected facades in accordance with AS3671[4] to determine the minimum external building treatments required. Details of the recommended building treatments are outlined in Section 8.

[4] Australian Standard AS3671:1989 Acoustics – Road Traffic Noise Intrusion – Building Siting and Design

8. Recommendations

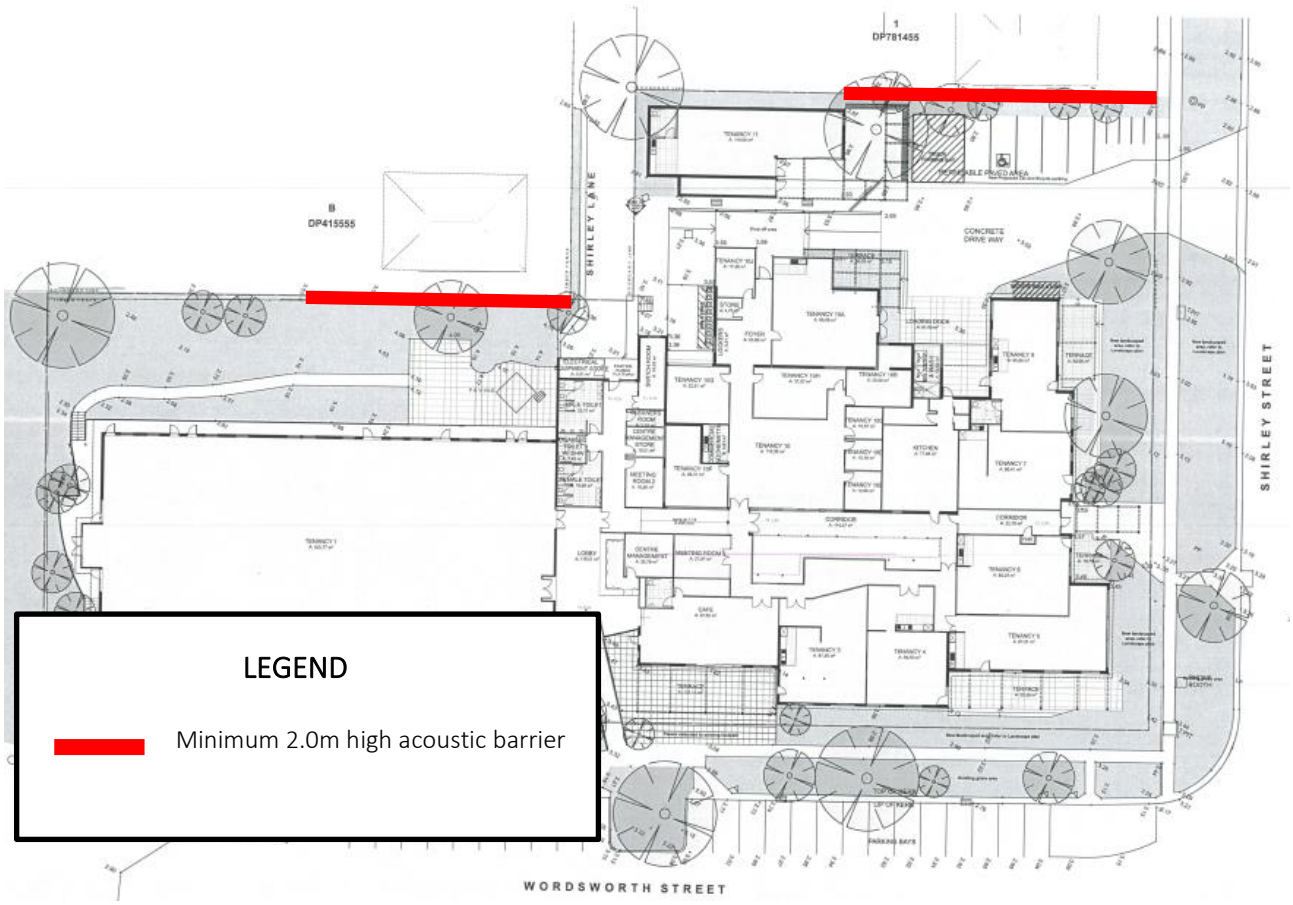
An assessment was conducted of noise generated from the site to the nearest noise sensitive receivers, and road traffic noise from Shirley Street onto the development. Compliance with the noise criteria outlined in Section 5 is predicted to be achieved based on the inclusion of the recommendations outlined below.

8.1. Onsite Noise

8.1.1. Acoustic Barrier

Acoustic barriers are required to reduce noise levels from the development to offsite noise sensitive receivers. The location and extent of the acoustic barriers is shown in Figure 6.

Figure 6: Recommended Acoustic Barriers



The acoustic barrier requirements are described below.

Barrier recommendations are as follows:

a. Acoustic barriers (shown by red colour) should be minimum 2.0m high relative to the finished level of the development site.

b. The barriers should be constructed of a material with a surface mass greater than 12.5kg/m^2;

c. Suitable materials may include masonry, glass, modular wall panels, plywood, fibre cement sheeting, or a combination of materials if desired;

d. No gaps or holes should be evident in the barrier construction for the extents shown.

8.1.2. Noise Management Controls

The following management strategies are recommended to be implemented to minimise noise annoyance:

- Alfresco dining at the café is to occur between the hours of 7am and 10pm.
- Deliveries and use of the loading dock is to occur between the hours of 7am and 6pm.
- Any grates or other protective covers in the entrance driveways must be rigidly fixed in position to eliminate movement and be maintained.

8.1.3. Mechanical Plant Noise

Because detailed plant selections are not available at this stage, it is not possible to carry out a detailed examination of the noise control measures that may be required to achieve the noise targets for mechanical plant.

A preliminary assessment of allowable plant noise limits to achieve compliance was conducted in Section 6.4.3.

Plant may need to be acoustically treated to achieve the criteria detailed in Section 5 to prevent noise emissions from adversely impacting the surrounding properties. This may include selecting the quietest plant possible, or treating the plant equipment with enclosures, barriers, duct lining and silencers, etc.

A mechanical plant noise assessment should be conducted by a suitably qualified acoustic consultant once plant selections are finalised. Noise criteria compliance measurements should then be conducted after the equipment is installed.

8.2. Road Traffic Noise

8.2.1. Building Treatments

Table 14 presents the recommended building treatments for compliance with the internal road traffic noise criteria. Tenancies not included in Table 14 are predicted to comply with standard building construction and do not require acoustic treatment.

