Project No: 232291AR

Noise Assessment
Proposed Community Centre
Heritage and Tigerhawk Drives
Chisholm, NSW

Prepared for:

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APPENDICES

1.0 - INTRODUCTION

This report presents the results, findings and recommendations arising from an acoustic assessment of the use of the proposed Chisholm Community Centre (CCC) at the corner of Heritage and Tiger Hawk Drives, Chisholm NSW (**Figure 1**).

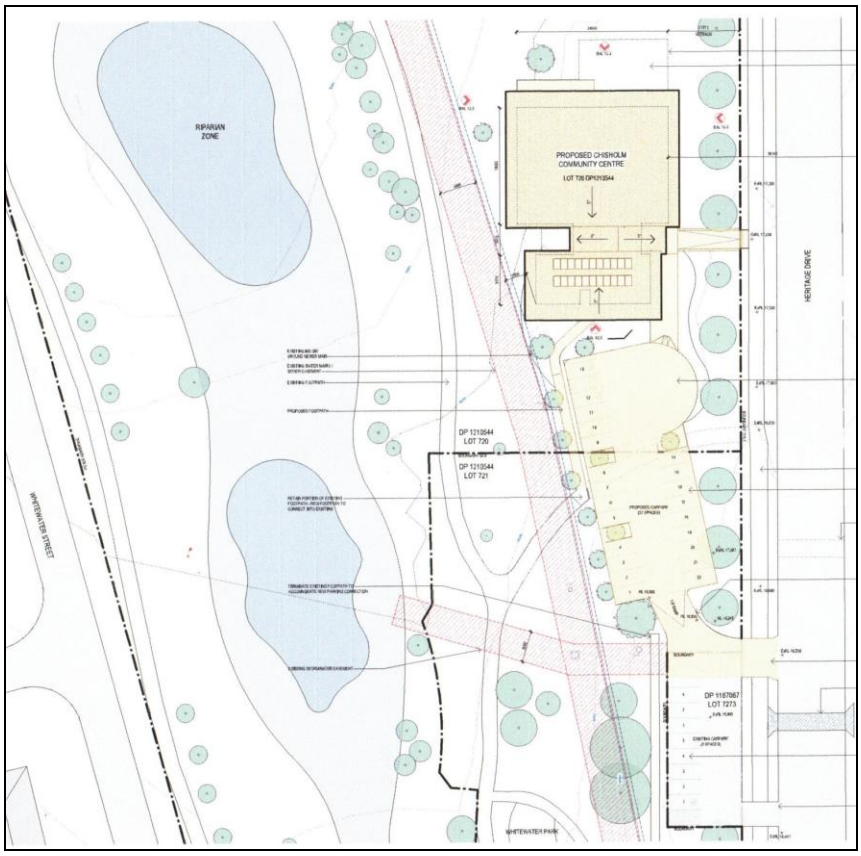


Figure 1 – Site Location

The acoustic assessment is to support a Development Application to Maitland City Council (MCC).

The CCC will be a purpose built facility, in two separate sections, with multi-purpose hall (MPH), kitchen and terrace area. There is also to be a relatively small commercial tenancy attached to southern section of the building.

It is proposed that the MPH will be used for such activities as meetings, seminars, exercise classes etc. It may also be used as an entertainment venue and may be hired out for weddings and private parties.

It is proposed that the CCC may open until 10pm Sunday to Thursday and until midnight on Friday and Saturday.

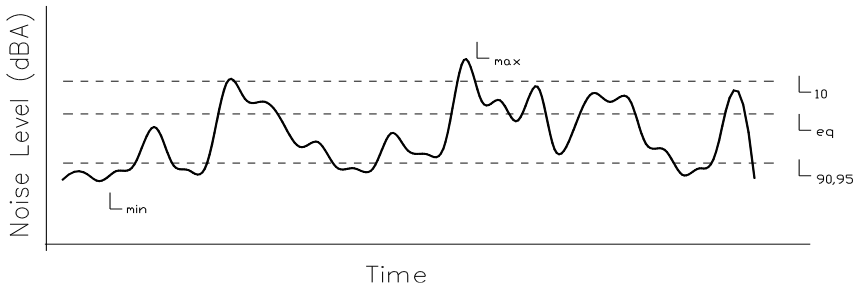
The commercial tenancy will be fitted out as a cold shell as part of the current D.A. There is no specific end user for the tenancy bit it will be some form of community service provider. The operation of the tenancy will not form part of the current acoustic assessment.

2.0 - TERMS AND DEFINITIONS

Table 1 contains the definitions of commonly used acoustical terms and is presented as an aid to understanding this report.

