

**PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL**

Approval no: DEV2022/1349

Date: 15/12/2023



**Environmental Noise Level Impact Assessment for Proposed
Childcare Centre and Residential Above, 69 & 71 Banana Street and
18 Outridge Street, Redland Bay**

conducted for

LA5 Trust, LA6 Trust, LA7 Trust and LA9 Trust

Report No: R22096.docx/D3678/Rev.0/14.10.22

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Calculations	Josh Finlayson	16.05.2022
Draft Report	David Moore	13.10.2022
Final Report	David Moore	14.10.2022
Revision 1 in response to DILGP queries	David Moore	16.07.2023

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Our reference: R22096.docx/D3678/Rev.1/16.07.23

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INTRODUCTION

It is proposed to remove all of the existing structures from the subject site at 69-71 Banana Street and 18 Outridge Street, Redland Bay (Lots 14, 15 and 16 on RP80201) and develop a childcare centre and residential:

- Two basement level carparks;
- Ground floor (level 1) childcare centre;
- Level 2 to Level 7 inclusive residential units;
- Rooftop plant and equipment area and residential common area, including bbqs, balconies and yoga lawn.

To ensure that this development does not create a noise nuisance relative to the nearby residential, together with on-site residential, this environmental noise level impact assessment has been prepared. To determine the appropriate noise limits reference was made to the Redland Planning Scheme and in particular Schedule 6, SC6.7 *Planning Scheme Policy 6 – Environmental emissions*. In accordance with this document the noise limit criteria is the acoustic quality objectives.

To assist in determining appropriate noise limits an unattended noise logger was located at monitoring location A, which was on the subject site adjacent to the northern boundary of 69 Banan Street, approximately midway between the eastern and western boundaries, with the microphone elevated 1.6 metres, for a 7-day period.

This report details the results of the ambient noise level study, all potential noise sources and source noise levels for the proposed development, noise limits, state of compliance with these noise limits and any required noise control measures.

Refer Figure 1 for locality plan, Figure 2 for monitoring location A and closest residential receptors, Figure 3 for the proposed site plan, Figure 4 for the Level 1 floor plan, Figure 5 for the Level 2 floor plan, Figure 6 for the Levels 3-6 floor plan, Figure 7 for the Level 7 floor plan and Figure 8 for the roof plan.



Figure 1
Locality Plan



Figure 2
 Monitoring Location A and Closest Residential (R1 to R4)