Table 14: Recommended Building Treatments

Tenancy	Minimum Acoustic Rating (R_W) to be Achieved			
	Glazing	Entry Door	External Walls	Roof/Ceiling
3	24	27	45	40
4	27	27	45	40
5	34 (front) 32 (side)	27	45	40
6	32	27	45	40
7	32	n/a	45	40
8	34 (front) 24 (rear)	27 (front) 20 (rear)	45	40
10A	24	n/a	45	40
11	24	27	45	40

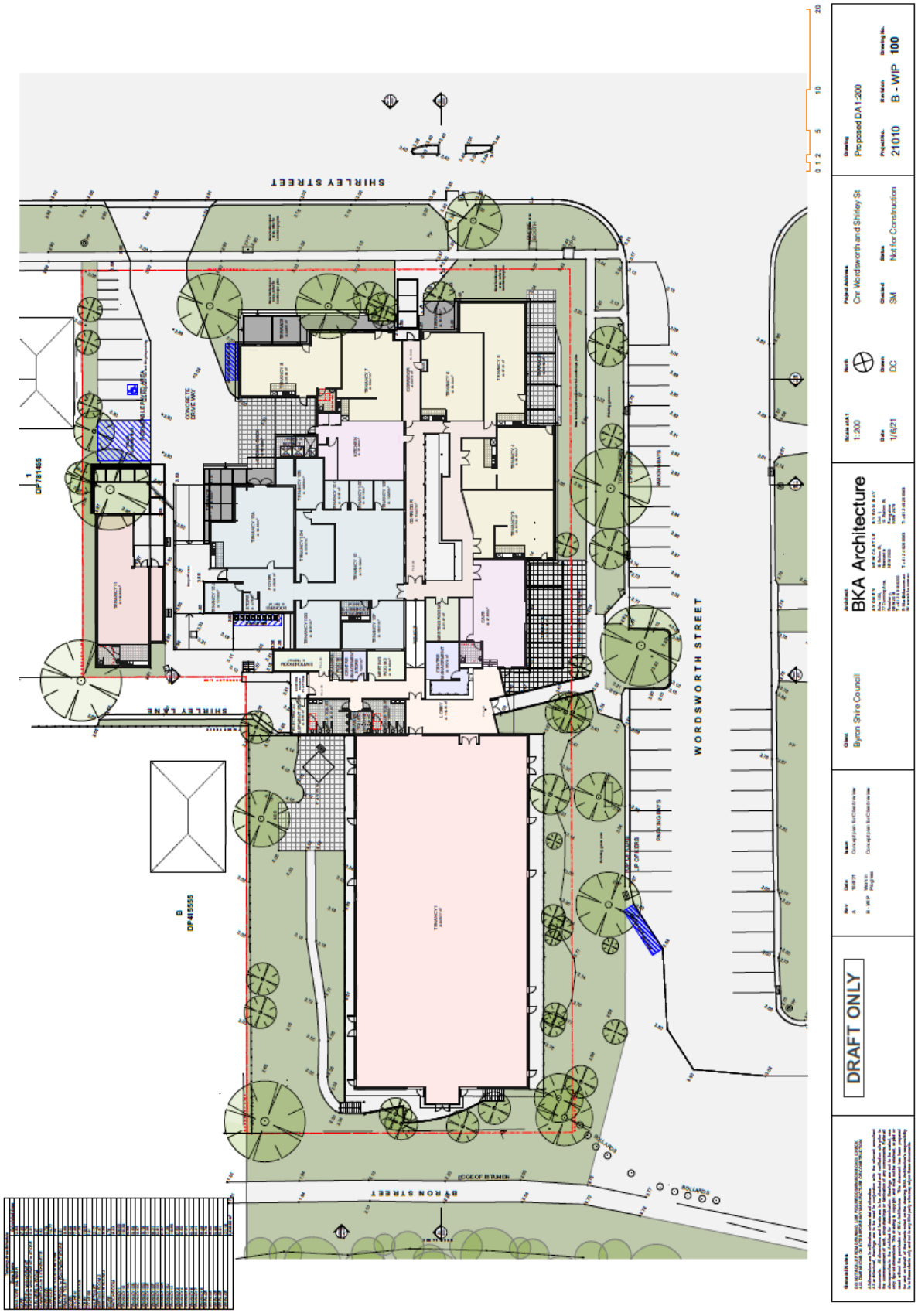
It is recommended that alternative ventilation is provided for these rooms so that doors/windows can be closed to exclude road traffic noise.

9. Conclusion

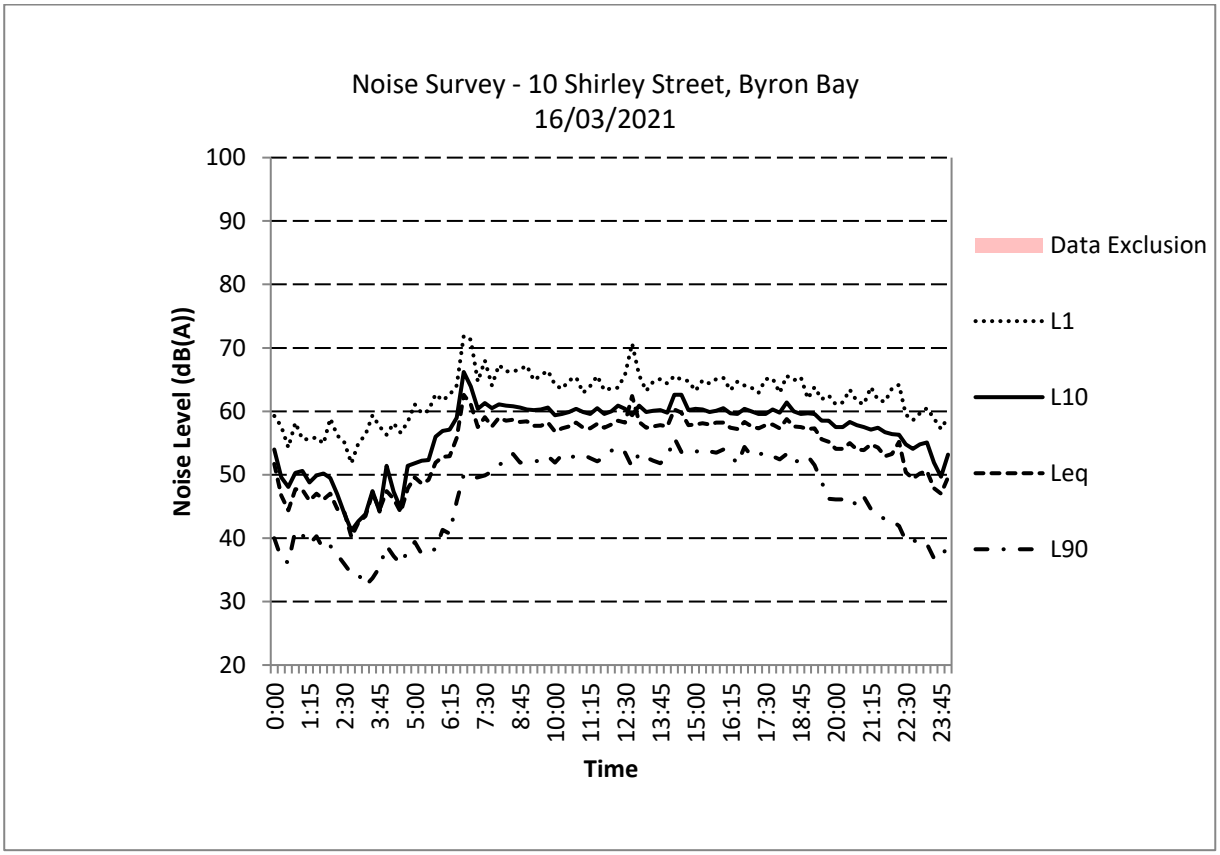
An environmental noise assessment was conducted of the proposed Byron Community Hub located at 10-12 Shirley Street, Byron Bay.