TABLE 1
DEFINITION OF ACOUSTICAL TERMS

Term	Definition
dB(A)	The quantitative measure of sound heard by the human ear, measured by the A-Scale Weighting Network of a sound level meter expressed in decibels (dB).
SPL	Sound Pressure Level. The incremental variation of sound pressure above and below atmospheric pressure and expressed in decibels. The human ear responds to pressure fluctuations, resulting in sound being heard.
STL	Sound Transmission Loss. The ability of a partition to attenuate sound, in dB.
Lw	Sound Power Level radiated by a noise source per unit time re 1pW.
Leq	Equivalent Continuous Noise Level - taking into account the fluctuations of noise over time. The time-varying level is computed to give an equivalent dB(A) level that is equal to the energy content and time period.
L1	Average Peak Noise Level - the level exceeded for 1% of the monitoring period.
L10	Average Maximum Noise Level - the level exceeded for 10% of the monitoring period.
L90	Average Minimum Noise Level - the level exceeded for 90% of the monitoring period and recognised as the Background Noise Level. In this instance, the L90 percentile level is representative of the noise level generated by the surrounds of the residential area.



3.0 - CRITERIA

The Office of Environment and Heritage (OEH) and MCC share responsibility for the approval and control of noise emissions from commercial and industrial premises within council boundaries. These approvals are generally based on procedures and criteria detailed in the Noise Policy for Industry (NPfI).

The NPfI doesn't contain specific procedures for the assessment of noise emissions from community centres but, in the absence of any other criteria, it is used in this assessment as a guide for determining potential impacts.

The NPfI describes intrusive and amenity criteria applicable to industrial sites. Applicable noise criteria depend on the existing background noise level at potentially affected residential receiver areas.

Ambient noise levels in the area were measured at 15 minute statistical intervals using an ARL EL316 environmental noise logger. The measurements were done in accordance with relevant OEH guidelines and AS 1055-1997 "Acoustics – Description and Measurement of Environmental Noise". The noise logger used complies with the requirements of AS 1259.2-1990 "Acoustics – Sound Level Meters", and has current NATA calibration certification.

The logger was programmed to continuously register environmental noise levels over the 15 minute intervals, with internal software calculating and storing Ln percentile noise levels for each sampling period. Calibration of the logger was performed as part of the instrument's initialisation procedures, with calibration results being within the allowable $\pm$ 0.5 dB(A) range.

The logger was located in the front yard of number 13 Whitewater Street, Chisholm (as denoted with a star in **Figure 2**) from Wednesday, July 12 until Wednesday July 19, 2023.

Figure 2 – Noise Logger Location (CCC site, shown indicatively, shaded blue)

Ambient Leq and background noise levels, obtained from the logger, are shown in **Table 2** and depicted graphically in **Appendix I**.
The NPfI specifies that in determining noise criteria background noise levels need only be used for those times when the noise source being assessed is to operate. In this instance during the night time period the centre will only operate between 10pm and midnight. As such, only the measurements for these hours have been included in the analysis for night (and shown in Table 2).

TABLE 2 MEASURED AMBIENT NOISE LEVELS 12/7/23 to 19/7/23			
Location	Day	Evening	Night
Whitewater Street	38 dB(A) L90	32 dB(A) L90	28 dB(A) L90
	53 dB(A) Leq 15 min	44 dB(A) Leq 15 min	38 dB(A) Leq 15 min

In setting noise goals for a particular project, the NPfI considers both Amenity and Intrusiveness criteria. The former is set to limit continuing increase in noise from industry, whilst the latter is set to minimise the intrusive impact of a particular noise source.

Amenity criteria are dependent upon the nature of the receiver area and the existing level of industrial noise. The most potentially affected receiver area near the site would be considered “suburban” as per the definitions in the NPfI.

The Project Amenity Noise Level for an industrial development is equal to the recommended amenity noise level for a suburban area (from Table 2.2 in the NPfI) minus 2 dB(A) (as detailed in notes to **Table 3**).

The intrusiveness criteria are based on the Rating Background Level (RBL) for the time period, plus 5 dB(A). The RBL (L90) is defined as the overall single figure background level representing each assessment period.

Table 3 specifies the Project Noise Trigger Levels (noise criteria) determined for the site based on procedures in the NPfI.

TABLE 3
NOISE CRITERIA

Location	Criterion	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
Chisholm	Intrusiveness dB(A),Leq(15-min.)[1]	43	37	35[2]
	Amenity dB(A),Leq(15 min)[3]	58	48	43
	Project Noise Trigger Levels	**43 (15 min.)**	**37 (15 min)**	**35 (15 min)**

1 Rating Background Level (RBL) + 5dB. RBL is the median value of each ABL (Assessment Background Level) over the entire monitoring period. The ABL is a single figure representing the "L_{90} of the $L_{90's}$" for each separate day of the monitoring period.
2. Minimum RBL is 30 dB(A).
3. Project amenity noise level (ANL) is suburban ANL (NPI Table 2.1) minus 5 dB(A) plus 3 dB(A) to convert from a period level to a 15-minute level.

The noise criteria (as shown in Table 3) are based on an Leq noise level. The most significant noise source at the CCC is expected to be that of amplified music associated with events in the MPH.