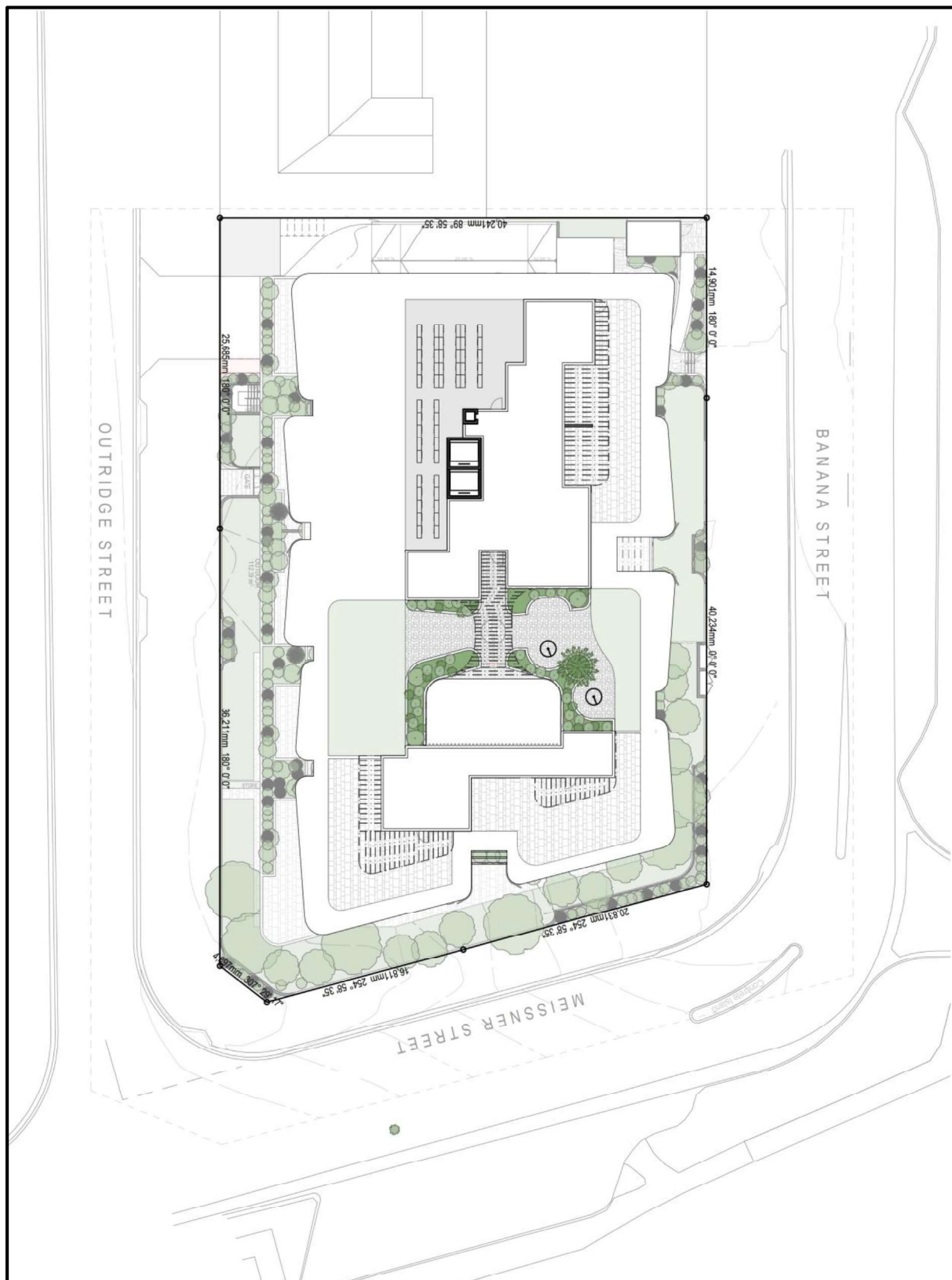


Figure 3
Proposed Site Plan

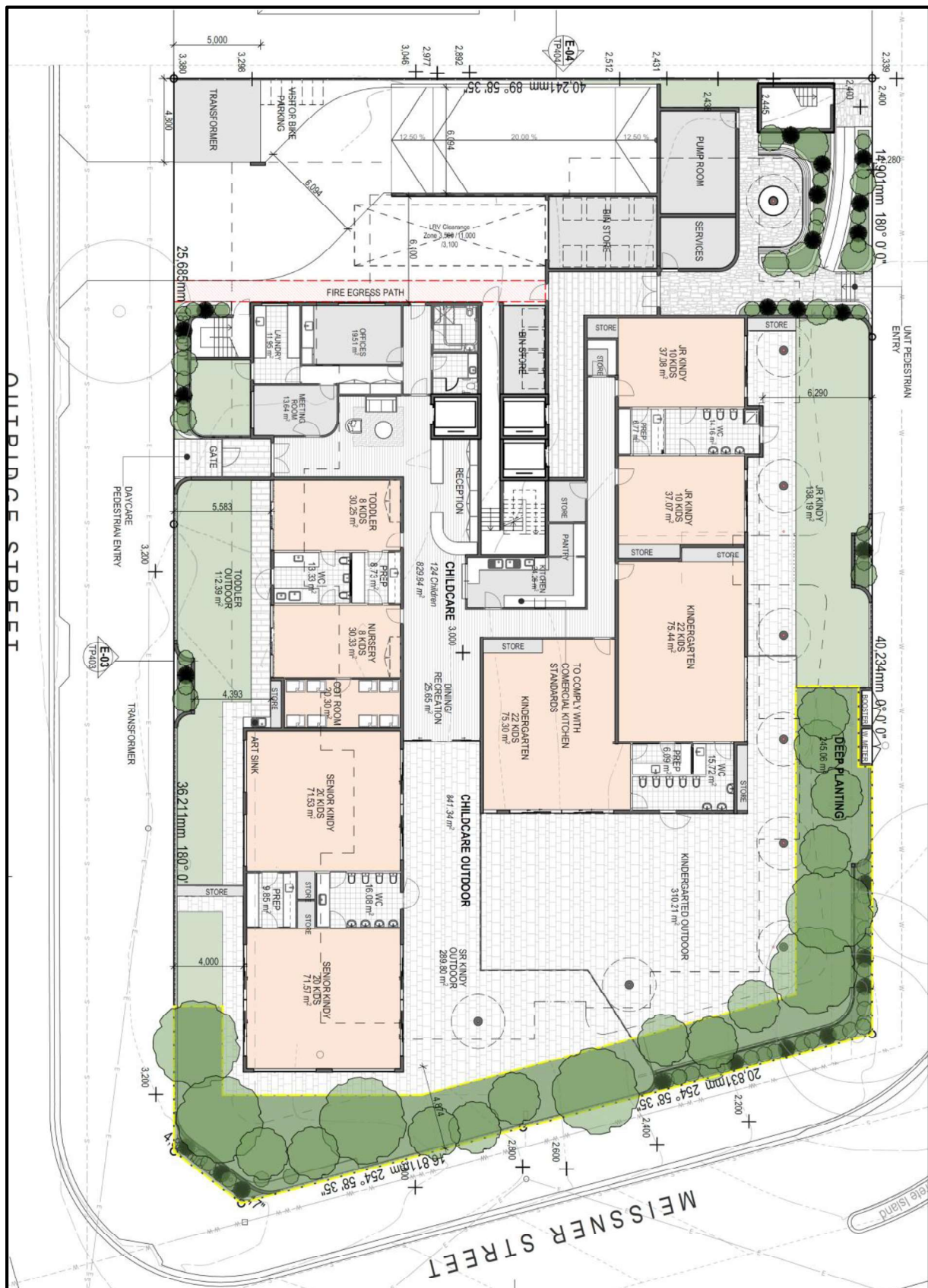


Figure 4
Level 1 Floor Plan

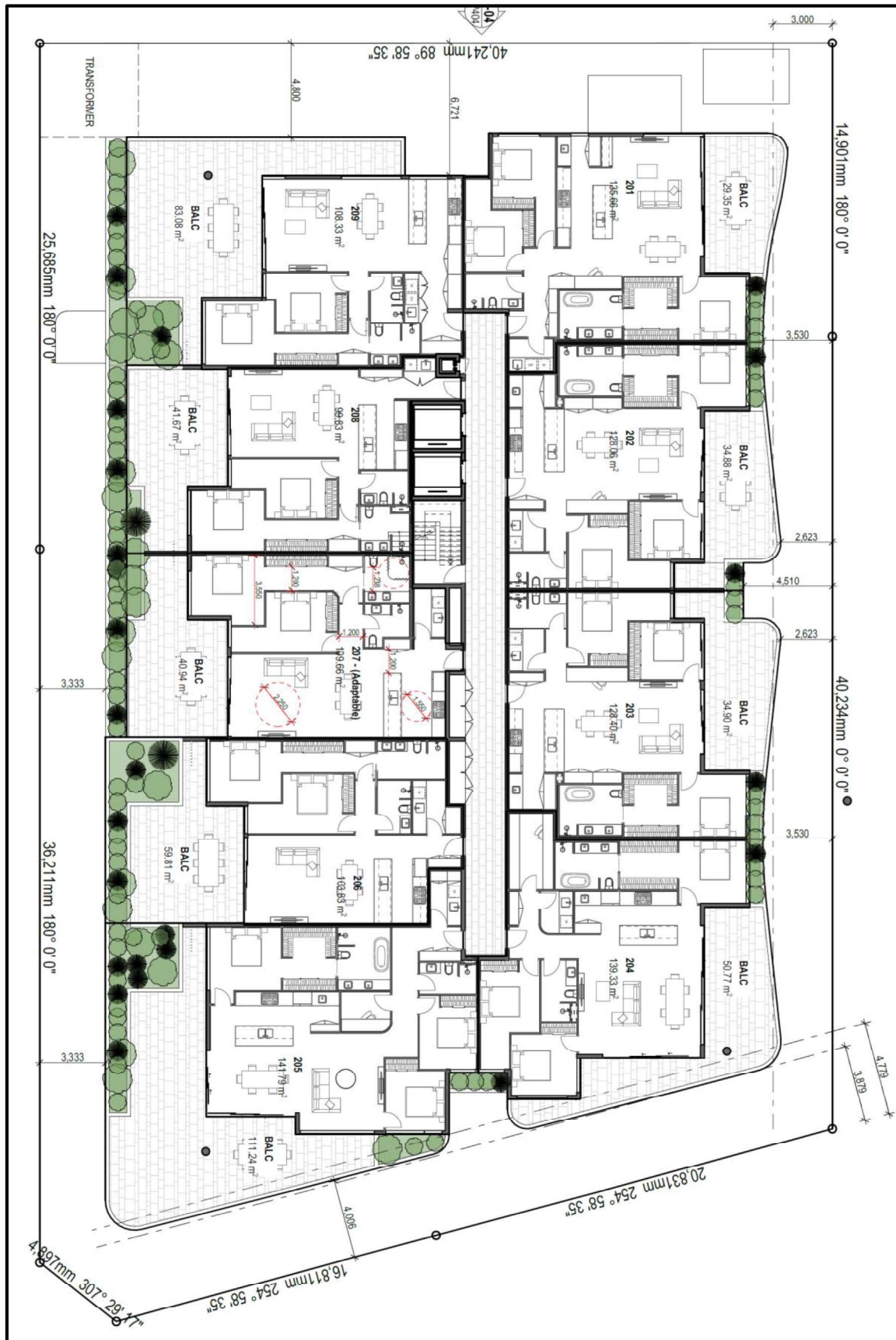


Figure 5
 Level 2 Floor Plan



Figure 6
 Level 3-6 Floor Plan



Figure 7
Level 7 Floor Plan

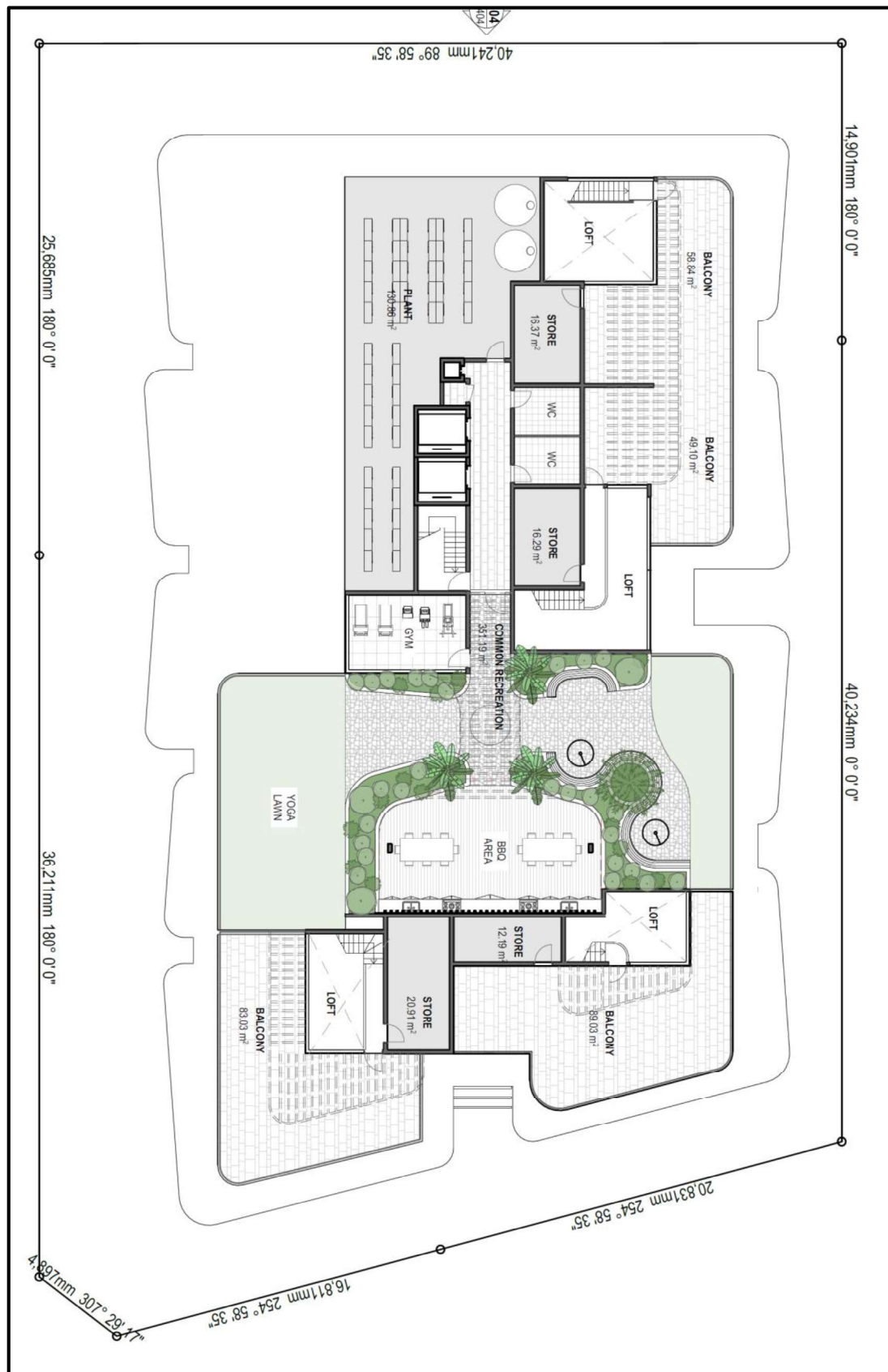


Figure 8
Roof Plan

CRITERIA

Measurements and Calculations

All noise level measurements were conducted generally in accordance with the following:

- general requirements of the Queensland environmental protection legislation;
- Environmental Protection (Noise) Policy 2019 (EPP Noise);
- *Noise Measurement Manual*, Queensland Department of Environment and Heritage Protection, Version 4.01, 10 March 2020;
- Australian Standard AS 1055 - 2018, *Acoustics, Description and measurement of environmental noise*.

Noise Limits

In accordance with Planning Scheme Policy 6 – Environmental emissions, the acoustic amenity of the nearby residential must be protected in accordance with the Acoustic Quality Objectives.

Schedule 1 of the Environmental Protection (Noise) Policy 2019 nominates the following Acoustic Quality Objectives for dwellings:

- Acoustic quality objectives, daytime and evening, external to dwelling:
 - 50 dB(A) $L_{Aeq,adj,1H}$;
 - 55 dB(A) $L_{A10,adj,1H}$; and
 - 65 dB(A) $L_{A1,adj,1H}$;
- Acoustic quality objectives, daytime and evening, inside dwelling:
 - 35 dB(A) $L_{Aeq,adj,1H}$;
 - 40 dB(A) $L_{A10,adj,1H}$; and
 - 45 dB(A) $L_{A1,adj,1H}$;
- Acoustic quality objectives, night-time, inside dwelling:
 - 30 dB(A) $L_{Aeq,adj,1H}$;
 - 35 dB(A) $L_{A10,adj,1H}$; and
 - 40 dB(A) $L_{A1,adj,1H}$;

For the night-time period the internal noise criteria needs to be converted to be equivalent to outside the closest residences. Allowing a 7 dB(A) noise level reduction from outside to inside (based on all of the windows open and in accordance with the Queensland Environmental Protection Agency Ecoaccess Guideline *Planning for Noise Control*) the internal criteria would be equivalent to the following levels external to the dwelling:

- 37 dB(A) $L_{Aeq,adj,1H}$;
- 42 dB(A) $L_{A10,adj,1H}$; and
- 47 dB(A) $L_{A1,adj,1H}$.

CURRENT AMBIENT NOISE LEVELS

For monitoring location A Table 1 details the results of the ambient noise level measurements obtained from the un-attended noise logger. For details of the ambient noise level measurement equipment, equipment settings, calibration, monitoring location and atmospheric conditions, refer Appendix A. Appendix B contains, for the key parameters, all of the results of the ambient noise level measurements. Refer Appendix C for atmospheric data for Redland, which predominantly complied with the requirements of the Australian Standard for conducting environmental noise levels.

With respect to noise the following should be noted:

- daytime: 0700 to 1800 hours;
- evening: 1800 to 2200 hours;
- night-time: 2200 to 0700 hours;
- 'A' weighted: adjustment made by the sound level meter to the measured noise to correspond to the response of the human ear. This adjustment is standardised by international noise standards;
- $L_{Aeq,T}$: the equivalent continuous (or approximately the 'average') 'A' weighted sound pressure level for the measurement period 'T';
- $L_{A1,T}$: the 'A' weighted sound pressure level exceeded for 1% of the measurement period 'T';
- $L_{A10,T}$: the 'A' weighted sound pressure level exceeded for 10% of the measurement period 'T', which is an approximation of the 'average of the maximum noise levels';
- $L_{A90,T}$: the 'A' weighted sound pressure level exceeded for 90% of the measurement period 'T', which is an approximation of the 'average of the minimum noise levels', which is also known as the 'background' noise level;
- RBL: the Rating Background Level is the 10th percentile of the $L_{A90,T}$ background sound levels for the periods daytime, evening and night-time, and is a single figure for each of these time periods.