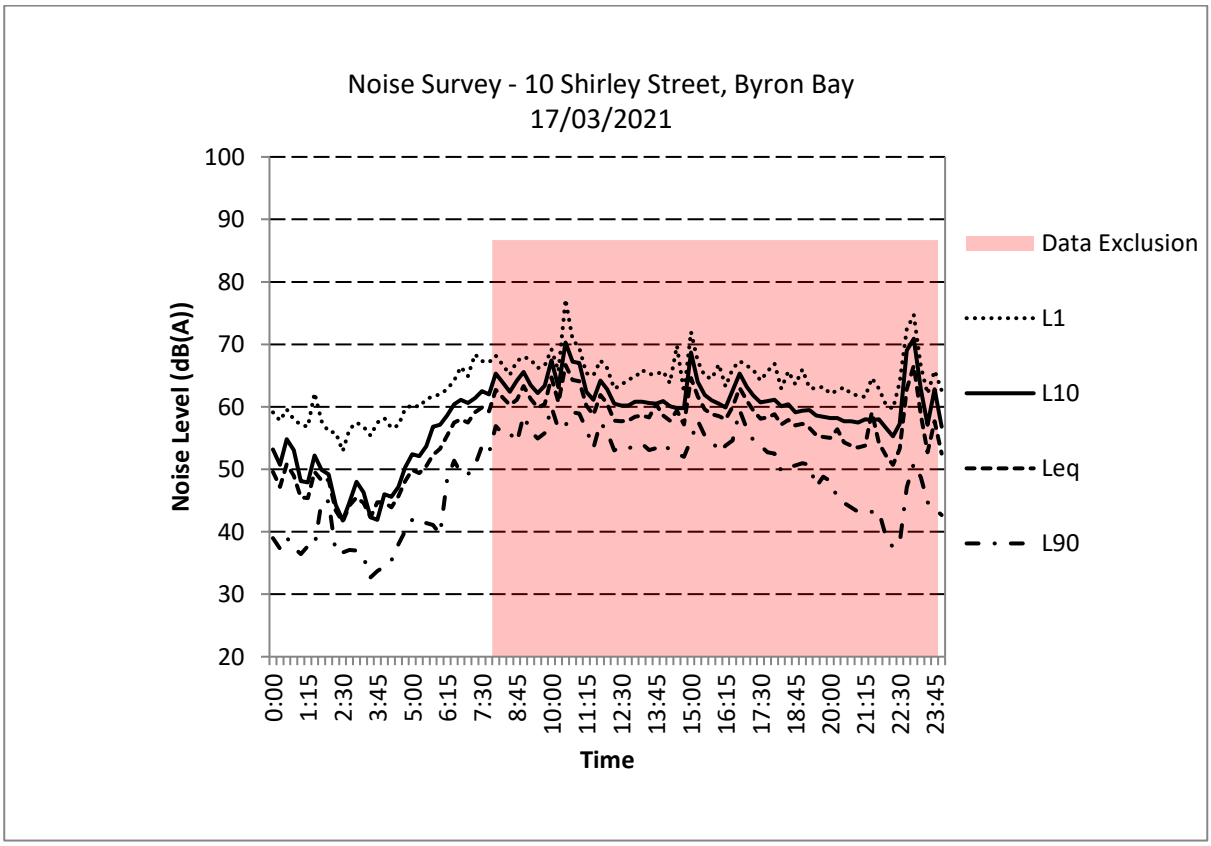
Provided the recommendations presented in Section 8 are implemented, the development is predicted to comply with the noise requirements outlined in Section 5.

Appendix A Sample of Development Plans


SHIRLEY STREET
WORDSWORTH STREET
BYRON STREET
SHIRLEY LANE
DRAFT ONLY
BKA Architecture
Byron Shire Council
Proposed DA 1:200
21010
B - WIP
100

