acousticworks

Proposed Church
3303-3305 Logan Road
Underwood

ACOUSTIC REPORT






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Evangelical Formosan Church of ROHI Inc.

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1. Introduction

This report is in response to a request by Evangelical Formosan Church of ROHI Inc. for an environmental noise impact assessment of a proposed church to be located at 3303-3305 Logan Road, Underwood. To facilitate the assessment, unattended noise monitoring was conducted in the vicinity of nearby residences to establish the criteria for onsite activities. Based on the data obtained, onsite activities were assessed to surrounding sensitive receivers with recommendations for acoustic treatments specified in this report.

2. Site Description

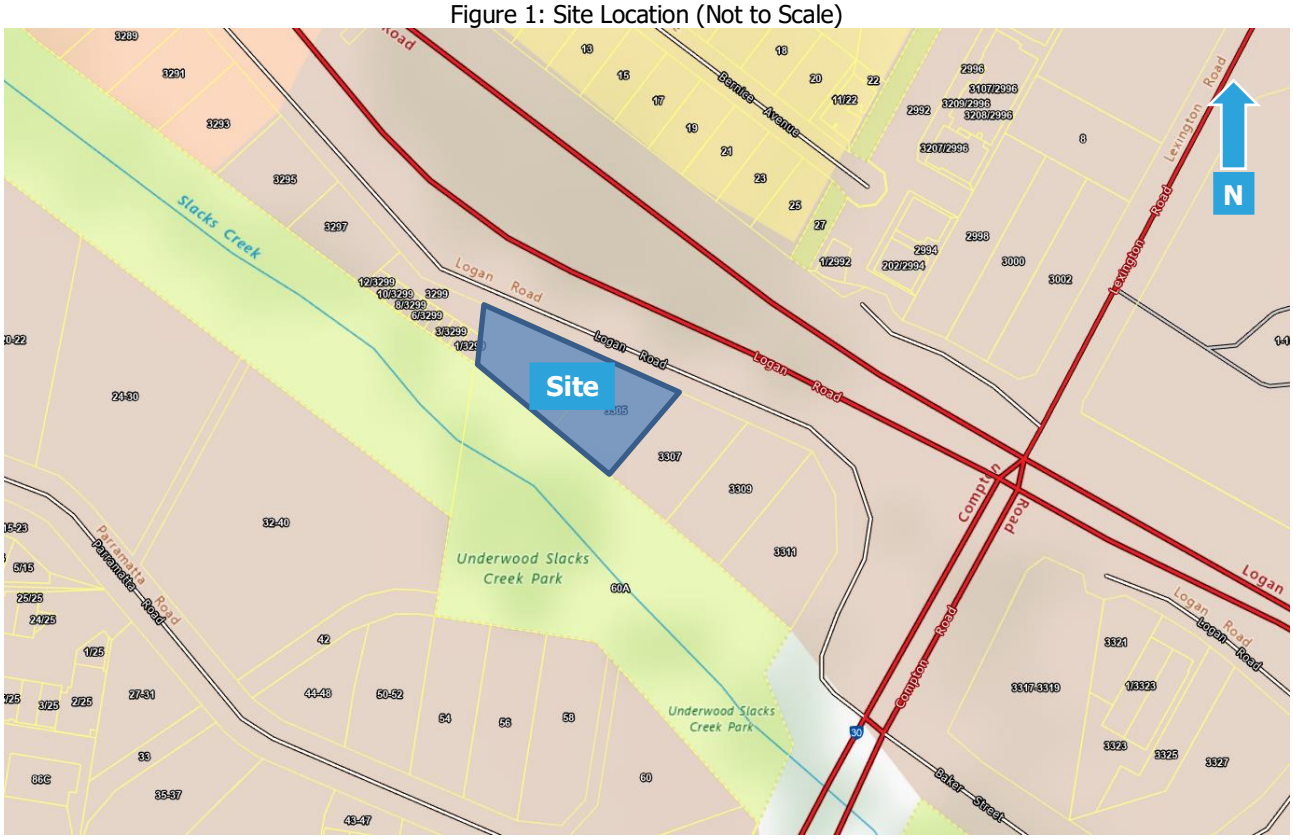
2.1 Site Location

The site is described by the following:

3303-3305 Logan Road, Underwood
Lots 36 and 37 on SL10904

Refer to Figure 1 for site location.

Figure 1: Site Location (Not to Scale)



A site survey was conducted on 5 December 2022 and identified the following:

a) The site is currently a vacant lot with a small two storey building on the northwestern boundary, which will be demolished to make way for the new development.
b) A one storey commercial building bounds the site to the northwest.
c) An industrial building is adjacent the southeastern boundary of the site.
d) Logan Road and a nature reserve separates the site from one storey and two storey residential dwellings on Bernice Avenue.
e) Slacks Creek and Underwood Slacks Creek Park separates to the site to the south from industrial land uses.

2.2 Proposal

The proposal is to develop a church and relevant facilities as follows:

- Total site area of 3,441m^2.
- Carparking will be located generally in the eastern half of the site. The carpark will have capacity for a total of 62 vehicles.
- The church will include a main hall, foyer, offices, multi-purpose rooms, a kitchen and outdoor courtyards.
- The capacity of the main hall is between 70 – 100 patrons.
- Operating hours of the church are based on Sunday Worship times between 2:00pm to 3:30pm. All activity is assessed within the daytime period (7am-6pm).
- Site access will be via Logan Road.

Refer to the Appendix for proposed development plans.

2.3 Zoning

Review of the Logan Planning Scheme Interactive Mapping indicates that the proposed development is located within a Mixed-Use zone. Sensitive uses in the vicinity are also zoned Mixed Use, Recreation and Open Space and Medium Density Residential.

2.4 Acoustic Environment

The site is primarily affected by road traffic noise from Logan Road and noise from industrial uses in the locality.

3. Equipment

The following equipment was used to facilitate the ambient noise monitoring:

- Rion NL42 Environmental Noise Monitor
- Pulsar Model 105 Sound Calibrator

The Environmental Noise Monitors hold current NATA Laboratory Certification and were field calibrated before and after the monitoring period, with no significant drift from the reference signal recorded.

4. Receivers and Noise Monitoring Locations

4.1 Receiver Locations

The nearest sensitive receiver locations were identified as follows;

1. One and two storey residential dwelling located north of the site at 13-27 Bernice Avenue, zoned medium-density residential.
2. Two storey industrial buildings located to the southeast of the site at 3307 Logan Road, zoned mixed-use.
3. Industrial land uses located to the south of the site on Parramatta Road, zoned mixed-use.
4. A two-storey commercial/retail precinct located to the northwest of the site at 3299 Logan Road, zoned mixed-use.

These locations were chosen as being representative of the nearest sensitive receivers to the proposed development. Refer to Figure 2 for these locations.

Figure 2: Noise Monitor and Sensitive Receiver Locations



4.2 Unattended Noise Monitoring

A Rion NL42 environmental noise monitor was placed at 23 Bernice Avenue to measure ambient noise levels. This location was selected as it was the only appropriate and secure location to place a noise monitor. The monitor was located in a free field position with the microphone approximately 1.4 metres above ground surface level. The monitor was set to record noise levels between 5 December 2022 and 12 December 2022.

The noise monitor was set to record noise levels in "A" Weighting, Fast response using 15-minute statistical intervals. Background noise monitoring was conducted generally in accordance with Australian Standard AS1055:2018 *Acoustics – Description and measurement of environmental noise*.

Refer to Figure 2 for noise monitoring location.

5. Measured Noise Levels

This section presents the measured road traffic and background noise levels and the weather conditions during the monitoring period. Any periods of inclement weather or extraneous noise were omitted from the measured data prior to determining the overall results.