Table 1 Results of Ambient Noise Assessment, Monitoring Location A															
Day	Date	Time	$L_{Aeq,T}$			$L_{A1,T}$			$L_{A10,T}$			$L_{A90,T}$			RBL
			Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Average
Thursday	05.05.22	Evening	39.5	49.1	45.5	47.9	59.5	54.6	41.4	52.0	47.6	34.2	42.5	38.3	34.5
		Night	30.2	58.8	48.5	36.6	72.4	61.0	31.9	63.0	50.2	27.0	42.3	34.8	28.0
Friday	06.05.22	Day	47.1	59.5	53.4	54.0	70.6	64.3	46.7	60.7	55.6	38.0	48.3	42.5	38.9
		Evening	43.6	68.6	61.0	51.0	76.1	67.0	46.5	73.3	64.6	38.3	64.9	54.8	38.3
		Night	30.3	61.0	47.0	35.0	71.7	58.1	31.2	66.4	51.5	26.7	40.1	34.1	27.7
Saturday	07.05.22	Day	46.2	61.4	53.7	53.3	70.0	63.6	48.6	69.5	58.1	37.7	50.9	41.8	38.5
		Evening	37.7	46.9	44.1	45.0	58.0	53.6	39.4	49.3	46.3	34.0	40.5	37.8	35.0
		Night	27.9	60.7	50.0	34.8	66.6	58.0	28.7	63.9	53.4	25.2	54.6	42.2	25.8
Sunday	08.05.22	Day	45.4	57.4	52.1	52.7	66.5	61.2	47.7	58.1	54.0	37.5	50.1	45.7	39.6
		Evening	40.7	47.5	44.6	46.3	56.0	52.4	43.2	49.2	46.8	36.9	41.7	39.5	37.1
		Night	40.1	62.6	54.1	44.8	67.3	59.7	42.5	65.5	56.9	36.2	59.7	49.8	38.2
Monday	09.05.22	Day	49.9	65.0	56.4	56.6	79.8	66.8	50.9	62.6	57.2	42.7	59.6	51.2	45.5
		Evening	41.9	59.3	51.5	48.8	61.1	57.0	44.1	60.6	53.6	37.4	56.9	48.0	38.0
		Night	33.0	58.0	47.0	39.6	69.7	57.5	34.7	60.4	49.9	30.0	47.3	38.5	30.8
Tuesday	10.05.22	Day	49.3	60.8	57.4	57.2	73.0	64.9	52.2	62.6	59.5	43.6	56.0	52.6	48.7
		Evening	51.6	60.5	56.4	58.4	65.7	62.2	54.6	63.0	58.9	46.6	56.1	52.1	48.0
		Night	48.0	60.1	55.5	53.2	69.3	61.7	50.9	62.8	57.9	44.5	55.1	51.3	47.3

Table 1 Results of Ambient Noise Assessment, Monitoring Location A															
Day	Date	Time	L _{Aeq,T}			L _{A1,T}			L _{A10,T}			L _{A90,T}			RBL
			Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Average
Wednesday	11.05.22	Day	46.8	69.3	60.2	56.9	75.5	66.5	48.5	71.5	63.0	41.9	65.2	55.5	47.4
		Evening	47.2	54.1	50.4	53.2	60.3	57.2	49.3	57.4	53.0	43.2	47.6	45.8	44.0
		Night	41.6	54.1	48.2	45.6	66.0	56.3	43.6	56.6	50.7	39.2	47.7	43.6	40.6
Thursday	12.05.22	Day	46.4	60.0	53.5	50.1	72.4	63.9	46.9	60.6	55.4	38.9	50.9	45.0	39.6

Average Noise Level, dB(A)

L _{Aeq,T}	Daytime	55.2	L _{A90,T}	Daytime	47.8
	Evening	50.5		Evening	45.2
	Night-time	50.0		Night-time	42.0
L _{A1,T}	Daytime	64.5	RBL	Daytime	42.6
	Evening	57.7		Evening	39.3
	Night-time	58.9		Night-time	34.1
L _{A10,T}	Daytime	57.5			
	Evening	53.0			
	Night-time	52.9			

The early morning (0600 to 0700 hours) average ambient noise levels were similar to the daytime average ambient noise levels and, therefore, daytime noise criteria has been applied from 0600 hours rather than 0700 hours.

Based on the Acoustic Quality Objectives the noise limits are:

- daytime (0700 to 1800 hours): 50 dB(A) L_{Aeq,adj,1H}, 65 dB(A) L_{A1,adj,1H} and 55 dB(A) L_{A10,adj,1H};
- evening (1800 to 2200 hours): 50 dB(A) L_{Aeq,adj,1H}, 65 dB(A) L_{A1,adj,1H} and 55 dB(A) L_{A10,adj,1H};
- night-time (2200 to 0700 hours): 37 dB(A) L_{Aeq,adj,1H}, 47 dB(A) L_{A1,adj,1H} and 42 dB(A) L_{A10,adj,1H};

From the above average ambient noise levels it can be seen that most of the existing L_{Aeq,T}, L_{A1,T} and L_{A10,T} ambient noise levels exceed the Acoustic Quality Objectives, particularly for the night-time period. Therefore, compliance with the Acoustic Quality Objectives will result in source noise levels, at the closest residential, below the current ambient noise levels.

SOURCE NOISE LEVELS

The potential noise sources associated with proposed development are as follows:

- car driving: 39 dB(A) L_{Aeq,adj,1H}, 45 dB(A) L_{A1,adj,1H} and 41 dB(A) L_{A10,adj,1H} @ 8 m;
- delivery truck: 55 dB(A) L_{Aeq,adj,1H}, 60 dB(A) L_{A1,adj,1H} and 58 dB(A) L_{A10,adj,1H} @ 8 m;
- waste collection: 58 dB(A) L_{Aeq,adj,1H}, 65 dB(A) L_{A1,adj,1H} and 60 dB(A) L_{A10,adj,1H} @ 8 m;
- delivery truck: 55 dB(A) L_{Aeq,adj,1H}, 60 dB(A) L_{A1,adj,1H} and 58 dB(A) L_{A10,adj,1H} @ 8 m;
- transformer: 40 dB(A) L_{Aeq,adj,1H}, 42 dB(A) L_{A1,adj,1H} and 41 dB(A) L_{A10,adj,1H} @ 3 m.

Residential Apartments

- air-conditioning: 50 dB(A) $L_{Aeq,adj,1H}$, 52 dB(A) $L_{A1,adj,1H}$ and 51 dB(A) $L_{A10,adj,1H}$ @ 2 m;
- people on rooftop: 55 dB(A) $L_{Aeq,adj,1H}$, 60 dB(A) $L_{A1,adj,1H}$ and 58 dB(A) $L_{A10,adj,1H}$ @ 8 m;

Child Care Centre

- air-conditioning: 62 dB(A) $L_{Aeq,adj,1H}$ 64 dB(A) $L_{A1,adj,1H}$ and 63 dB(A) $L_{A10,adj,1H}$ @ 2 m;
- children at play: 60 dB(A) $L_{Aeq,adj,1H}$ @ 10m, as assessed by the consultant for approximately 60 to 70 children of different ages all playing outside, not under cover;
- children at play: In accordance with the AAAC Guideline for Child Care Centre source noise level for 10 children:
 - 77 to 80 dB(A) L_{WA} for 0 to 2 years of age;
 - 83 to 87 dB(A) L_{WA} for 2 to 3 years of age;
 - 84 to 90 dB(A) L_{WA} for 3 to 6 years of age.
 - average noise level for the combination of the different ages 84 dB(A) L_{WA} , which is equivalent to 56 dB(A) @ 10 metres for 10 children.

With respect to the pump room at Ground Floor level advice from the architect is that all of the pumps in this room are for the sprinkler system and will only be operational in the event of an emergency. Therefore, under normal operational circumstances for this proposed development, there will be no noise from the pump room and it does not require any further consideration.

Given that the consultant's measured child care centre source noise level was for actual children of different ages at play outdoors and was for an actual 15-minute period, the child care centre source noise level adopted in this report is 60 dB(A) $L_{Aeq,adj,1H}$, 67 dB(A) $L_{A1,adj,1H}$ and 63 dB(A) $L_{A10,adj,1H}$ @ 10 metres.

For the residential units it has been assumed that all of the air-conditioning would be located within the plant and equipment area of the roof.

TRAFFIC NOISE

In the information request from the Department of State Development, Infrastructure, Local Government and Planning it is requested that traffic noise impact be considered.

In accordance with the State Development Assessment Provisions v3.0 *State Code 1: Development in a state-controlled road environment* and based on the measured background sound levels the relevant noise criteria for the residential component are:

- primary external living areas: ≤ 57 dB(A) $L_{A10,18H}$ free field;
- habitable rooms: Queensland Development Code Mandatory Part 4.4 (MP4.4).

and for the child care centre:

- outdoor play areas: ≤ 62 dB(A) $L_{A10,12H}$ free field;
- indoor education areas: ≤ 35 dB(A) $L_{Aeq,1H}$ maximum.

Residential

At monitoring location A the relevant traffic noise levels for Friday 6 May 2022 (all other week days had rainfall and therefore could not be referenced as they were non-compliant with the requirements of the traffic noise assessment criteria of the Department of Transport and Main Roads) were:

- 53.4 dB(A) $L_{A10,18H}$ free field;
- 54.5 dB(A) $L_{A10,12H}$ free field;
- 54.3 dB(A) $L_{Aeq,1H}$ maximum over 24-hours.

Monitoring location A was 34 metres from the centre of Banana Street and the closest part of the residential development is 16 metres from the centre of Banana Street, with this reduction in separation distance increasing free field traffic noise levels from Banana Street by 3.3 dB(A) to the following values:

- 56.7 dB(A) $L_{A10,18H}$ free field;
- 57.8 dB(A) $L_{A10,12H}$ free field.

The traffic noise limit for the primary external living areas is 57 dB(A) $L_{A10,18H}$ free field and this is complied with.

For the internal habitable rooms the minimum R_w values required to provide adequate traffic noise reduction from outside to inside is determined based on the Noise Category in accordance with MP4.4 and is relative to facade corrected traffic noise levels.

The facade corrected traffic noise level at the closest residential facades to Banana Street is $56.7 + 2.5 = 59.2$ dB(A) $L_{A10,18H}$. In accordance with MP4.4 this is Noise Category 1. On this basis the facades facing Banana Street and Meissner Street (eastern and southern facades) must comply with Noise Category 1, but due to reduced angle of view the facade facing Outridge Street (western facade) and the northern facade would be Noise Category 0.