Appendix B Unattended Noise Monitoring Graphs


Noise Survey - 10 Shirley Street, Byron Bay
16/03/2021
Noise Level (dB(A))
100
90
80
70
60
50
40
30
20
0:00
1:15
2:30
3:45
5:00
6:15
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Noise Survey - 10 Shirley Street, Byron Bay
17/03/2021
Noise Level (dB(A))
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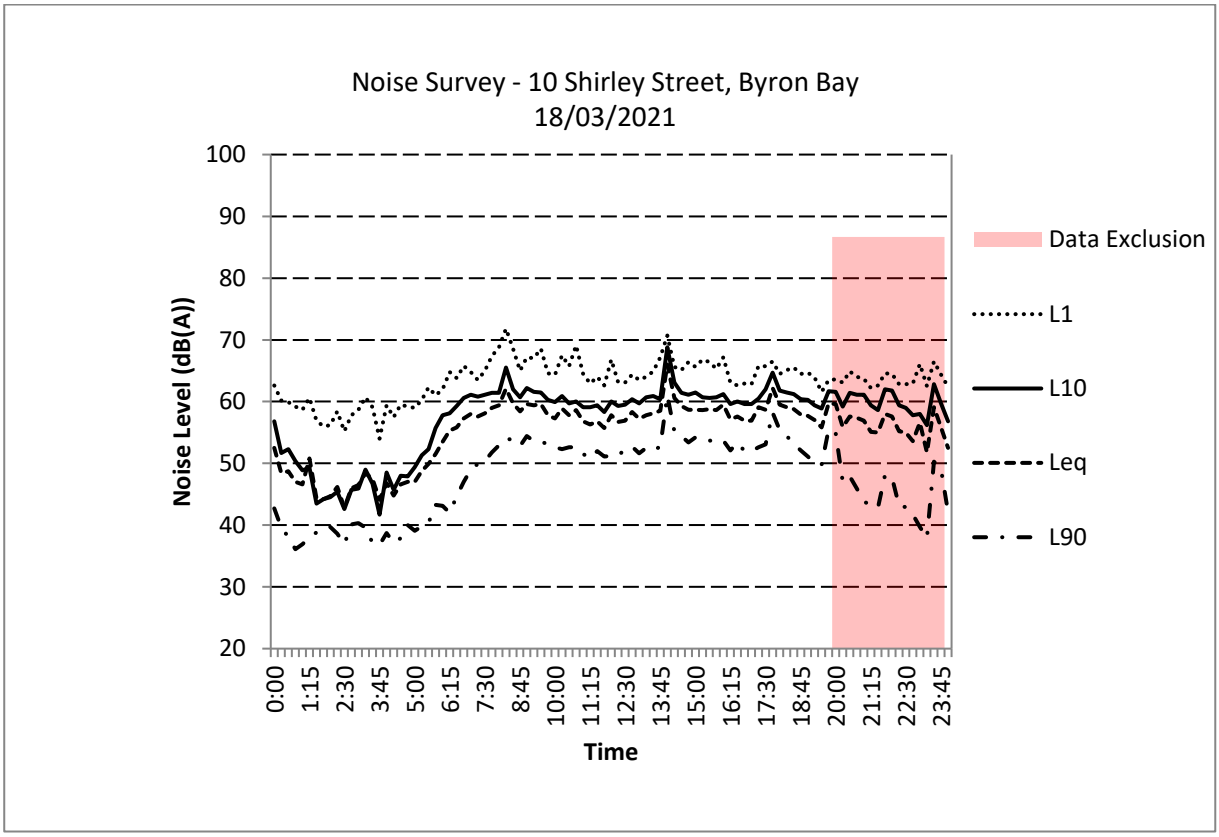
1:15
2:30
3:45
5:00
6:15
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Noise Survey - 10 Shirley Street, Byron Bay
18/03/2021
Noise Level (dB(A))
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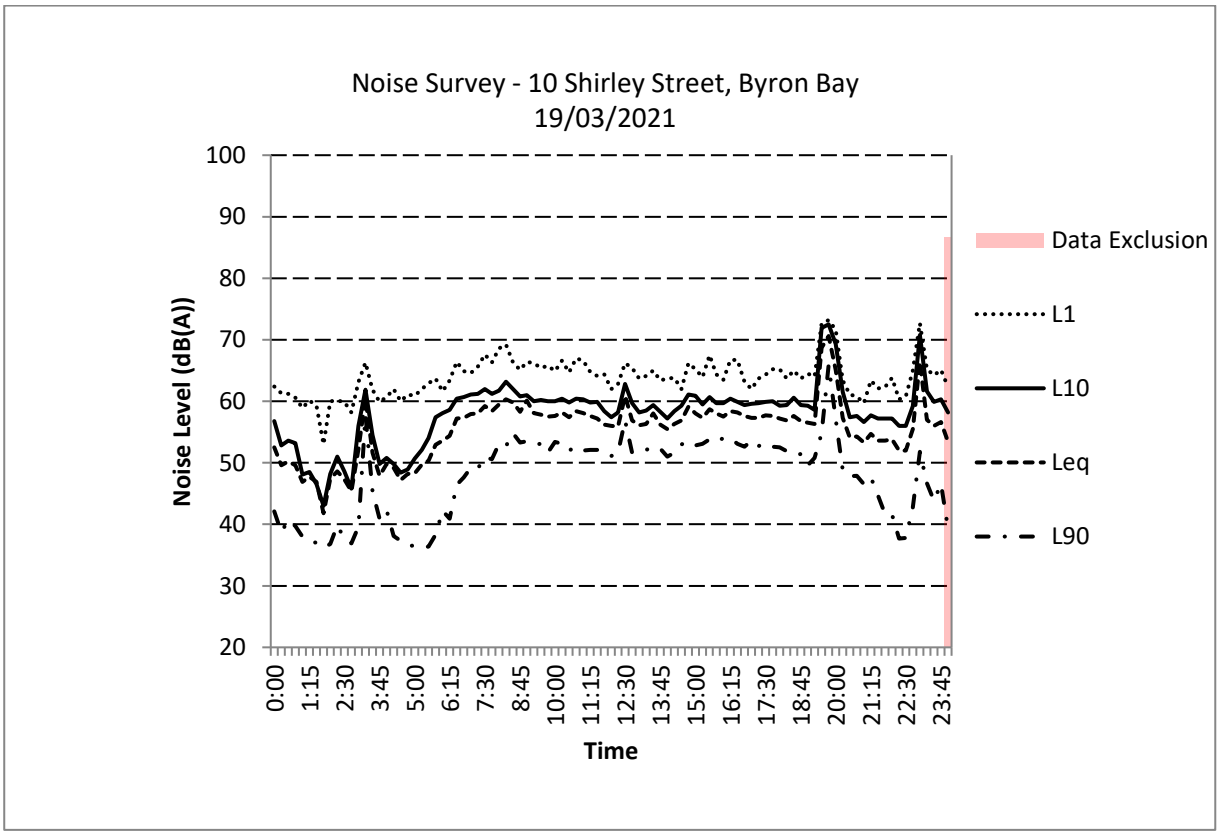