5.1 Meteorological Conditions

Meteorological observations during the unattended noise monitoring period were obtained from the Bureau of Meteorology website (http://www.bom.gov.au/climate/data), shown in Table 1 below.

Table 1: Meteorological Conditions – Logan City

Day	Date	Rainfall (mm)	Wind			
			9am		3pm	
			Speed (km/h)	Direction	Speed (km/h)	Direction
Monday	5/12/22	0	4	S	7	E
Tuesday	6/12/22	0	2	W	9	NW
Wednesday	7/12/22	0	Calm	-	2	NE
Thursday	8/12/22	2.2	2	N	4	NE
Friday	9/12/22	0	4	SE	4	E
Saturday	10/12/22	0	2	E	*	*
Sunday	11/12/22	0	2	E	*	*
Monday	12/12/22	0	Calm	-	4	N
Tuesday	13/12/22	14.0	4	SW	4	SE

*BOM weather data not available.

5.2 Ambient Noise Levels

The background noise levels measured at the monitoring location are as follows:

Table 2: Measured Ambient Noise Levels – Monday to Saturday

Day	Date	L90 dB(A)		
		Day (7am-6pm)	Evening (6pm to 10pm)	Night (10pm-7am)
Monday	5/12/22	49	48	39
Tuesday	6/12/22	50	47	42
Wednesday	7/12/22	50	47	43
Thursday	8/12/22	53	50	45
Friday	9/12/22	54	47	44
Saturday	10/12/22	51	47	41
Monday	12/12/22	54	48	42
Tuesday	13/12/22	55*	-	47*
Overall value		52	48	42

*Measurement data affected by rain and removed prior to determining overall value.

Table 3: Measured Ambient Noise Levels - Sunday

Day	Date	L90 dB(A)		
		Day	Evening	Night
Sunday	11/12/22	51	46	40

Refer to the appendix for a graphical representation of the noise monitoring.

6. Noise Criteria

6.1 Logan City Council - Environmental Noise Criteria

The noise criteria for the receiver zone as applied by Logan City Council in SC6.2.3 Planning Scheme Policy 3 of the Logan Planning Scheme 2015 v8.1 are detailed as follows:

6.1.1 Noise Emission Standards – Residential Amenity (Receiver 1)

Table 4 details the criteria for noise sensitive uses within a Medium Density Residential zone (Receiver 1).

Table 4: Logan City Council noise criteria – Noise Emission Standards for the Protection of Residential Amenity

Noise Type	Time Period	Monday to Saturday	Sunday and Public Holidays
Non-steady sound	Daytime (7am - 6pm)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 5dB(A)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 5dB(A)
	Evening (6pm - 10pm)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 5dB(A)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 5dB(A)
	Night (10pm - 7am)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 0dB(A) and $L_{Amax} \leq$ 60dB(A)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 0dB(A) and $L_{Amax} \leq$ 60dB(A)
Continuous noise	Anytime	$L_{A90,T}$ plus 0dB(A)	$L_{A90,T}$ plus 0dB(A)

6.1.1.1 Applicable Noise Criteria – Receiver 1

Based on the measured ambient noise levels in Section 5, the noise criteria applicable to Receiver 1 are as follows. Note that as the site operates primarily on a Sunday, these criteria has been used to provide the worst case. It is also expected that the church will only operate during the daytime period.

Table 5: Applicable Noise Criteria – Residential Amenity, Daytime Period

Noise Type	Time Period	Monday to Saturday L_{Aeq} dB(A)	Sunday L_{Aeq} dB(A)
Non-steady sound	Daytime (7am - 6pm)	56	56
Continuous noise	Anytime	51	51

6.1.2 Noise Emission Standards – General Amenity (Receivers 2, 3 and 4)

Table 6 details the criteria for noise sensitive uses within a Mixed-Use zone (Receivers 2, 3 and 4).

Table 6: Logan City Council Criteria – Noise Emission Standards for the Protection of General Amenity

Noise Type	Time Period	Monday to Saturday	Sunday and Public Holidays
Non-steady sound	Daytime (7am - 6pm)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 10dB(A)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 5dB(A)
	Evening (6pm - 10pm)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 10dB(A)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 5dB(A)
	Night (10pm - 7am)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 5dB(A) and $L_{Amax} \leq$ 80dB(A)	$L_{Aeq\ adj,T} \leq L_{A90}$ plus 5dB(A) and $L_{Amax} \leq$ 80dB(A)
Continuous noise	Anytime	$L_{A90,T}$ plus 5dB(A)	$L_{A90,T}$ plus 5dB(A)

6.1.2.1 Applicable Noise Criteria – Receivers 2, 3 and 4

Based on the measured ambient noise levels in Section 5, the noise criteria applicable to Receivers 2, 3 and 4 are as follows. Note that as the site operates primarily on a Sunday, these criteria have been used to provide the worst-case. It is also expected that the church will only operate during the daytime period.

Table 7: Applicable Noise Criteria – General Amenity, Daytime Period

Noise Type	Time Period	Monday to Saturday L_{Aeq} dB(A)	Sunday L_{Aeq} dB(A)
Non-steady sound	Daytime (7am - 6pm)	61	56
Continuous noise	Anytime	56	56

7. Environmental Assessment

7.1 Noise levels from church patrons

Noise associated with patrons is based on a technical paper '*Prediction of Noise from Small to Medium Sized Crowds*' (Hayne et al, 2011). The paper was based upon attended noise measurements conducted at a sample of premises to account for range of patron numbers. Based on the measured levels, the resulting analysis determined that the Sound Power Level (LAeq, T) of a small-medium crowd could be predicted by the following equation:

L_{WAeq} = 15 log (number of patrons) + 64 dB(A) (approx. maximum 100 patrons)

Using the above formula, the predicted overall sound power level generated by attendees within each area is presented in Table 8.

Table 8: Predicted sound power levels of attendees – General Sunday Services

Attendees/Area	Expected maximum number of guests (worst case)	Predicted Sound Power Level dB(A)
Main Hall	100	94
MPR – English Service	25	85
MPR A/B/C	20	84
Courtyard	100	94

Based on omnidirectional radiation into free space, the equivalent source sound pressure levels when measured at 1m are taken to be 8dB(A) lower than the sound power levels presented. This has been calculated using the methodology contained in Chapter 6 of *Engineering Noise Control Theory and Practice (Fourth Edition) by David A. Bies and Colin H. Hansen.*

To provide the worst-case noise impacts, the calculations in the following section are based on all church attendees being located in the outdoor courtyard.

7.2 Noise from general sources

Noise from general sources associated with the development, such as car park activities etc., has been assessed based on measurements of similar activities taken from previous projects. The calculations assume that the activities are located at the closest point within the development site to each receiver location and the calculation distances used in the assessment are based on impacts at the lot boundaries of the receivers. Noise emanating from the main church hall assumes that all windows and doors are fully open. Any relevant shielding, building transmission loss or recommended acoustic treatment is taken into account in the assessment.