In accordance with MP4.4 the following minimum R_w values are applicable for each for the above nominated noise categories, for habitable rooms only:

- Category 0: no additional acoustic treatment, standard building assessment provisions apply;
- Category 1:
 - Glazing: R_w 24 for glazing with up to and equal to $1.8m^2$;
 R_w 27 for glazing greater than $1.8m^2$;
 - External walls: R_w 35;
 - Roof: R_w 35;
 - Entry Doors: R_w 28;

With respect to the above the following examples of achieving the nominated minimum R_w values should be noted (extracted from MP4.4):

- **Noise Category 0:** no additional acoustic treatment required;
- **Noise Category 1:**
 - Glazing R_w 27:
 - minimum 4mm thick glass with full perimeter *acoustically rated seals*;
 - Glazing R_w 24:
 - minimum 4mm thick glass with standard weather seals;
 - external walls R_w 35:
 - single leaf of clay brick masonry at least 110mm thick with:
 - (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and

- (ii) One layer of plasterboard at least 10mm thick fixed to outside face of studs
- OR
- minimum 6mm thick fibre cement sheeting or weatherboards or plank cladding externally, minimum 90mm deep timber stud or 92mm metal stud, standard plasterboard at least 13mm thick internally.
- Roof Rw 35:
 - Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity.
- Entry doors Rw 28:
 - fixed so as to overlap the frame or rebate of the frame, constructed of -
 - (i) Wood, particleboard or blockboard not less than 33mm thick; or
 - (ii) Compressed fibre reinforced sheeting not less than 9mm thick; or
 - (iii) Other suitable material with a mass per unit area not less than 24.4kg/m²; or
 - (iv) Solid core timber door not less than 35mm thick fitted with full perimeter *acoustically rated seals*.

Child Care Centre

For the child care centre the only potential noise source for traffic noise is Banan Street, as there is greater separation distance to Meissner Street and intervening walls. The traffic noise limits for the child care centre are relative to the external play areas and the internal educational and play areas, as well as sleep areas.

For the external play area adjacent to Banana Street the traffic noise level is 57.8 dB(A) $L_{A10,12H}$, which complies with the 62 dB(A) $L_{A10,12H}$ noise limit and, therefore, no further noise control measures are required.

For the internal areas the noise limit is 35 dB(A) $L_{Aeq,1Hmax}$ and the traffic noise level is 54.3 dB(A) $L_{Aeq,1Hmax}$ relative to monitoring location A, which is 34 metres from the centre of traffic on Banana Street. The closest child care centre building façade to the centre of Banana Street is 20 metres distant, and this reduction in separation distance will result in a traffic noise level increase of 2.3 dB(A). Therefore the child care centre building needs to provide a traffic noise level reduction of $54.3 + 2.3 - 35 = 21.6$ dB(A) relative to the Banana Street side of the child care centre, which is equivalent to Noise Category 1 as per MP4.4. For all other aspects of the child care centre building the relevant Noise Category would be 0, with no additional acoustic treatment required.

For that side of the child care centre closest to Banana Street the relevant minimum Rw values are detailed above (for Noise Category 1).

NOISE LEVEL IMPACT

R1 – Closest Residence to South

At the closest residence to the south the noise level impact of the various noise sources will be as per Table 2.

Table 2 – Calculated Noise Impact to Closest Residence to South												
Noise Source				Adjustment, dB(A)			Noise Level @ Receptor, dB(A)			Complies With Limit for Day/Evening/Night (Y/N)		
Description	Noise Level, dB(A)											
	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}	Distance	Barrier	Multiple noise sources	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}
Car driving (8m)	39	45	41	-13	0	-	26	32	28	Y/Y/Y	Y/Y/Y	Y/Y/Y
Delivery truck (8m)	55	60	58	-20	-15	-	20	25	23	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Waste collection (8m)	58	65	60	-20	-15	-	23	30	25	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Residential A/C (2m)	50	52	51	-30	-10	+10	20	22	21	Y/Y/Y	Y/Y/Y	Y/Y/Y
Transformer (3m)	40	42	41	-28	0	-	12	14	13	Y/Y/Y	Y/Y/Y	Y/Y/Y
People on rooftop (8m)	55	60	58	-15	-10	-	30	35	33	Y/Y/N/A	Y/Y/N/A	Y/Y/N/A
Childcare A/C (2m)	62	64	63	-26	0	+10	46	48	47	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Children at play (10m)	60	65	63	-12	0	-	48	53	51	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A

At the closest residence to the south, and assuming that the operation of delivery trucks, waste collection and the childcare centre are only applicable from 0600 to 1800 hours and that the rooftop area cannot be used after 2200 hours, all of the potential noise sources comply with the noise limits for the daytime, evening and night-time periods, as applicable to each of the noise sources.

R2 – Closest Residence to West-South-West

At the closest residence to the west-south-west the noise level impact of the various noise sources will be as per Table 3.

Table 3 – Calculated Noise Impact to Closest Residence to West-south-west												
Noise Source				Adjustment, dB(A)			Noise Level @ Receptor, dB(A)			Complies With Limit for Day/Evening/Night (Y/N)		
Description	Noise Level, dB(A)											
	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}	Distance	Barrier	Multiple noise sources	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}
Car driving (8m)	39	45	41	-19	0	-	20	26	22	Y/Y/Y	Y/Y/Y	Y/Y/Y
Delivery truck (8m)	55	60	58	-20	-8	-	27	32	30	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Waste collection (8m)	58	65	60	-20	-8	-	30	37	32	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Residential A/C (2m)	50	52	51	-32	0	+10	28	30	29	Y/Y/Y	Y/Y/Y	Y/Y/Y
Transformer (3m)	40	42	41	-28	0	-	12	14	13	Y/Y/Y	Y/Y/Y	Y/Y/Y
People of rooftop (8m)	55	60	58	-19	-10	-	26	31	29	Y/Y/N/A	Y/Y/N/A	Y/Y/N/A
Childcare A/C (2m)	62	64	63	-30	0	+7	39	41	40	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Children at play (10m)	60	65	63	-18	-5	-	38	43	41	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A

At the closest residence to the west-south-west, and assuming that the operation of delivery trucks, waste collection and the childcare centre are only applicable from 0600 to 1800 hours and that the rooftop area cannot be used after 2200 hours, all of the potential noise sources comply with the noise limits for the daytime, evening and night-time periods, as applicable to each of the noise sources.

R3 – Closest Residence to West-North-West

At the closest residence to the west-north-west the noise level impact of the various noise sources will be as per Table 4.

Table 4 – Calculated Noise Impact to Closest Residence to West-north-west												
Noise Source				Adjustment, dB(A)			Noise Level @ Receptor, dB(A)			Complies With Limit for Day/Evening/Night (Y/N)		
Description	Noise Level, dB(A)											
	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}	Distance	Barrier	Multiple noise sources	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}
Car driving (8m)	39	45	41	-12	0	-	27	33	29	Y/Y/Y	Y/Y/Y	Y/Y/Y
Delivery truck (8m)	55	60	58	-14	0	-	41	46	44	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Waste collection (8m)	58	65	60	-14	0	-	44	51	46	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Residential A/C (2m)	50	52	51	-27	0	+10	33	35	34	Y/Y/Y	Y/Y/Y	Y/Y/Y
Transformer (3m)	40	42	41	-19	0	-	21	23	22	Y/Y/Y	Y/Y/Y	Y/Y/Y
People of rooftop (8m)	55	60	58	-14	-10	-	31	36	34	Y/Y/N/A	Y/Y/N/A	Y/Y/N/A
Childcare A/C (2m)	62	64	63	-24	0	+7	45	47	46	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Children at play (10m)	60	65	63	-14	-12	-	34	39	37	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A

At the closest residence to the west-north-west, and assuming that the operation of delivery trucks, waste collection and the childcare centre are only applicable from 0600 to 1800 hours and that the rooftop area cannot be used after 2200 hours, all of the potential noise sources comply with the noise limits for the daytime, evening and night-time periods, as applicable to each of the noise sources.

R4 – Closest Residence to North

At the closest residence to the north the noise level impact of the various noise sources will be as per Table 5.

Table 5 – Calculated Noise Impact to Closest Residential to North												
Noise Source				Adjustment, dB(A)			Noise Level @ Receptor, dB(A)			Complies With Limit for Day/Evening/Night (Y/N)		
Description	Noise Level, dB(A)											
	L _{Aeq,adj} ,1H	L _{A1,adj} ,1H	L _{A10,adj} ,1H	Distance	Barrier	Multiple noise sources	L _{Aeq,adj} ,1H	L _{A1,adj} ,1H	L _{A10,adj} ,1H	L _{Aeq,adj} ,1H	L _{A1,adj} ,1H	L _{A10,adj} ,1H
Car driving (8m)	39	45	41	0	-8	-	31	37	33	Y/Y/Y	Y/Y/Y	Y/Y/Y
Delivery truck (8m)	55	60	58	-4	-8	-	43	48	46	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Waste collection (8m)	58	65	60	-4	-5	-	49	56	51	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Residential A/C (2m)	50	52	51	-22	-8	+10	30	32	31	Y/Y/Y	Y/Y/Y	Y/Y/Y
Transformer (3m)	40	42	41	-9	0	-	31	33	32	Y/Y/Y	Y/Y/Y	Y/Y/Y
People of rooftop (8m)	55	60	58	-9	-12	-	34	39	37	Y/Y/N/A	Y/Y/N/A	Y/Y/N/A
Childcare A/C (2m)	62	64	63	-18	0	+3	47	49	48	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Children at play (10m)	60	65	63	-10	-10	-	40	45	43	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A

At the closest residence to the north, and assuming that the operation of delivery trucks, waste collection and the childcare centre are only applicable from 0600 to 1800 hours and that the rooftop area cannot be used after 2200 hours, all of the potential noise sources comply with the noise limits for the daytime, evening and night-time periods, as applicable to each of the noise sources, provided that there is an acoustic barrier on that part of the northern boundary adjacent to the location of the delivery trucks and waste collection which provides a noise reduction of at least 8 dB(A) for the delivery trucks and 5 dB(A) for the waste collection vehicles. Refer to Noise Control section of this report for further details.

Closest on Site Residential

At the closest on-site residential, namely the residential units on Level 2 relative to the ground floor noise sources and the residential units on Level 6 relative to noise sources on the rooftop, the noise level impact of the various noise sources will be as per Table 6, noting that there is a concrete slab between this closest on-site residential and the ground floor level noise sources.