6:15
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Noise Survey - 10 Shirley Street, Byron Bay
19/03/2021
Noise Level (dB(A))
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40
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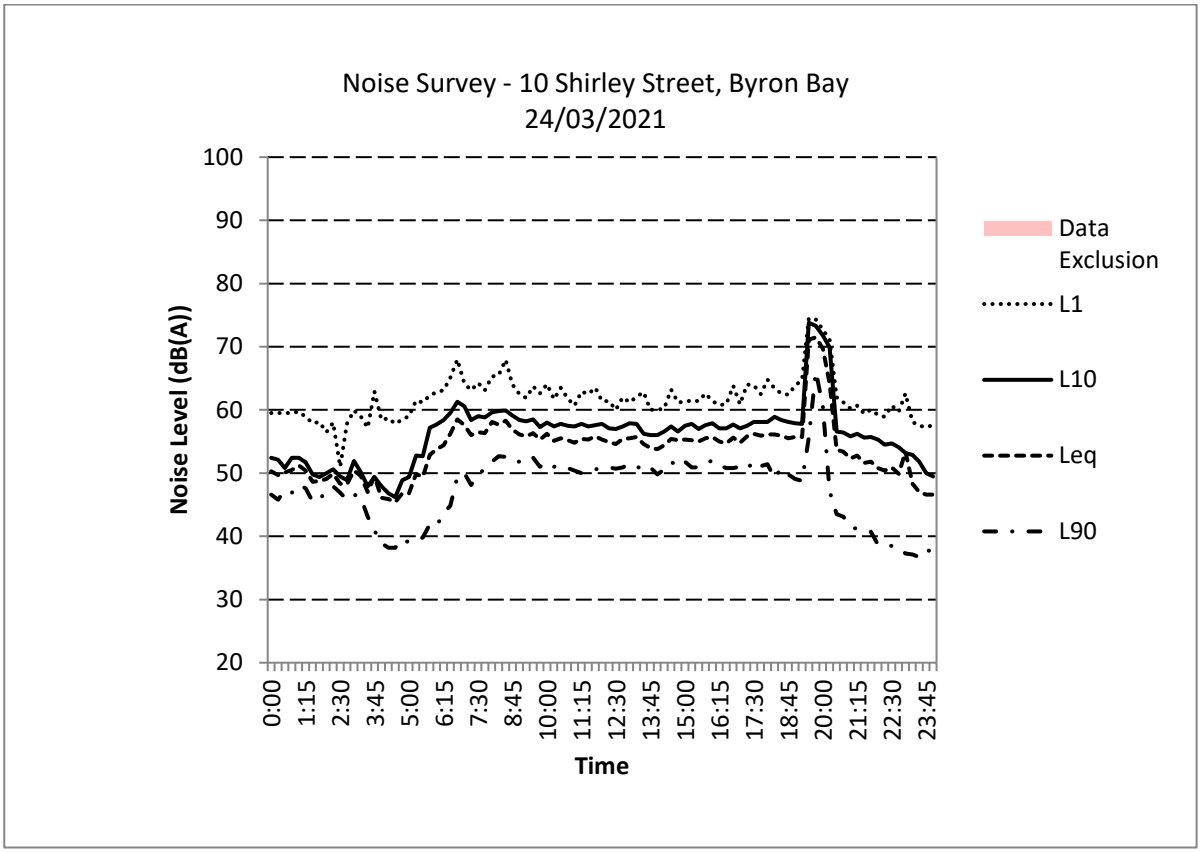
2:30
3:45
5:00
6:15
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Noise Survey - 10 Shirley Street, Byron Bay
24/03/2021
Noise Level (dB(A))
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40
30
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2:30
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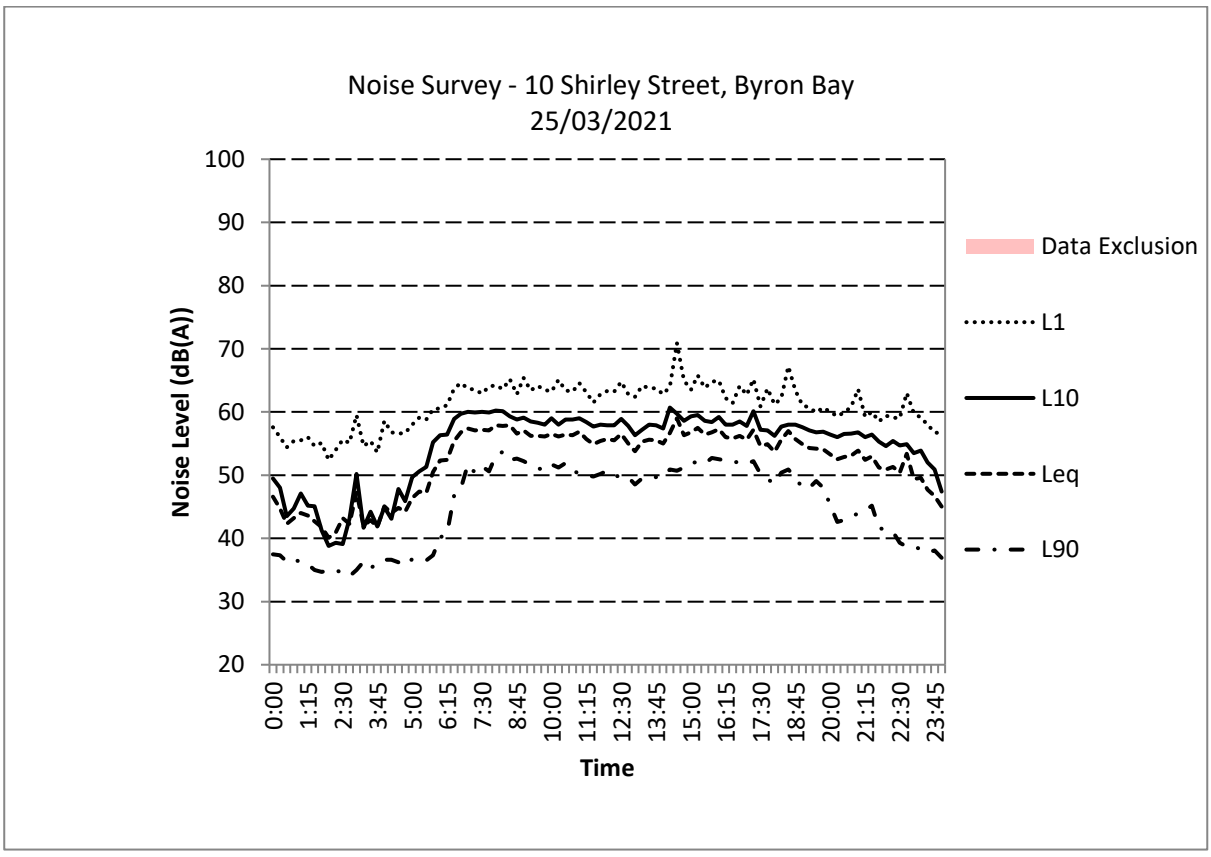