The calculations also assume that all activities occur simultaneously, which may not be the case in practice. Hence, the assessment is considered to be conservative. The noise source levels and predicted impacts at the receiver locations are shown in the following table;

Table 9: Noise Emission Standards Assessment – Daytime Period, Sundays

Receiver	Description	Source Leq@1m dB(A)	Correction dB(A)*	Corrected Leq@1m dB(A)	No. of events per 15min Day	Duration per event	Distance (m)	Barrier (height (m)) Inc	Barrier screening dB	Building TL or shield dB	Topo screening dB	Dist atten. @-6dB/dd	LAeq adj,T ext. dB(A) Day	LAeq 15 min Compliance Day
	Receivers 1. 13-27 Bernice Avenue (N) 2. 3307 Logan Road (SE) 4. Paramatta Road (S) 3. 3299 Logan Road (NW)													
	Criteria													56
	Car passby	69		69	25	15	98					-40	25	Yes
1	Car door closure	75	2	77	25	2	101					-41	23	Yes
	Car start	74	2	76	25	2	101					-41	22	Yes
	Carpark Voice Conversation	70		70	1	900	103					-41	29	Yes
	Van delivery	85	2	87	1	60	111					-41	34	Yes
	Amplified Music Church Auditorium	90		90	1	900	119			-10		-42	38	Yes
	Outdoor Courtyard Patrons	86		86	1	900	104					-41	45	Yes
	MPR - English Service	77		77	1	900	112			-10		-41	26	Yes
	MPR A/B/C	76		76	1	900	117			-14		-42	20	Yes
	Total												46	**Yes**
	Criteria													56
	Car passby	69		69	25	15	12					-22	43	Yes
2	Car door closure	75	2	77	25	2	13					-22	42	Yes
	Car start	74	2	76	25	2	13					-22	41	Yes
	Carpark Voice Conversation	70		70	1	900	19					-26	44	Yes
	Amplified Music Church Auditorium	90		90	1	900	56			-10		-35	45	Yes
	Outdoor Courtyard Patrons	86		86	1	900	49					-34	52	Yes
	MPR - English Service	77		77	1	900	74			-18		-37	22	Yes
	MPR A/B/C	76		76	1	900	70			-21		-37	18	Yes
	Total												54	**Yes**
	Criteria													56
	Car passby	69		69	25	15	75					-38	27	Yes
3	Car door closure	75	2	77	25	2	70					-37	28	Yes
	Car start	74	2	76	25	2	70					-37	27	Yes
	Carpark Voice Conversation	70		70	1	900	82					-38	32	Yes
	Amplified Music Church Auditorium	90		90	1	900	73			-10		-37	43	Yes
	Outdoor Courtyard Patrons	86		86	1	900	88			-19		-39	28	Yes
	MPR - English Service	77		77	1	900	80			-10		-38	29	Yes
	MPR A/B/C	76		76	1	900	74			-10		-37	29	Yes
	Total												43	**Yes**
	Criteria													56
	Car passby	69		69	25	15	58			-6		-36	23	Yes
4	Car door closure	75	2	77	25	2	64			-4		-36	24	Yes
	Car start	74	2	76	25	2	64			-4		-36	23	Yes
	Carpark Voice Conversation	70		70	1	900	55			-6		-35	29	Yes
	Amplified Music Church Auditorium	90		90	1	900	40			-16		-32	42	Yes
	Outdoor Courtyard Patrons	86		86	1	900	24	1.8	-8			-28	50	Yes
	MPR - English Service	77		77	1	900	17			-10		-25	42	Yes
	MPR A/B/C	76		76	1	900	16			-10		-24	42	Yes
	Total												52	**Yes**

*Correction due to tonality and impulsiveness as per AS1055:2018.

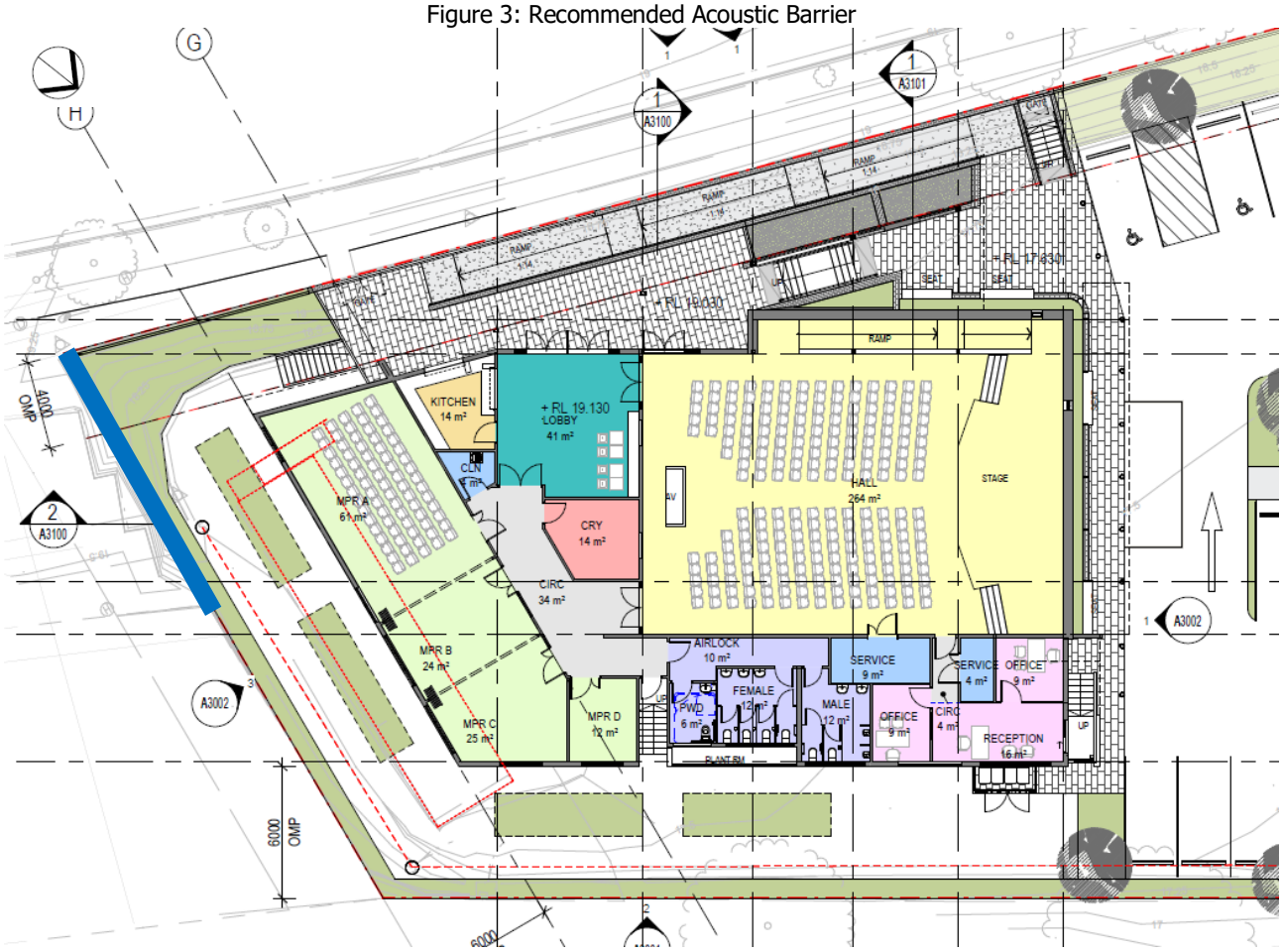
Compliance is predicted with the intrusive noise criteria on the condition the recommendations in Section 8 are implemented.

8. Recommendations

8.1 Acoustic Barriers

An acoustic barrier is recommended to be constructed along the northwestern site boundary as shown in Figure 3. The height of the barrier shall be 1.8m above the finished boundary level on the higher side of the retaining wall, i.e. a base RL of 19.25m). The barrier shall be constructed using 19mm thick lapped timber (minimum 50% overlap), masonry, fibre cement sheet, Hebel, Perspex, plywood, or other material with a minimum surface density of 12.5kg/m^2. The barrier shall be free of gaps and holes. If gates are required, all gaps are kept to a minimum when the gates are closed (maximum of gap of 10-20mm along the base and maximum 5mm along the sides).