Table 6 – Calculated Noise Impact to Closest on-site Residential												
Noise Source				Adjustment, dB(A)			Noise Level @ Receptor, dB(A)			Complies With Limit for Day/Evening/Night (Y/N)		
Description	Noise Level, dB(A)											
	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}	Distance	Barrier	Multiple noise sources	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}	L _{Aeq,adj,1H}	L _{A1,adj,1H}	L _{A10,adj,1H}
Car driving (8m)	39	45	41	+2	-40	-	1	7	3	Y/Y/Y	Y/Y/Y	Y/Y/Y
Delivery truck (8m)	55	60	58	+2	-40	-	17	22	20	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Waste collection (8m)	58	65	60	+2	-40	-	20	27	22	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Transformer (3m)	40	42	41	-6	-5	-	29	31	30	Y/Y/Y	Y/Y/Y	Y/Y/Y
People of rooftop (8m)	55	60	58	-6	-12	-	37	42	40	Y/Y/N/A	Y/Y/N/A	Y/Y/N/A
Childcare A/C (2m)	62	64	63	-10	-40	+10	32	34	33	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A
Children at play (10m)	60	65	63	+5	-20	-	45	50	48	Y/N/A/N/A	Y/N/A/N/A	Y/N/A/N/A

At the closest on-site residential to the above noise sources, and assuming that the operation of delivery trucks, waste collection and the childcare centre are only applicable from 0600 to 1800 hours and that the rooftop area cannot be used after 2200 hours, all of the potential noise sources comply with the noise limits for the daytime, evening and night-time periods, as applicable to each of the noise sources, with no additional noise control measures required.

NOISE CONTROL

To ensure compliance with all of the noise limits (and based on the premis that daytime commences at 0600 hours) the following noise control measures are applicable:

1. hours of operation for the childcare centre are not earlier than 0600 hours not later than 1800 hours;
2. Rooftop residential facilities are only available during the daytime and evening, that is from 0600 to 2200 hours;
3. Delivery vehicles are only permitted on site from 0600 to 1800 hours;
4. Waste collection is only permitted from 0600 to 1800 hours;
5. acoustic barrier as per detail below;
6. facades of residential units facing Banana Street and Meissner Street to be constructed from materials which comply with Noise Category 1. Northern and western facades of residential units Noise Category 0 – no additional noise control measures required;
7. the closest part of the child care centre building to Banana Street, and only the eastern side of this closest part, to be constructed from materials which comply with Noise Category 1. All other facades of the child care centre building are Noise Category 0 – no additional noise control measures required.

Once the selection of all of the plant and equipment are finalised, an acoustic consultant should be engaged to re-calculate plant and equipment noise impact and determine whether or not any additional noise control measures are required.

Acoustic Barrier

Relative to the ground floor of the adjoining residence to the north an acoustic barrier providing at least an 8 dB(A) noise reduction for delivery trucks and a 5 dB(A) noise reduction for waste collection is required. By path difference calculation this acoustic barrier must be 2.0 metres high, located as per Figure 9, be continuous and gap free and have a minimum surface area density of 12.5 kg/m². Examples of suitable materials of construction include, but is not limited to:

- reinforced concrete;
- concrete block;
- brick;
- hebel panel;
- sheet metal at least 2 mm thick;
- minimum 9 mm thick fibrous cement sheeting;
- earth mound;
- lapped timber palings, for example kiln dried softwood palings at least 23 mm thick and overlapped a minimum 15 mm;
- any combination of the above.

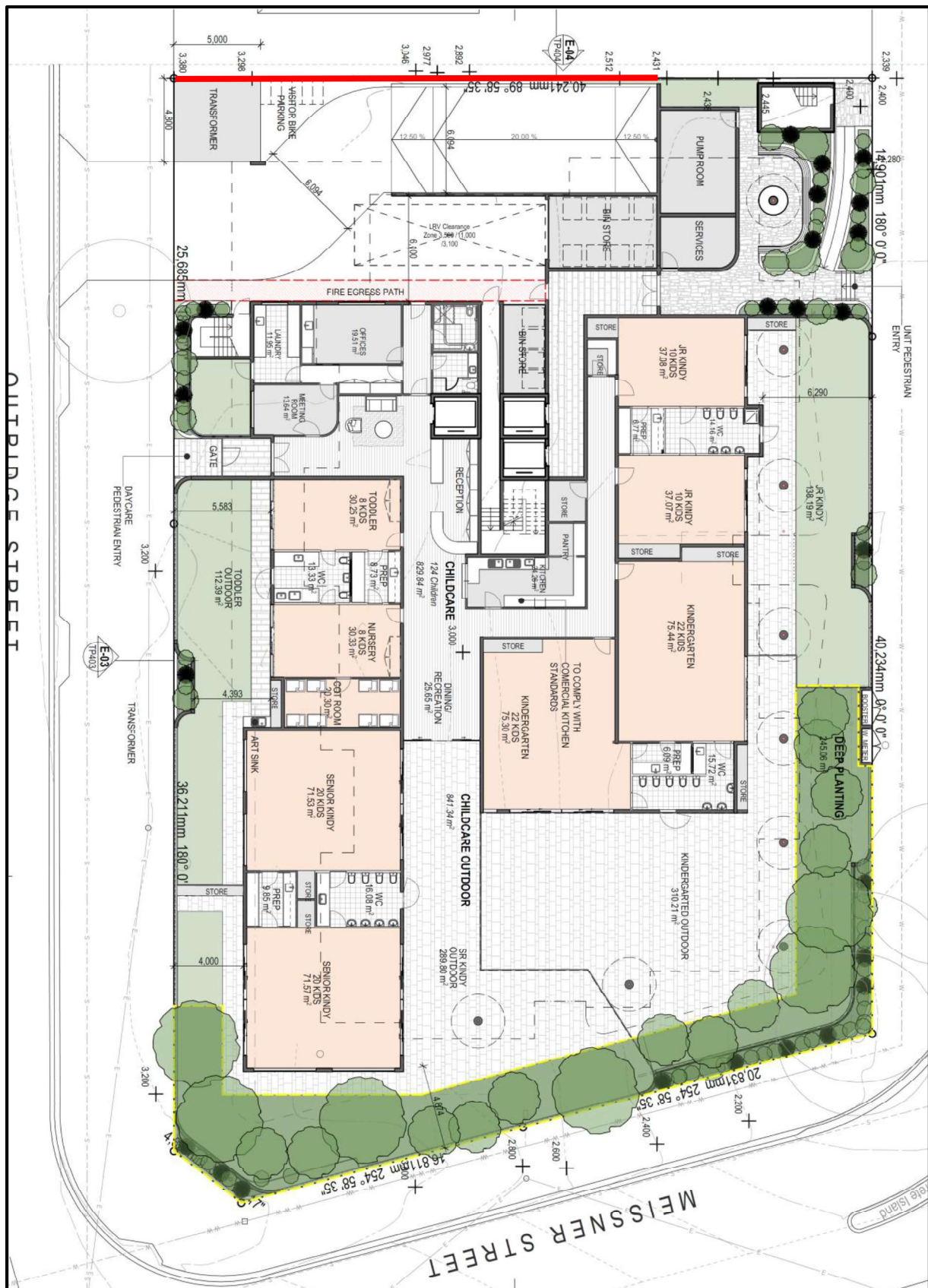


Figure 9
Location of 2.0m High Acoustic Barrier (Bold Red Line)

CONCLUSIONS

It is proposed to remove all of the existing structures from the subject site at 69-71 Banana Street and 18 Outridge Street, Redland Bay and develop a childcare centre and residential:

- Two basement level carparks;
- Ground floor (level 1) childcare centre;
- Level 2 to Level 7 inclusive residential units;
- Rooftop plant and equipment area and residential common area, including bbqs, balconies and yoga lawn.

To assist in determining appropriate noise limits an unattended noise logger was located at monitoring location A, which was on the subject site adjacent to the northern boundary of 69 Banan Street, approximately midway between the eastern and western boundaries, with the microphone elevated 1.6 metres, for a 7-day period.

The noise limit criteria, in accordance with Schedule 6, SC6.7 *Planning Scheme Policy 6 – Environmental emissions*, is to protect the acoustic environmental values in a manner consistent with the Environmental Protection (Noise) Policy 2008 and in particular the Acoustic Quality Objectives have been considered.

For all of the potential noise sources their noise levels were calculated to the closest residential and compared to the noise limit criteria, namely the Acoustic Quality Objectives. The closest residences to the subject site are denoted R1 to R4 at Figure 2, as well as the on-site residential.

On the basis that the rooftop area will not operate post 2200 hours, that the childcare centre will not operate before 0600 hours or after 1800 hours and that delivery trucks and waste collection vehicles will only be on site between 0600 and 1800 hours, then the following acoustic barrier will provide adequate noise control for the proposed development to the closest residence to the north:

- along that part of the northern boundary of the subject site as detailed in Figure 9, 2.0 metre high acoustic barrier.

The acoustic barrier must be continuous and gap free, be located as per Figure 9, be the nominated height relative to existing ground levels and be constructed of materials with a minimum surface area density of 12.5 kg/m².

For all other close residences, no additional noise control measures are required.

To control traffic noise to the residential units, the facades of the residential units facing Banana Street and Meissner Street must be constructed from materials which comply with Noise Category 1. Northern and western facades of residential units are Noise Category 0 – no additional noise control measures required.

For the closest part of the child care centre building to Banana Street, and only the eastern side of this closest part, must be constructed from materials which comply with Noise Category 1. All other facades of the child care centre building are Noise Category 0 – no additional noise control measures required.

Once the selection of all of the plant and equipment are finalised, an acoustic consultant should be engaged to re-calculate plant and equipment noise impact and determine whether or not any additional noise control measures are required.

RECOMMENDATION

It is recommended that, from an environmental noise perspective, the proposed childcare centre and residential development at 69 to 71 Banana Street and 18 Outridge Street, Redland Bay be approved, provided that the noise control measures detailed in this report are incorporated into this development.

APPENDIX A: LOGGED NOISE LEVEL MEASUREMENT EQUIPMENT

Measurement Equipment

The following equipment was used to conduct the 7-day ambient noise level study at Monitoring Location A:

- Bruel and Kjaer Type 2260 Observer – Serial No. 2487423, with Type BZ 7219 version 1.2 Software and Prepolarised free-field ½" microphone, Type 4189, Serial No. 2469624;
- Bruel and Kjaer Type 3592 outdoor microphone kit, including Type UA1404 outdoor microphone;
- Bruel and Kjaer Type AO 0442 ten metre microphone extension cable; and
- Bruel and Kjaer Type 4231 Sound Level Calibrator, Serial No. 2292736.

All of the above equipment is Type 1 in accordance with the requirements of Australian Standard AS 1259-1990, *Acoustics – Sound Level Meters*, as required by Australian Standard AS 1055-2018.