5:00
6:15
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Noise Survey - 10 Shirley Street, Byron Bay
25/03/2021
Noise Level (dB(A))
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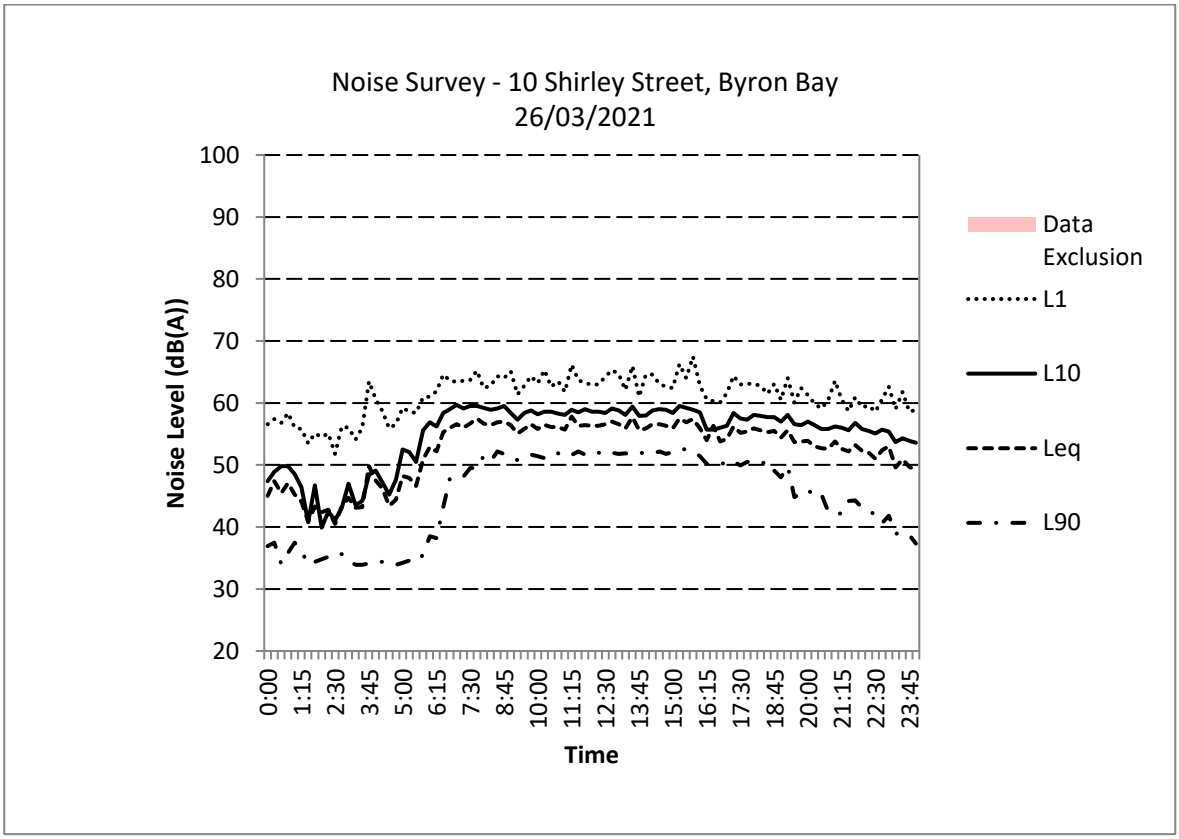
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Noise Survey - 10 Shirley Street, Byron Bay
26/03/2021
Noise Level (dB(A))
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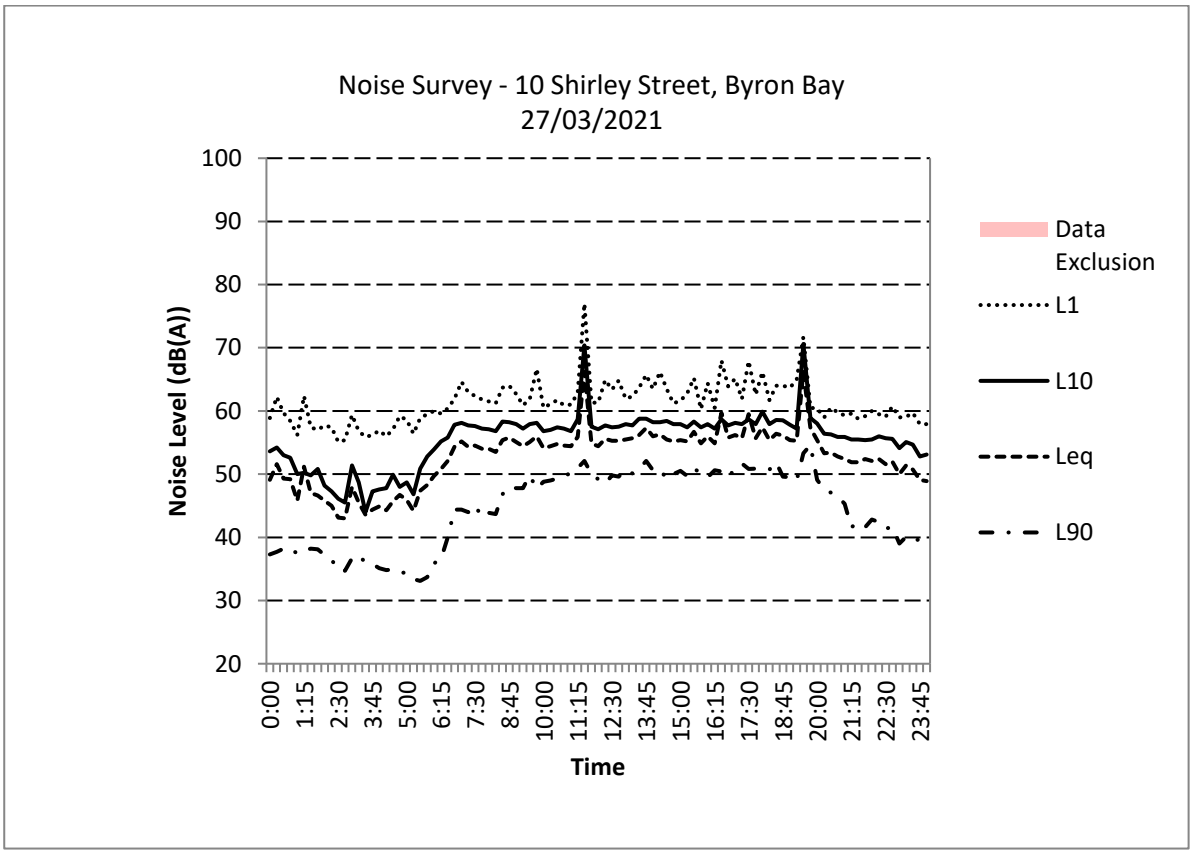
6:15
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Noise Survey - 10 Shirley Street, Byron Bay
27/03/2021
Noise Level (dB(A))
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50