Figure 3: Recommended Acoustic Barrier



Acoustic barrier 1.8m high above top of retaining wall, base RL 19.25m

8.2 Onsite Activities

Compliance is predicted with Logan City Council assessment criteria at the nearest receivers for the proposed operation of the development on the condition the following recommendations are implemented:

- Music in the main church hall has been assessed based on a measurement of 90dB(A) Leq taken at 1m from the speaker. If music is played at this level, then compliance with the noise criteria is predicted for all time periods. However, if a higher noise level is desired, we recommend that staff verify compliance by standing at the boundaries of the neighbouring receivers, listening, and adjusting the volume until the music is inaudible.
- Waste collection is to be conducted in accordance with existing commercial uses in the area to minimise the potential for disturbance.

8.2.1 Onsite Mechanical Plant

No information regarding mechanical services was available at the time of the assessment. We recommend that any new mechanical plant is designed to comply with the continuous noise criteria stated in Section 6 with an assessment by a qualified acoustic consultant to be conducted prior to installation.

9. Conclusion

An environmental noise assessment was conducted for the proposed church to be located at 3303-3305 Logan Road, Underwood. On the condition the recommendations detailed in Section 8 are implemented, compliance is predicted with Logan City Council assessment criteria.

If you should have any queries, please do not hesitate to contact us.

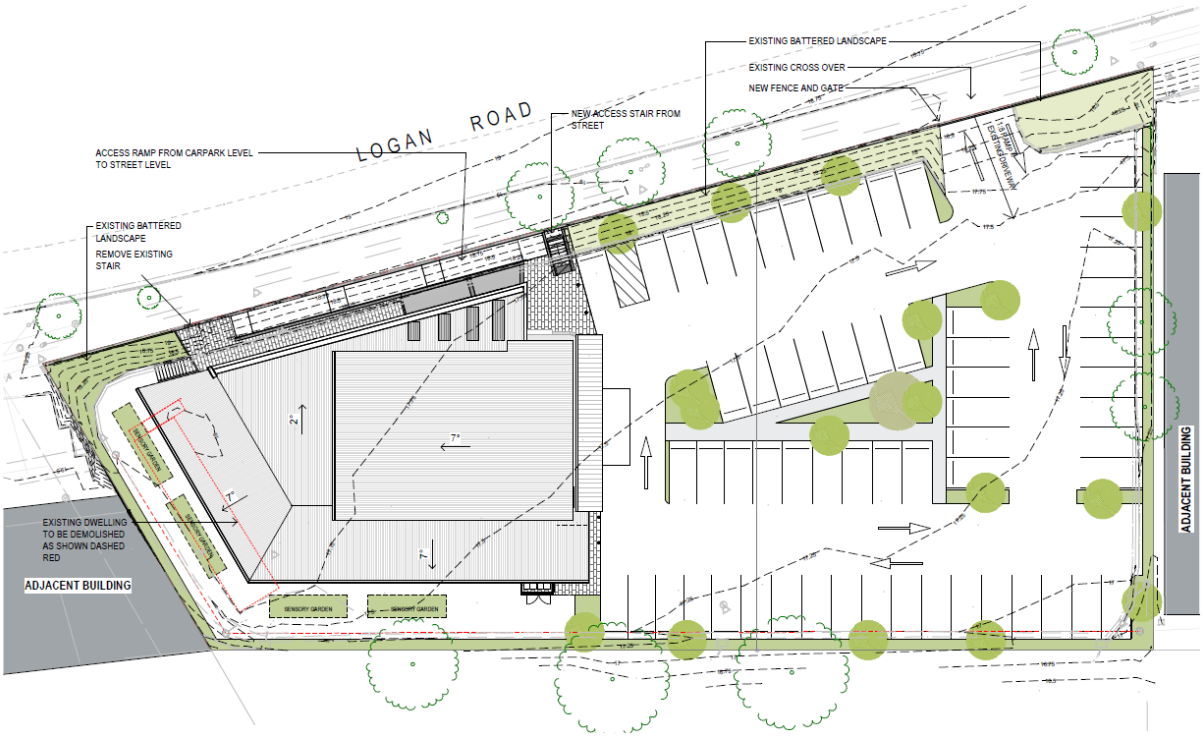
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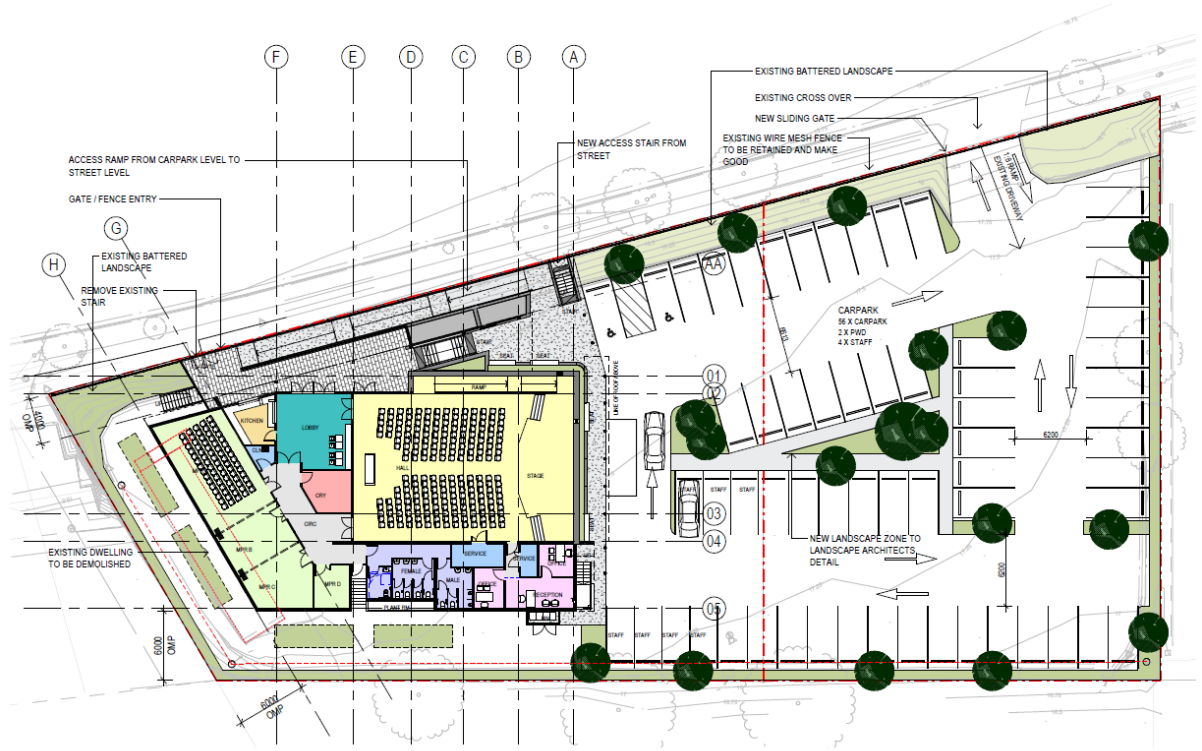
10. Appendices