Measurement Equipment Settings

The above equipment was used with the following settings:

- Detector: RMS
- Time Weighting: FAST
- Frequency Weighting: A
- Sound Incidence: FRONTAL
- Microphone sensitivity: -29.9 dB

Calibration

The sound level meter was calibrated to the required value of 93.8 dB at 1000 Hz immediately before and after the noise level measurements were conducted. At no time was an adjustment of more than ± 0.5 dB required. This complies with the requirements of the Australian Standard.

Monitoring Location

Monitoring Location A was located on the subject site adjacent to the northern boundary of 69 Banana Street, approximately midway between the western and eastern boundaries, with the microphone elevated 1.6 metres above ground level. Refer Figure 2 for further detail.

Atmospheric Conditions

Throughout the 7-day period, atmospheric conditions generally complied with the requirements of the Australian Standard – refer Appendix C for detail. Whilst there was some rainfall on some of the days this rainfall only impacted the L_{A90} levels for the Monday 9th, Tuesday 10th and Wednesday 11th May and, therefore, these results were excluded from the averages.

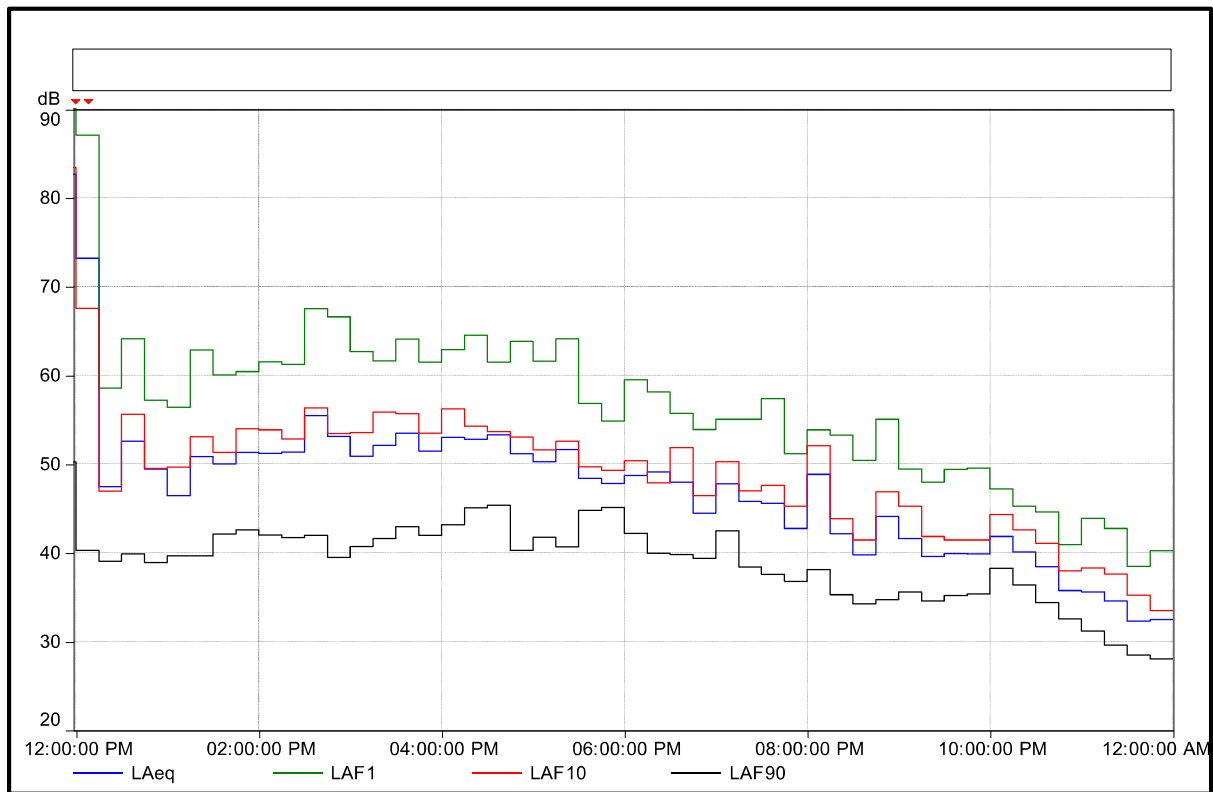
APPENDIX B: DETAILED RESULTS OF AMBIENT LOGGED NOISE LEVELS

Instrument:	2260
Application:	BZ7219 version 1.2
Start Time:	05/05/2022 11:58:05 AM
End Time:	12/05/2022 11:19:48 AM
Elapsed Time:	167:21:43
Bandwidth:	1/3 Octave
Peaks Over:	140.0 dB
Range:	24.0-104.0 dB

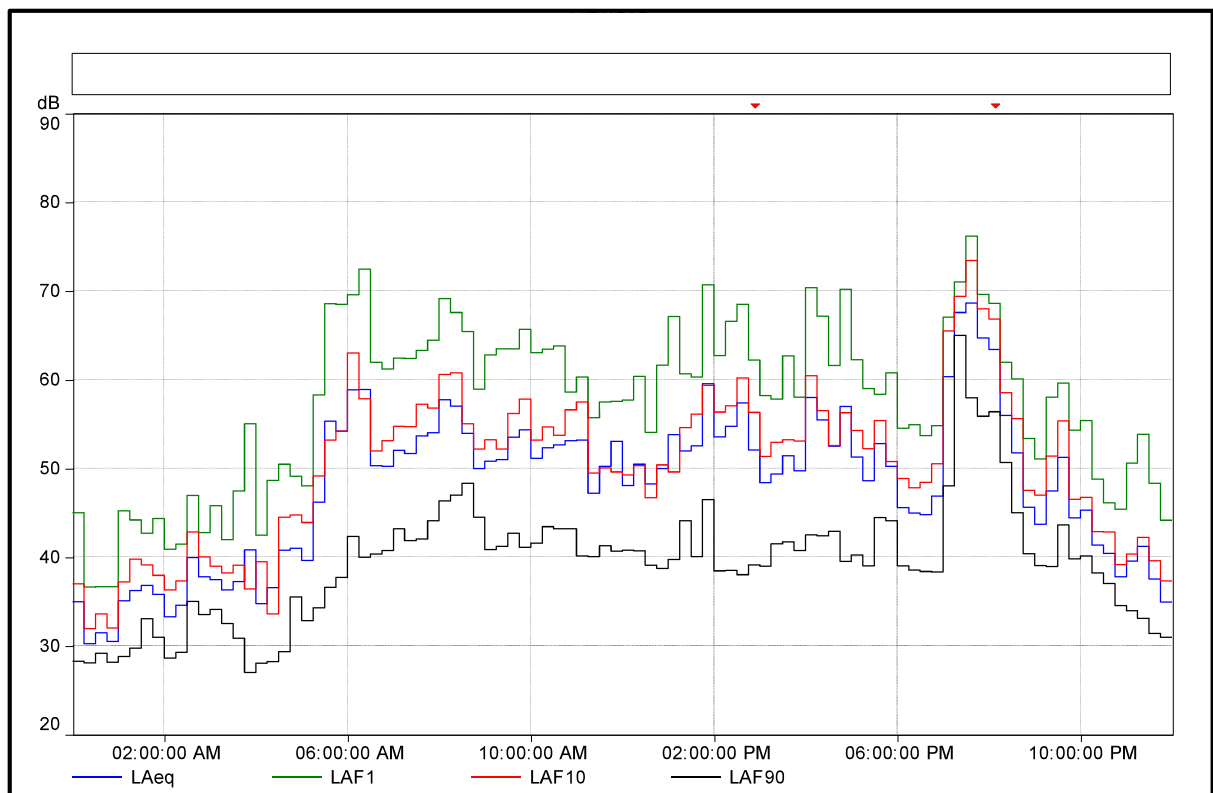
	Time	Frequency
Broad-band measurements:	S F I	A C
Broad-band statistics:	F	A
Octave measurements:	F	L
	Logging	
Log Rate:	0:15:00	
Broadband Parameters:	All	
Spectrum Parameters:	All	

Instrument Serial Number:	2487423
Microphone Serial Number:	
Input:	Microphone
Windscreen Correction:	None
S. I. Correction:	Frontal