40
30
20
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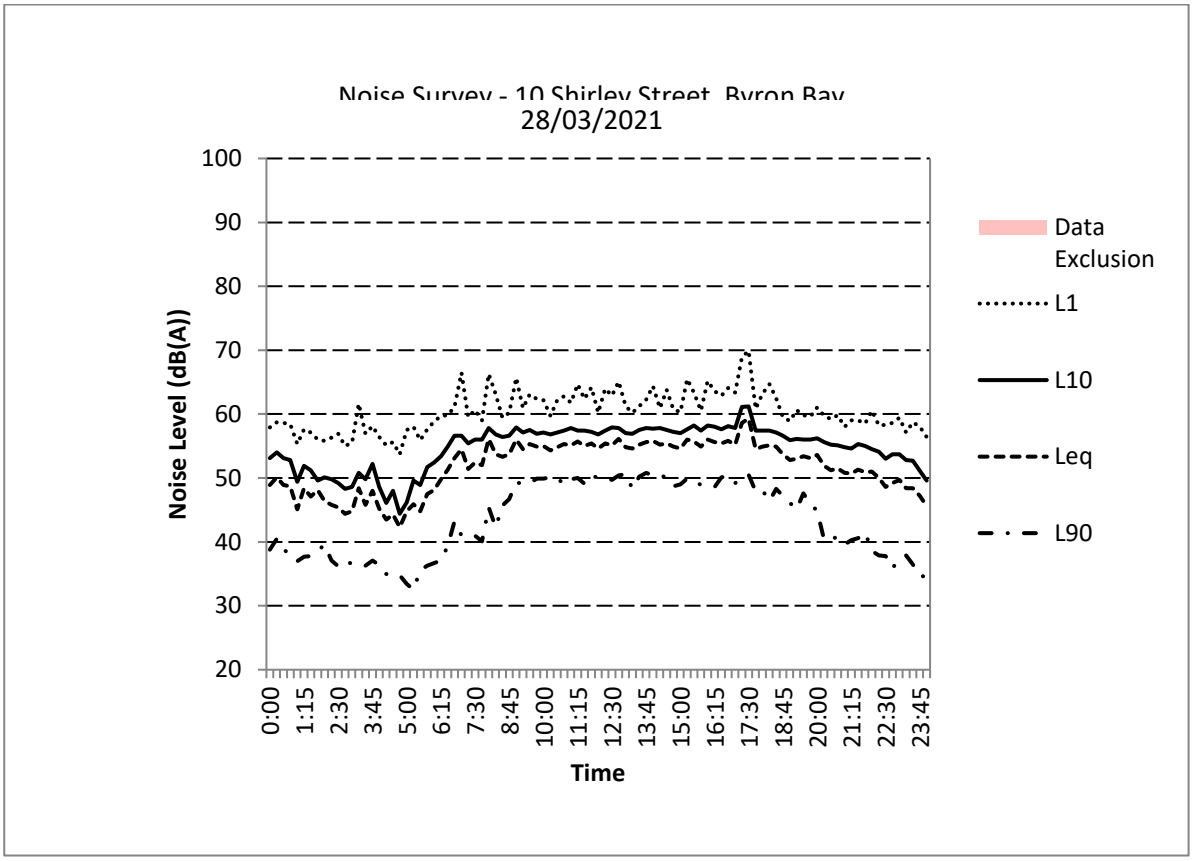
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Noise Survey - 10 Shirley Street, Byron Bay
28/03/2021
Noise Level (dB(A))
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40
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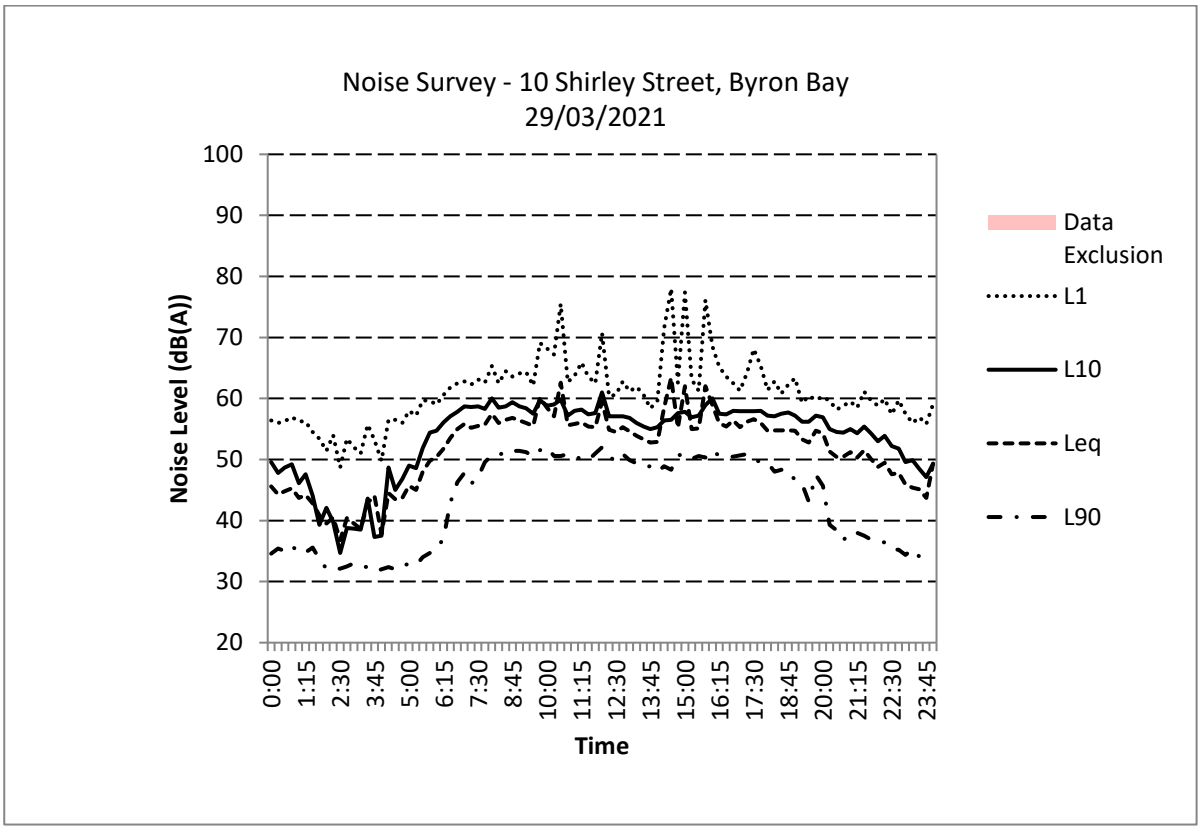
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Noise Survey - 10 Shirley Street, Byron Bay
29/03/2021
Noise Level (dB(A))
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6:15
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90