10.1 Development Plans



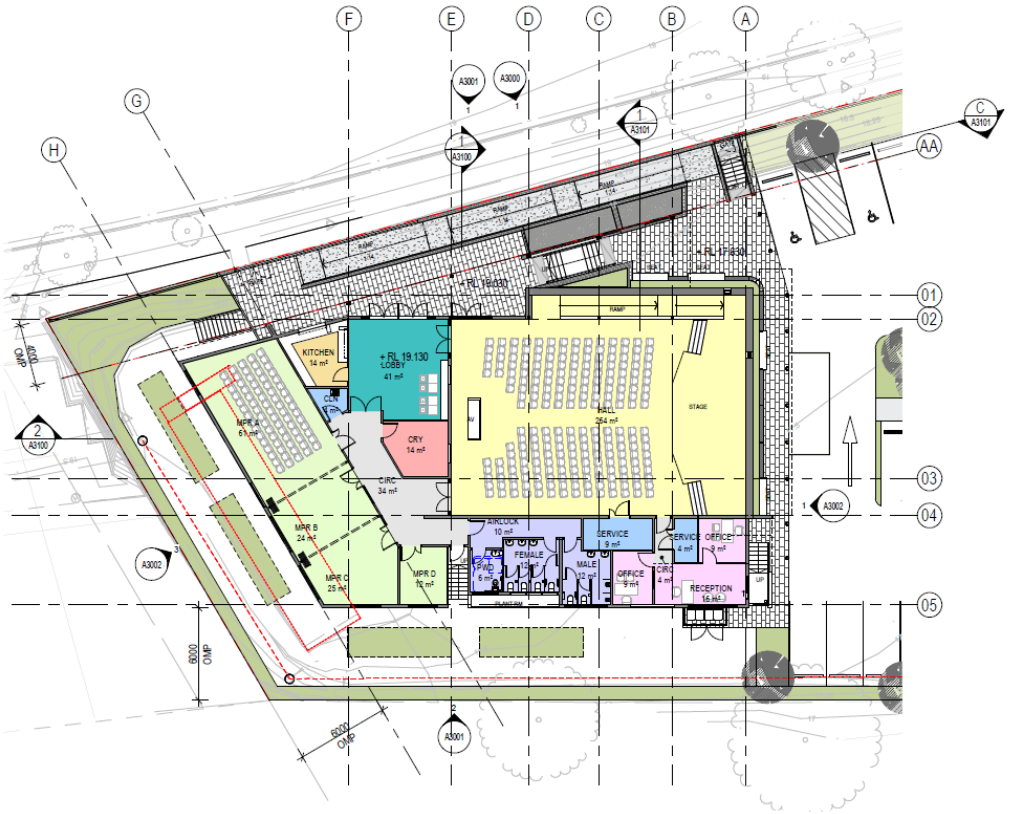
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DRAFT	DRAWING	NUMBER	REVISION	DATE	SCALE	PROJECT NAME
FOR EFC ROHI	SITE PLAN	A1100	A	11.04.2023	As indicated3	3303-3305 LOGAN ROAD



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FOR EFC ROHI	OVERALL CARPARK & LANDSCAPE PLAN	A1101	A	11.04.2023	1 : 250 @ A3	3303-3305 LOGAN ROAD



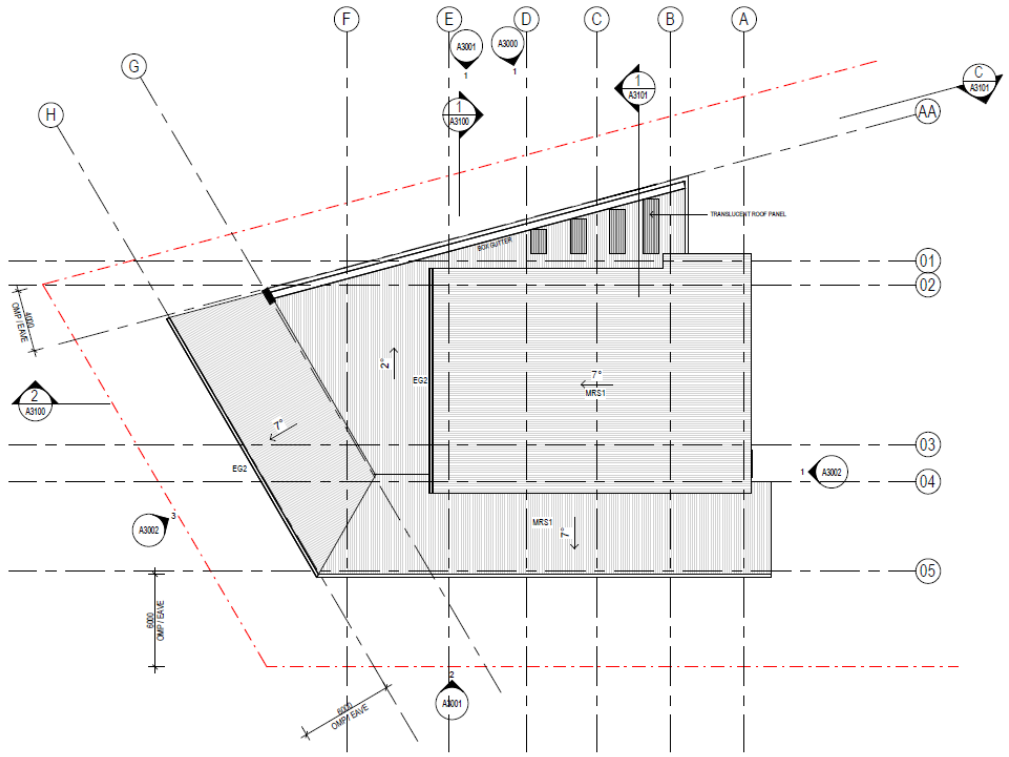
ROOM AREA SCHEDULE

ROOM NAME	AREA
AIRLOCK	10 m²
CIRC	34 m²
CIRC	4 m²
CLN	4 m²
CRY	14 m²
FEMALE	12 m²
HALL	264 m²
KITCHEN	14 m²
LOBBY	41 m²
MALE	12 m²
MPR A	61 m²
MPR B	24 m²
MPR C	25 m²
MPR D	12 m²
OFFICE	9 m²
OFFICE	9 m²
PWD	6 m²
RECEPTION	16 m²
SERVICE	9 m²
SERVICE	4 m²
20	583 m²

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DRAFT
FOR EFC ROHI

DRAWING	NUMBER	REVISION	DATE	SCALE	PROJECT NAME
GROUND FLOOR GA PLAN	A2000	A	11.04.2023	1 : 200@ A3	3303-3305 LOGAN ROAD

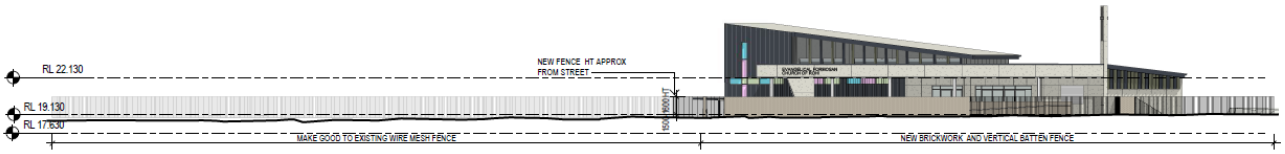


1 ROOF PLAN
1 : 200

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DRAWING	NUMBER	REVISION	DATE	SCALE	PROJECT NAME
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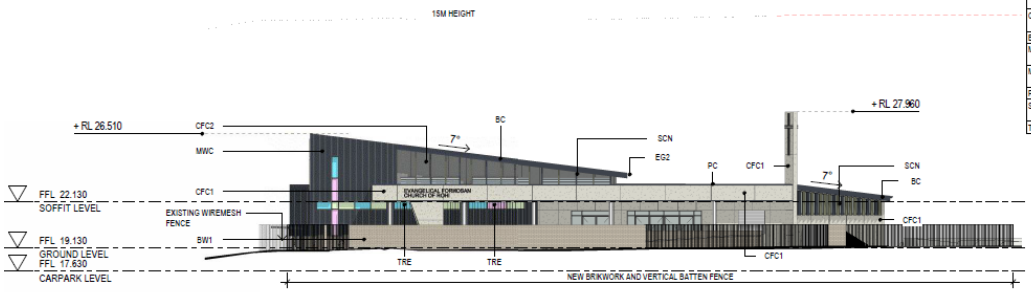