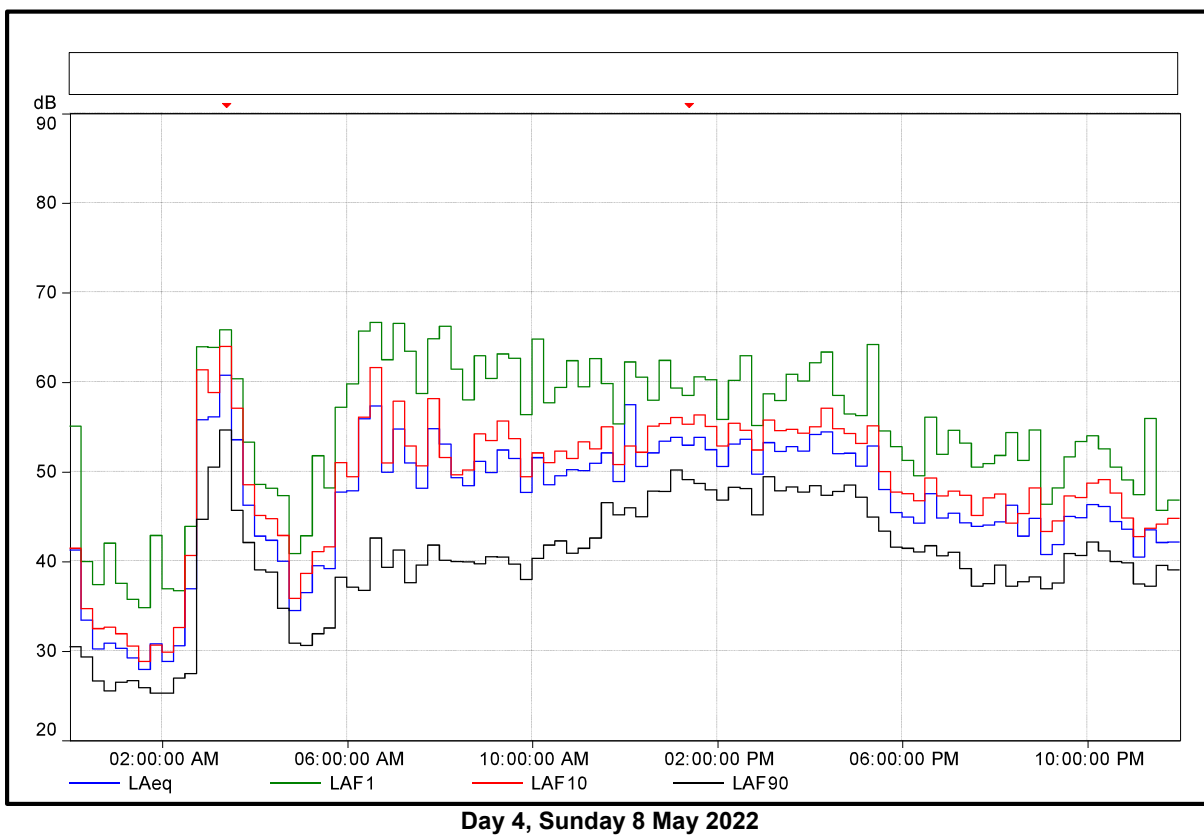
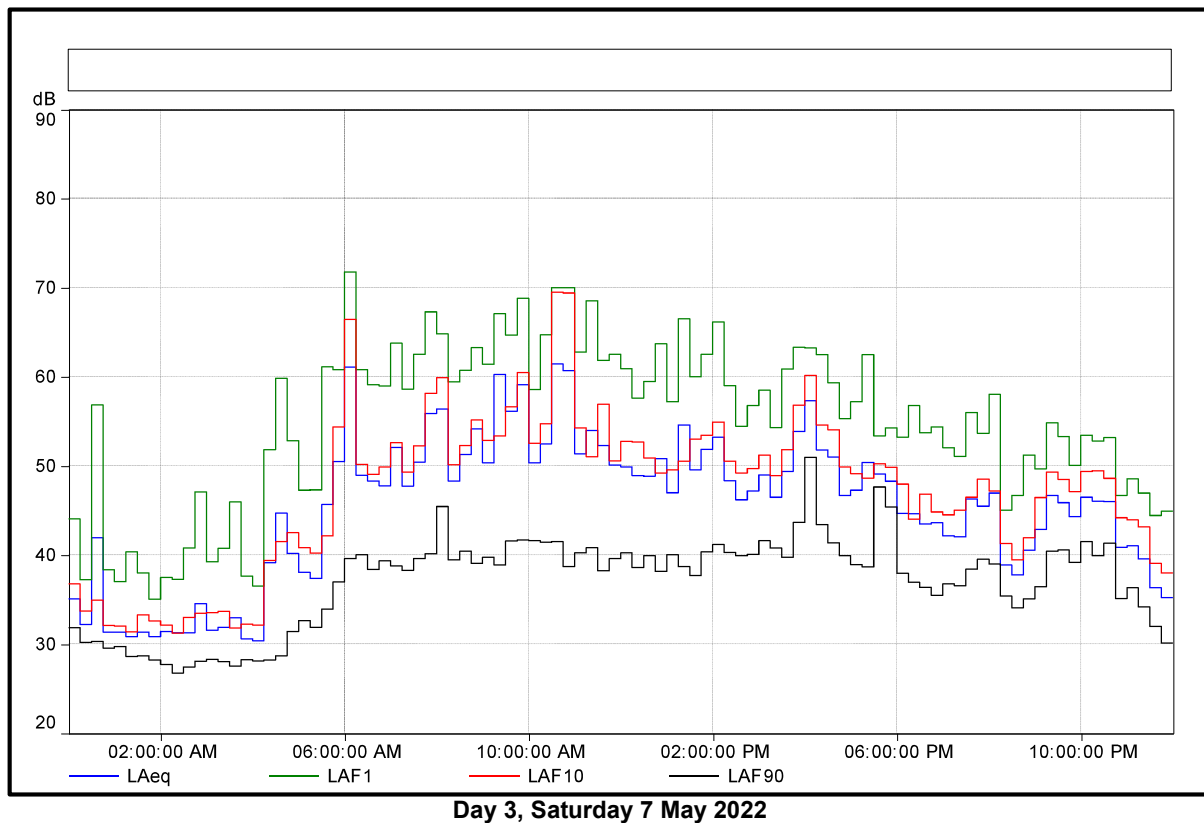
Calibration Time:	05/05/2022 11:56:03 AM
Calibration Level:	94.0 dB
Sensitivity:	-29.9 dB
ZF0023:	Not used

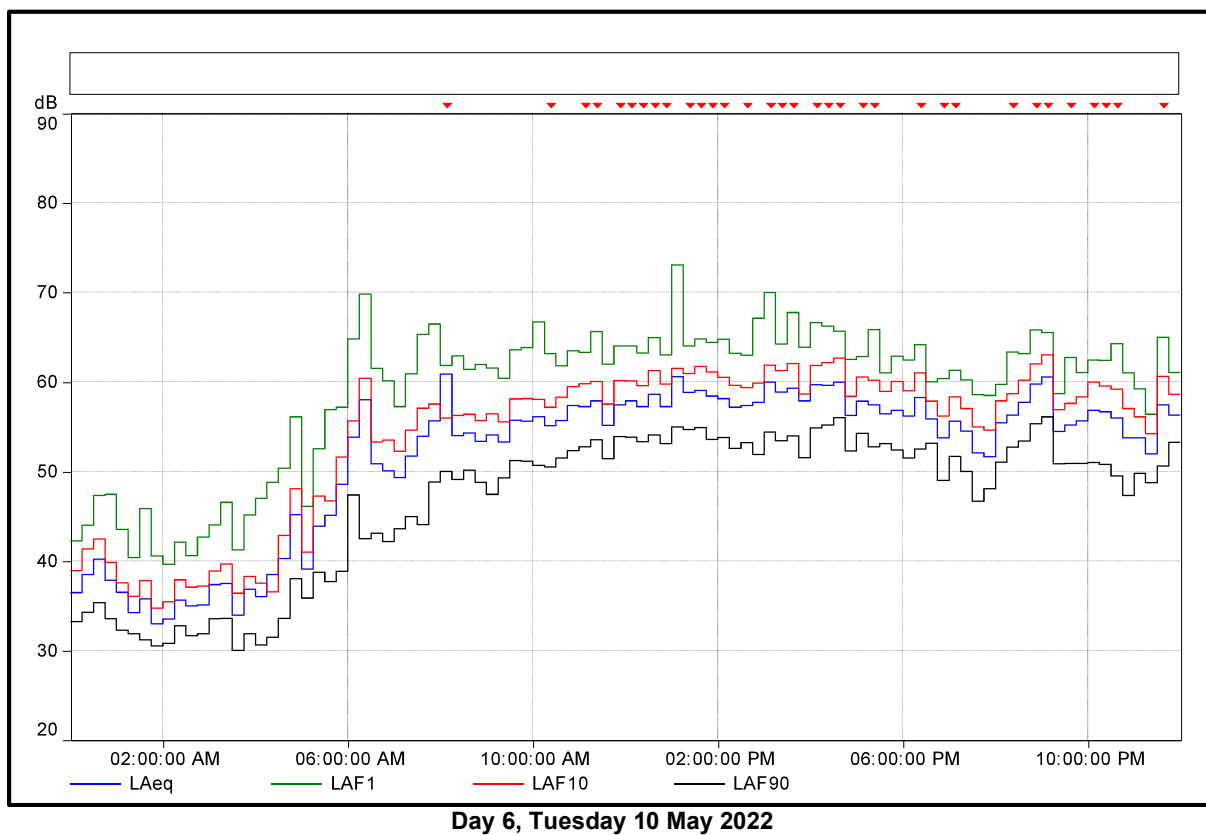
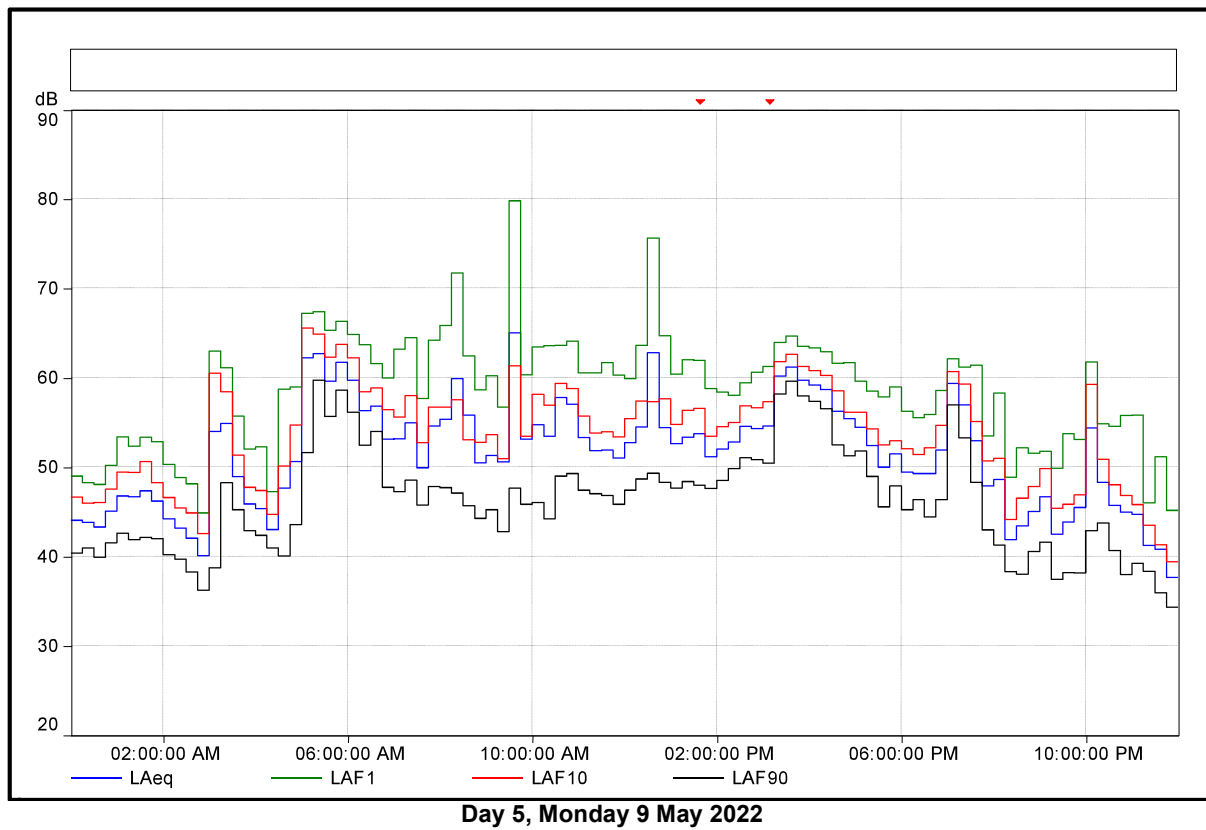