Appendix C Sample Calculations

Onsite Leq Noise Calculations – No Acoustic Treatment

				Distance to the Receivers			
Noise Source	**Duration**	**Leq**	**Leq 15min**	**R1**	**R2**	**R3**	**R4**
				NW	N	E	SW
Car door closure	2	78	51	5	38	100	20
Car bypass @ 5km/h	6	69	47	11	30	95	10
Car engine ignition	3	72	47	5	38	100	20
Conversations	720	65	64	20	36	41	8
Alfresco dining (café)	900	77	77	56	66	41	40
Truck passby	13	89	71	12	35	85	35
Unloading a delivery vehicle	60	80	68	22	50	80	36
Glass disposal	4	93	69	24	50	80	36
15 minute period (s)		**900**					
Noise level after Distance loss							
Car door closure				37	20	11	25
Car bypass @ 5km/h				26	18	8	27
Car engine ignition				33	16	7	21
Conversations				38	33	32	46
Alfresco dining (café)				42	41	45	45
Truck passby				49	40	32	40
Unloading a delivery vehicle				41	34	30	37
Glass disposal				42	35	31	38
Shielding from intervening structures							
Car door closure				0	0	14	8
Car bypass @ 5km/h				0	0	14	8
Car engine ignition				0	0	14	8
Conversations				0	0	0	0
Alfresco dining (café)				20	5	0	20
Truck passby				0	0	14	5
Unloading a delivery vehicle				0	5	14	10
Glass disposal				6	6	14	10
CONCAWE Atmospheric/Ground/Meteorology corrections							
Car door closure				0	0	0	0
Car bypass @ 5km/h				0	0	0	0
Car engine ignition				0	0	0	0
Conversations				0	0	0	0
Alfresco dining (café)				0	0	0	0
Truck passby				0	0	0	0
Unloading a delivery vehicle				0	0	0	0
Glass disposal				0	0	0	0
SubTotal - Noise Level at Receiver				**R1**	**R2**	**R3**	**R4**
Car door closure				37	20	-3	17
Car bypass @ 5km/h				26	18	-6	19
Car engine ignition				33	16	-7	13
Conversations				38	33	32	46
Alfresco dining (café)				22	36	45	25
Truck passby				49	40	18	35
Unloading a delivery vehicle				41	29	16	27
Glass disposal				36	29	17	28
CALC	number of events per 15mins						
Activity	**Events**	**Duration**		**R1**	**R2**	**R3**	**R4**
Car door closure	10			56085	971	6	556
Car bypass @ 5km/h	5			2188	294	1	420
Car engine ignition	5			10566	183	1	105
Conversations	1			6325	1952	1505	39528
Alfresco dining (café)	1			160	3638	29815	313
Truck passby	2			159356	18732	126	5924
Unloading a delivery vehicle	1			13774	843	41	514
Glass disposal	2			7734	1782	110	1368
Predicted Noise Level at the Receiver				**R1**	**R2**	**R3**	**R4**
Car door closure				47	30	7	27
Car bypass @ 5km/h				33	25	1	26
Car engine ignition				40	23	0	20
Conversations				38	33	32	46
Alfresco dining (café)				22	36	45	25
Truck passby				52	43	21	38
Unloading a delivery vehicle				41	29	16	27
Glass disposal				39	33	20	31

Onsite Leq Noise Calculations – With Acoustic Barriers

				Distance to the Receivers			
Noise Source	**Duration**	**Leq**	**Leq 15min**	**R1**	**R2**	**R3**	**R4**
				NW	N	E	SW
Car door closure	2	78	51	5	38	100	20
Car bypass @ 5km/h	6	69	47	11	30	95	10
Car engine ignition	3	72	47	5	38	100	20
Conversations	720	65	64	20	36	41	8
Alfresco dining (café)	900	77	77	56	66	41	40
Truck passby	13	89	71	12	35	85	35
Unloading a delivery vehicle	60	80	68	22	50	80	36
Glass disposal	4	93	69	24	50	80	36
15 minute period (s)		**900**					
Noise level after Distance loss							
Car door closure				37	20	11	25
Car bypass @ 5km/h				26	18	8	27
Car engine ignition				33	16	7	21
Conversations				38	33	32	46
Alfresco dining (café)				42	41	45	45
Truck passby				49	40	32	40
Unloading a delivery vehicle				41	34	30	37
Glass disposal				42	35	31	38
Shielding from intervening structures							
Car door closure				10	0	14	8
Car bypass @ 5km/h				8	0	14	8
Car engine ignition				10	0	14	8
Conversations				8	0	0	8
Alfresco dining (café)				20	5	0	20
Truck passby				8	0	14	5
Unloading a delivery vehicle				8	5	14	10
Glass disposal				8	6	14	10
CONCAWE Atmospheric/Ground/Meteorology corrections							
Car door closure				0	0	0	0
Car bypass @ 5km/h				0	0	0	0
Car engine ignition				0	0	0	0
Conversations				0	0	0	0
Alfresco dining (café)				0	0	0	0
Truck passby				0	0	0	0
Unloading a delivery vehicle				0	0	0	0
Glass disposal				0	0	0	0
SubTotal - Noise Level at Receiver				**R1**	**R2**	**R3**	**R4**
Car door closure				27	20	-3	17
Car bypass @ 5km/h				18	18	-6	19
Car engine ignition				23	16	-7	13
Conversations				30	33	32	38
Alfresco dining (café)				22	36	45	25
Truck passby				41	40	18	35
Unloading a delivery vehicle				33	29	16	27
Glass disposal				34	29	17	28
CALC	number of events per 15mins						
Activity	**Events**	**Duration**		**R1**	**R2**	**R3**	**R4**
Car door closure	10			5609	971	6	556
Car bypass @ 5km/h	5			347	294	1	420
Car engine ignition	5			1057	183	1	105
Conversations	1			1002	1952	1505	6265
Alfresco dining (café)	1			160	3638	29815	313
Truck passby	2			25256	18732	126	5924
Unloading a delivery vehicle	1			2183	843	41	514
Glass disposal	2			4880	1782	110	1368
Predicted Noise Level at the Receiver				**R1**	**R2**	**R3**	**R4**
Car door closure				37	30	7	27
Car bypass @ 5km/h				25	25	1	26
Car engine ignition				30	23	0	20
Conversations				30	33	32	38
Alfresco dining (café)				22	36	45	25
Truck passby				44	43	21	38
Unloading a delivery vehicle				33	29	16	27
Glass disposal				37	33	20	31

Appendix D SoundPLAN Noise Modelling Results

10-12 Shirley Street
M02 - Logger Verif

Receiver	Fl	Ground Height m	L10(18h) dB(A)
Logger - 58.5	GF	10.00	59.6

10-12 Shirley Street
Assessed receiver levels
M023 - Planning Horizon 2032 - receivers

Receiver	Floor	Dir	L10(18h) Facade Corrected dB(A)
Development - A	GF	N	68.6
Development - B	GF	N	69.2
Development - C	GF	N	70.5
Development - D	GF	E	65.1
Development - E	GF	E	61.9
Development - F	GF	E	58.0
Development - G	GF	E	55.1
Development - H	GF	S	47.3
Development - I	GF	W	50.8
Development - J	GF	W	57.4
Development - K	GF	N	60.2
Development - L	GF	S	53.1
Development Side Building - M	GF	E	59.1