1 A1100 STREET ELEVATION
1 : 250

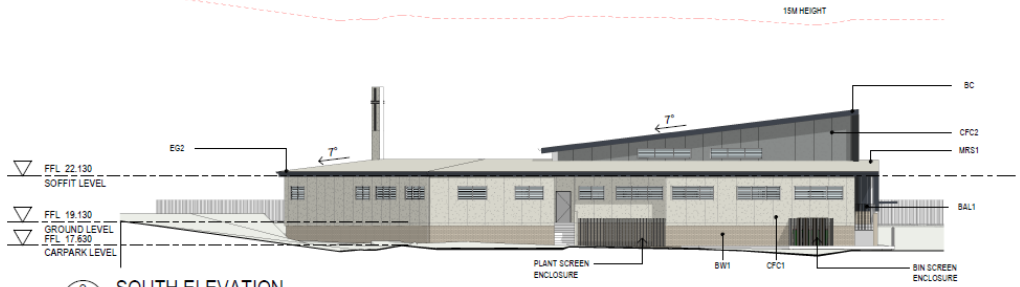
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DRAFT	DRAWING	NUMBER	REVISION	DATE	SCALE	PROJECT NAME
FOR EFC ROHI	STREET ELEVATION	A3000	A	11.04.2023	1 : 250 @ A3	3303-3305 LOGAN ROAD

LEGEND	
BAL1	AS1428.1 COMPLIANT 1500mm AFFL HIGH GALVANISED STEEL BALUSTRADE
BC	BARGE CAPPING - IRONSTONE
BW1	BRICKWORK - PGH MOONDUST
CFC1	EXPRESS JOINT CLADDING - COMPRESSED FIRBE CEMENT SHEET - SURFMIST
CFC2	EXPRESS JOINT CLADDING - COMPRESSED FIRBE CEMENT SHEET - WINGSPRAY
EG2	EAVES GUTTER COLORBOND IRONSTONE
MRS1	METAL ROOF SHEETING LYSAGHT TRIMDEK COLORBOND SURFMIST
MWC	EXTERNAL METAL WALL CLADDING LYSAGHT LONGLINE - IRONSTONE
PC	PARAPET WALL METAL CAPPING - IRONSTONE
SCN	VERETICA ALUMINIUM BLADE SCREEN - RANDOM COLOURS MANGROME & IRONSTONE
TRE	STAINLESS STEEL WIRE TRELLIS



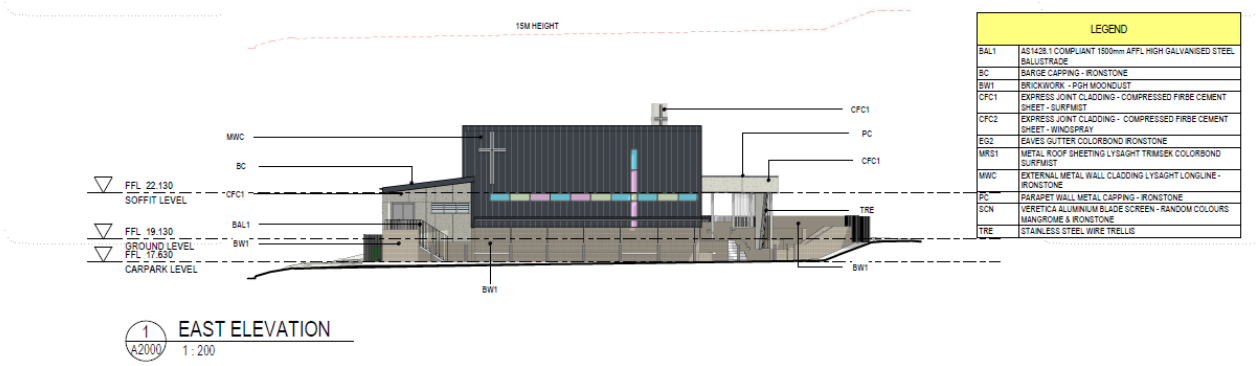
1 A2000 NORTH ELEVATION
1 : 200



2 A1100 SOUTH ELEVATION
1 : 200

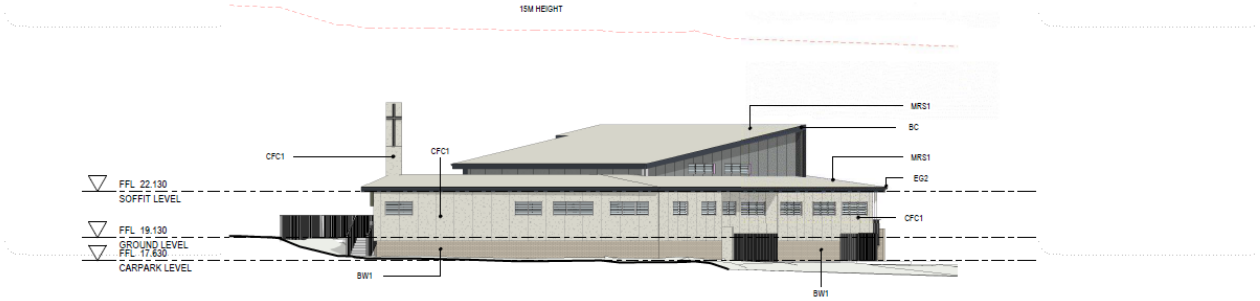
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DRAFT	DRAWING	NUMBER	REVISION	DATE	SCALE	PROJECT NAME
FOR EFC ROHI	ELEVATION SHEET 1	A3001	A	11.04.2023	1 : 200 @ A3	3303-3305 LOGAN ROAD



LEGEND	
BAL1	AS1428.1 COMPLIANT 1500mm AFFL HIGH GALVANISED STEEL BALUSTRADE
BC	BARGE CAPPING - IRONSTONE
BW1	BRICKWORK - PGH MOONDUST
CFC1	EXPRESS JOINT CLADDING - COMPRESSED FIRBE CEMENT SHEET - SURFMIST
CFC2	EXPRESS JOINT CLADDING - COMPRESSED FIRBE CEMENT SHEET - WINDSPRAY
EG2	EAVES GUTTER COLORBOND IRONSTONE
MRS1	METAL ROOF SHEETING LYSAGHT TRIMDEK COLORBOND SURFMIST
MWC	EXTERNAL METAL WALL CLADDING LYSAGHT LONGLINE - IRONSTONE
PC	PARAPET WALL METAL CAPPING - IRONSTONE
SCN	VERETICA ALUMINIUM BLADE SCREEN - RANDOM COLOURS MANGROME & IRONSTONE
TRE	STAINLESS STEEL WIRE TRELLIS