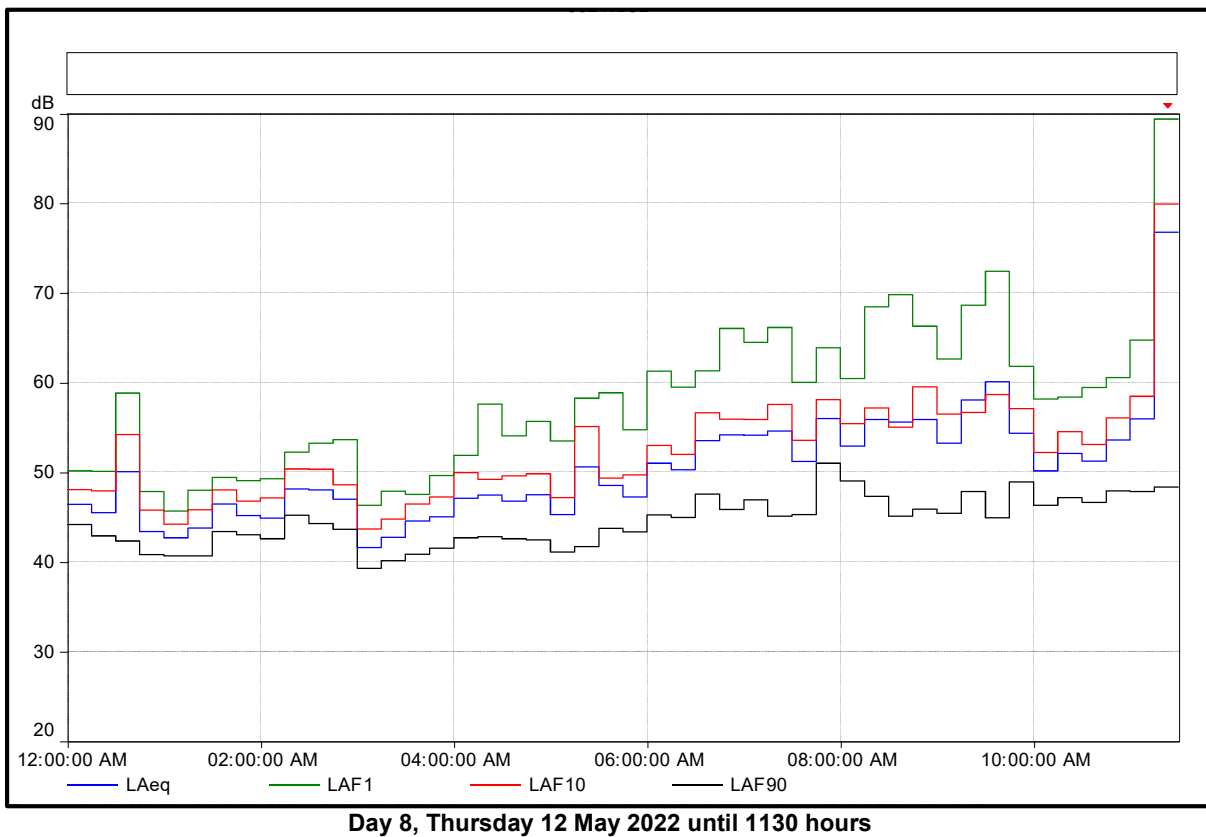
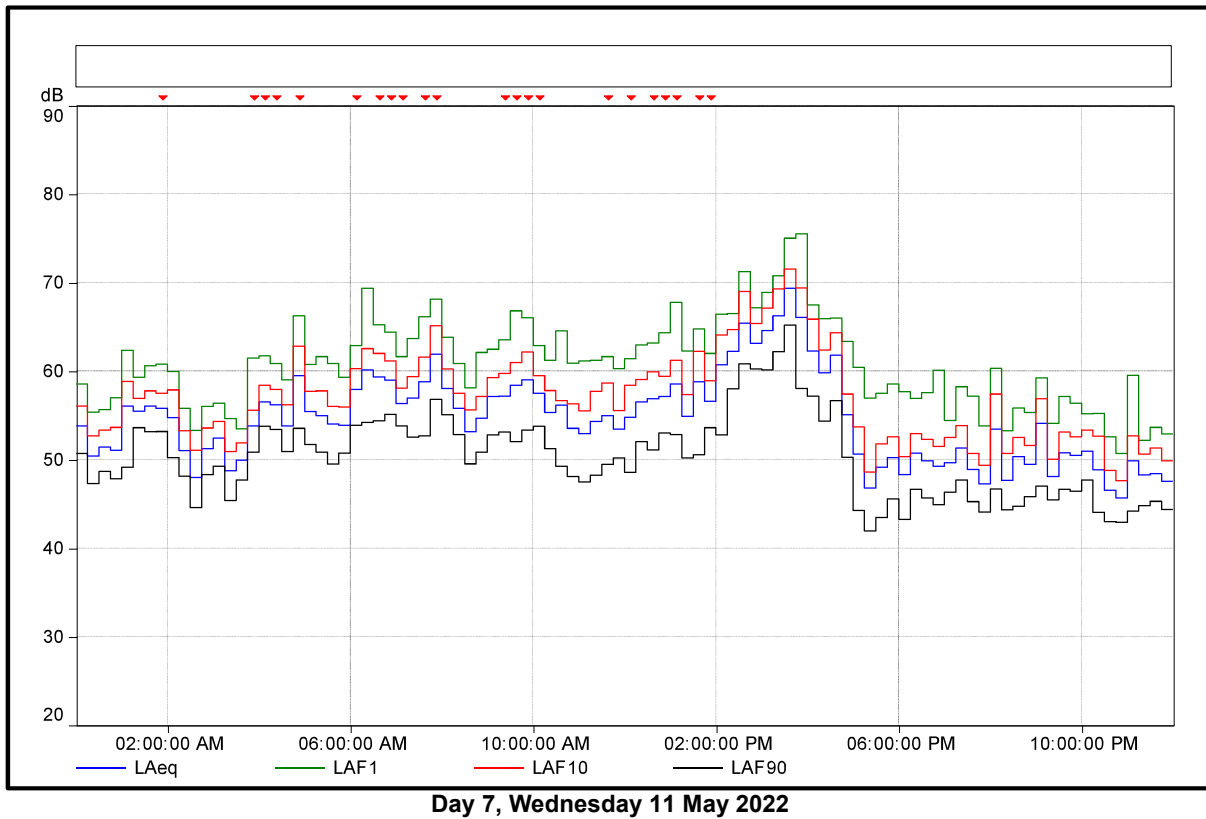
Day 1, Thursday 5 May 2022, from 1158 hours



Day 2, Friday 6 May 2022







APPENDIX C: ATMOSPHERIC CONDITIONS FOR MAY 2022, REDLAND

Redland, Queensland

May 2022 Daily Weather Observations

Australian Government

Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am				3pm								
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP	
																						°C
1	Su	17.4	23.0	0.2			S	30	11:14	20.6	89		S	6		20.4		86	S	11		
2	Mo	16.7	24.7	0			SSE	44	10:51	21.6	72		SSE	15		23.1	55		SE	20		
3	Tu	14.2	24.9	0			S	22	09:17	20.6	70		S	13		22.5	71		ESE	9		
4	We	15.0	25.0	0			SSE	15	09:13	20.9	80		S	6		23.7	68		ENE	2		
5	Th	18.0	26.1	0			N	20	22:12	22.4	86					24.3	74		NE	9		
6	Fr	20.3	26.7	0.6			S	30	19:22	20.9	96		WSW	9		25.9	69		SSW	6		
7	Sa	17.4	25.1	23.0			SW	31	22:45	21.1	84		WSW	6		22.6	81					
8	Su	16.1	22.6	5.4			SE	33	15:33	18.0	95		SW	6		22.2	73		SSE	15		
9	Mo	16.6	20.5	11.4			S	33	15:19	16.8	94		S	13		16.5	96		S	17		
10	Tu	15.9	23.6	22.0			SE	41	12:42	20.4	81		SSE	7		21.8	66		SE	19		
11	We	18.5	22.0	14.2			ESE	43	01:21	20.1	92		ESE	15		18.6	94		NE	22		
12	Th	18.5	23.2	38.8			NE	41	11:55	21.1	92		E	9		21.6	95		ENE	15		
13	Fr	20.4	23.9	35.2			NE	39	00:47	22.9	83		ENE	9		23.2	83		NE	11		
14	Sa	18.7	23.9	16.8			ESE	33	03:08	20.6	97		ESE	11		21.4	98		E	11		
15	Su	20.4	25.8	20.0			ENE	19	01:11	23.6	98		ENE	6		24.1	95		NNE	7		
16	Mo	20.6	27.0	4.2			NE	9	13:03	22.7	98		NNW	2		25.4	83		SE	4		
17	Tu	20.4	26.3	0.4			SE	46	15:49	22.5	96		SE	6		23.6	80		SE	17		
18	We	19.8	25.2	0			S	15	00:11	20.8	90		SSW	6		24.0	78		NE	7		
19	Th	17.4	22.9	4.2			SSE	30	13:00	19.6	96		SSE	11		21.4	69		SE	9		
20	Fr	17.4	20.8	0			S	28	19:49	19.2	76		SSE	9		18.3	84		SSE	9		
21	Sa	16.1	18.3	14.4			SE	35	09:09	17.3	98		SSE	7		17.2	97		SSW	7		
22	Su	16.2	20.8	29.4			SE	41	15:36	18.1	95		SE	9		17.9	88		SSE	17		
23	Mo	15.3	22.2	11.2			SSE	39	11:33	17.8	90		SSE	11		18.4	87		SSE	7		
24	Tu	15.6	22.1	23.8			S	31	11:00	17.3	94		SSE	11		20.6	77		SSE	11		
25	We	15.8	22.3	1.0			SE	30	13:28	19.6	79		SSE	9		18.9	80		SSE	9		
26	Th	14.5	23.0	3.8			SE	33	13:03	19.1	82		S	11		19.6	85		SE	13		
27	Fr	13.9	23.5	0			SE	30	11:09	20.3	74		SSE	11		22.0	61		SE	9		
28	Sa	13.7	24.4	0			SW	19	09:00	18.4	83		WSW	11		24.2	54		WSW	4		
29	Su	13.0	20.6	0.2			W	43	12:06	17.6	70		W	9		20.4	44		W	17		
30	Mo	11.2	20.0	0			W	52	22:25	16.5	64		NW	7		18.4	74		N	9		
31	Tu	14.3	20.0	0.4			W	57	11:41	16.3	49		W	26		18.8	44		W	24		
Statistics for May 2022																						
Mean		16.8	23.2							19.8	85			9			21.3	77			11	
Lowest		11.2	18.3							16.3	49			Calm			16.5	44		Calm		
Highest		20.6	27.0	38.8			W	57		23.6	98		W	26		25.9	98		W	24		
Total				280.6																		

Observations were drawn from Redland (Alexandra Hills) (station 140007)

IDCJDW4155 202205 - Prepared at 13:02 UTC on 5 Oct 2022

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