1 A2000 EAST ELEVATION
1 : 200



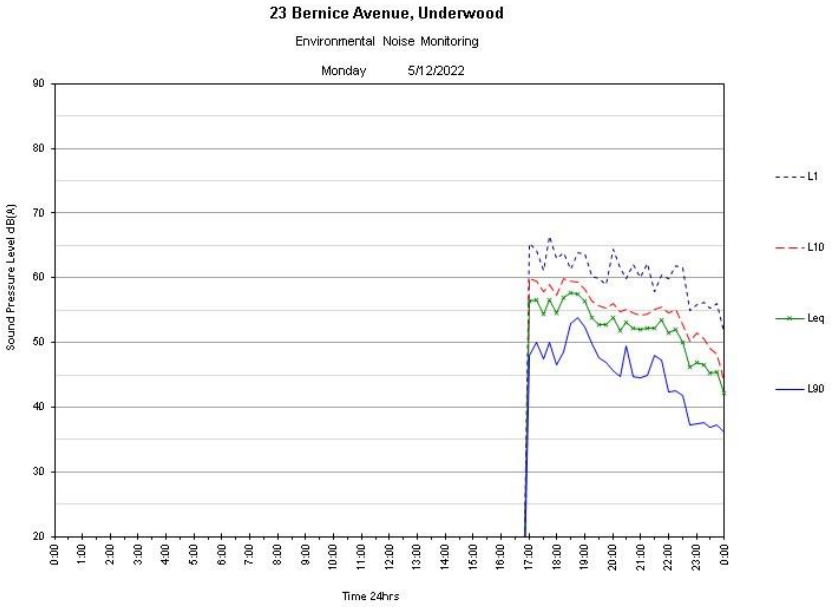
3 A1100 WEST ELEVATION 2
1 : 200

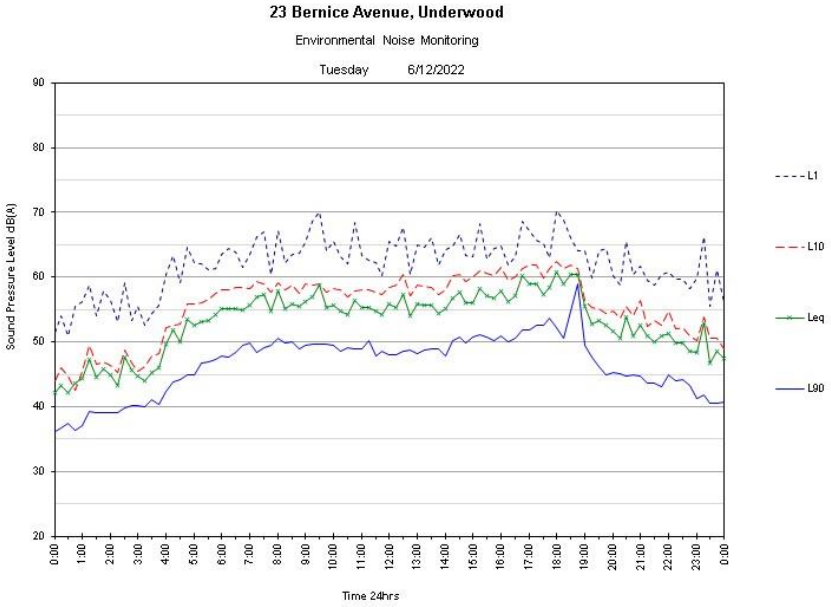
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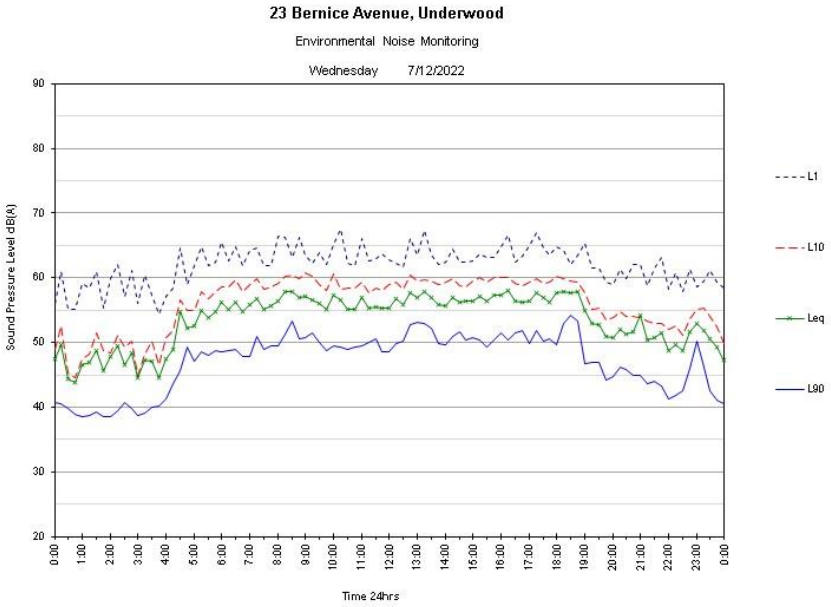
DRAFT

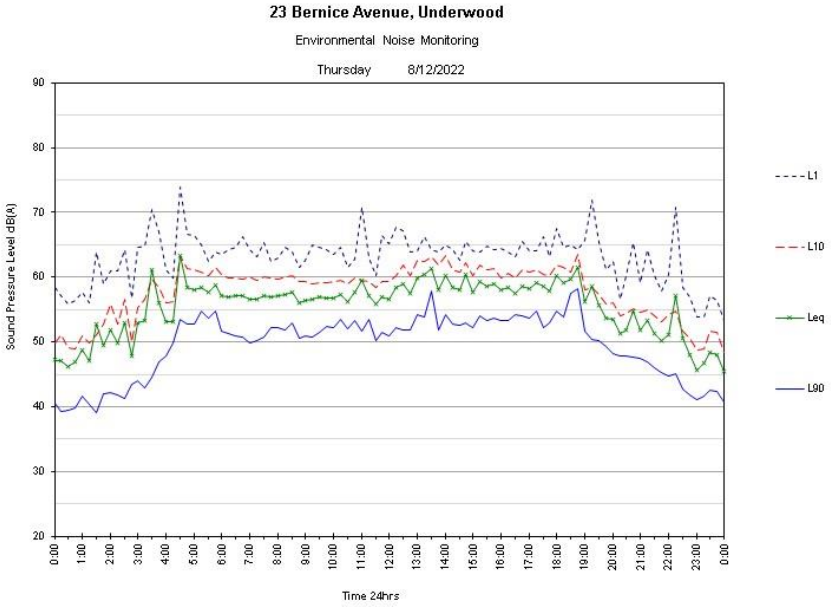
FOR	DRAWING	NUMBER	REVISION	DATE	SCALE	PROJECT NAME
EFC ROHI	ELEVATION SHEET 2	A3002	A	11.04.2023	1 : 200@ A3	3303-3305 LOGAN ROAD

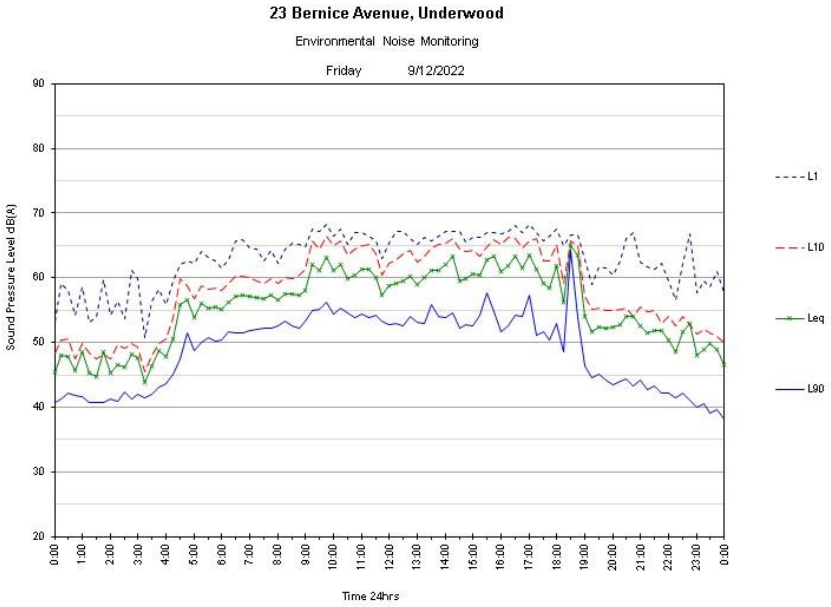
10.2 Noise Monitoring Charts

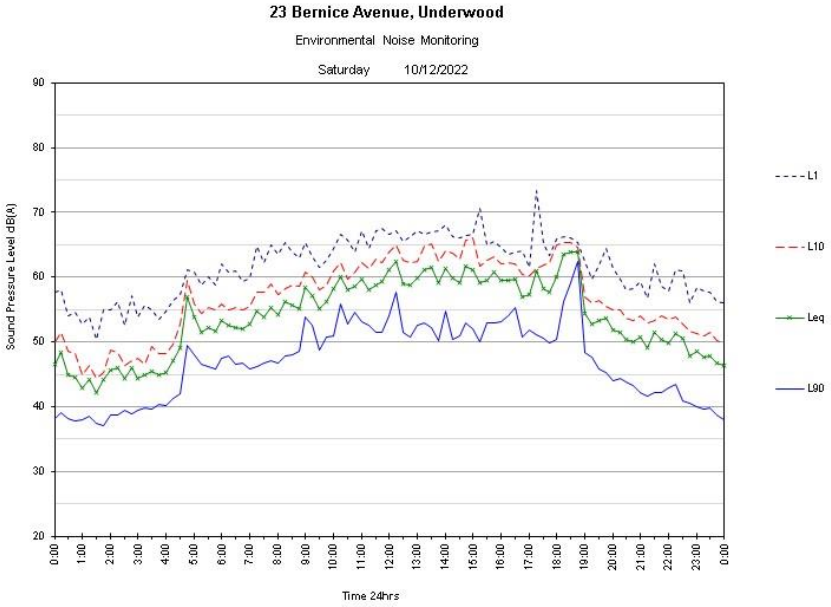


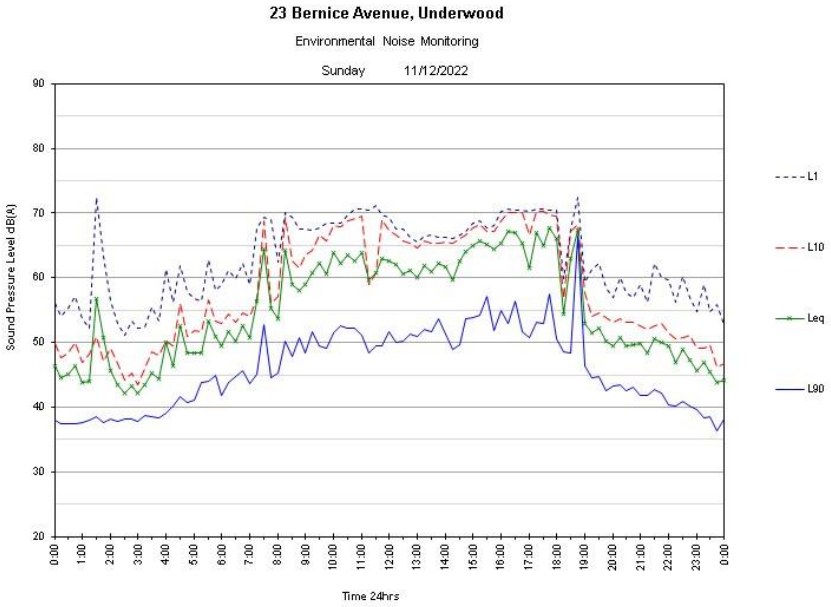


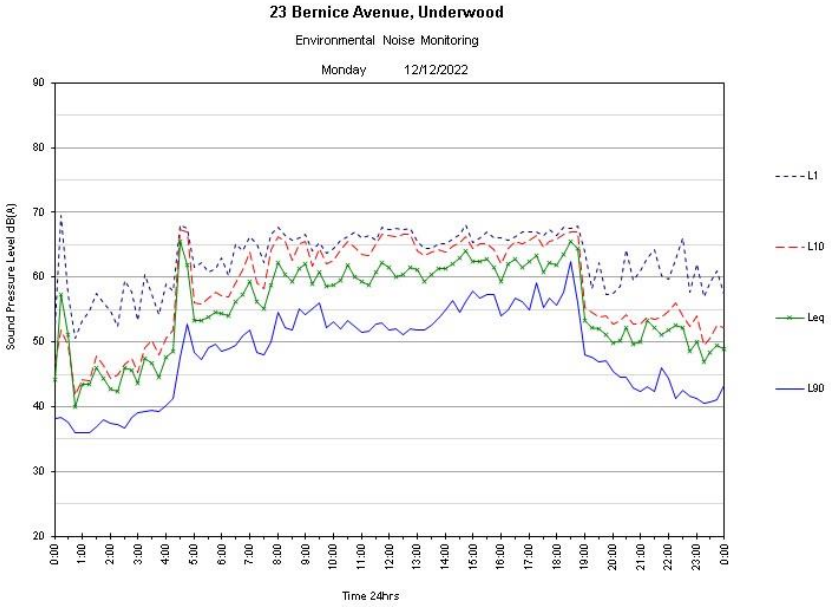

23 Bernice Avenue, Underwood
Environmental Noise Monitoring
Wednesday 7/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90

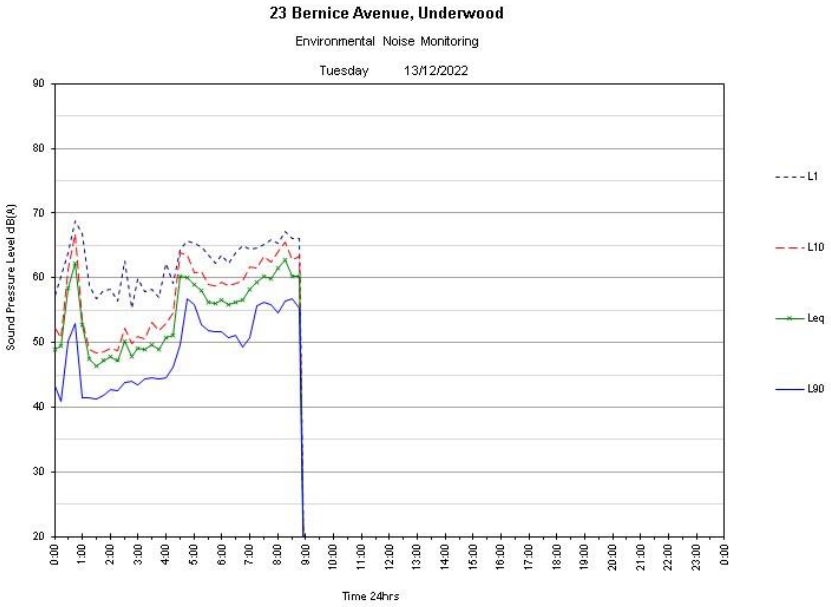

23 Bernice Avenue, Underwood
Environmental Noise Monitoring
Thursday 8/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90


23 Bernice Avenue, Underwood
Environmental Noise Monitoring
Friday 9/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90


23 Bernice Avenue, Underwood
Environmental Noise Monitoring
Saturday 10/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90


23 Bernice Avenue, Underwood
Environmental Noise Monitoring
Sunday 11/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90


23 Bernice Avenue, Underwood
Environmental Noise Monitoring
Monday 12/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90


23 Bernice Avenue, Underwood
Environmental Noise Monitoring
Tuesday 13/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90