To guide the assessment of potential adverse noise impacts reference is also made to the standard noise conditions typically imposed on licensed premises by the Independent Liquor and Gaming Authority (ILGA). These conditions relate to the playing of amplified music at licenced premises, as detailed below (note that the ILGA criteria are based on an L10 noise level, and the current criteria are considered against an Leq noise level);

The noise level emitted from the premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz - 8 kHz inclusive) by more than 5 dB between 7.00 a.m. and 12.00 midnight at the boundary of any affected residence.

The background noise level adopted for the current this assessment has, therefore, been derived by calculating the background L90 from the unattended logger for the evening time period and adopting a measured background octave band spectra taken from the Spectrum Acoustics technical database from measurements made in a typical suburban area, as shown in **Table 4**.

TABLE 4 OCTAVE BAND CRITERIA (Leq)										
		Octave Band Centre Frequency, Hz								
Period	*dB(A)*	*31.5*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Evening	37	22	22	24	25	31	33	30	28	25
Night	35	20	20	22	23	29	31	28	26	23

4.0 - NOISE ASSESSMENT

4.1 Multi-Purpose Hall (MPH)

The proposed layout of the CCC is shown in **Figure 3**.

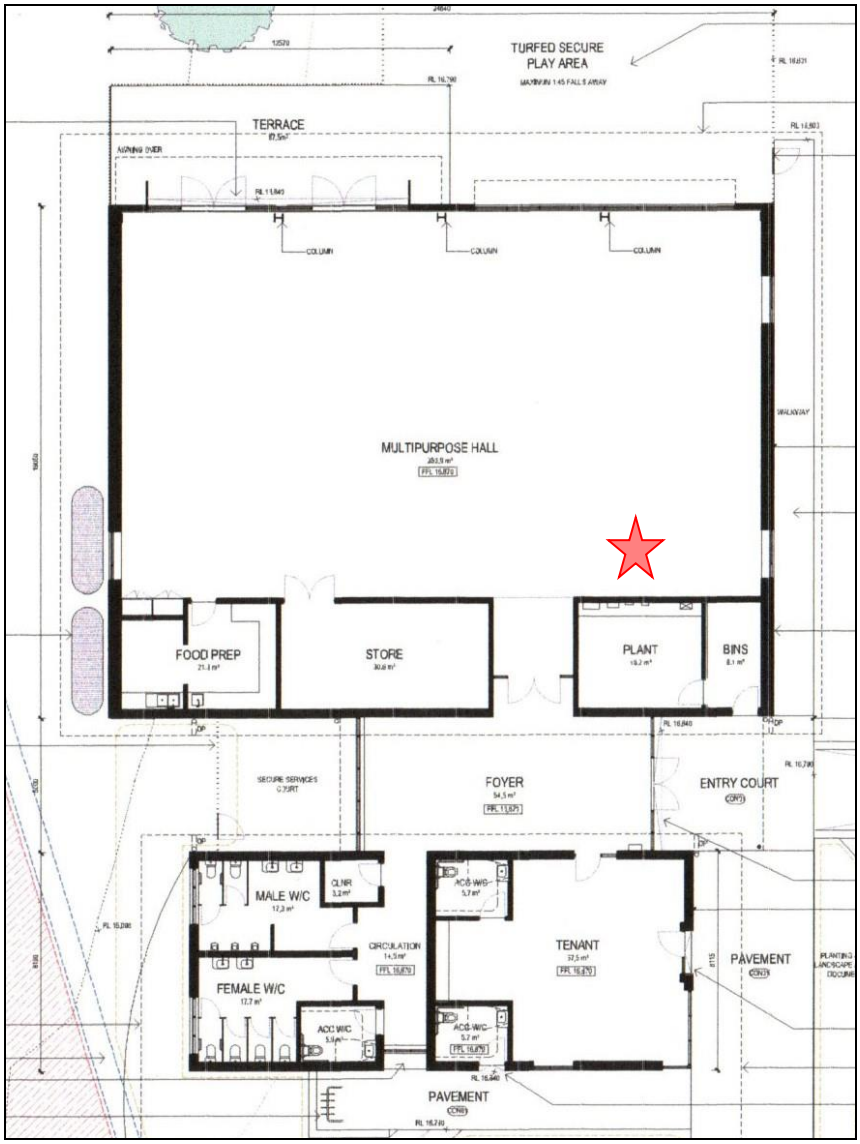


Figure 3 – Proposed Building Layout

As previously detailed it is envisaged that the CCC may operate until 10pm Sunday to Thursday and until midnight on Friday and Saturday.

It is envisaged that the majority of events in the MPH will be general gatherings of people for meetings, seminars and workshops etc. These will not generate significant noise and will not require any further assessment.

It is also envisaged, however, that the MPH may be hired out for events such as weddings or parties. This use would likely involve the use of amplified music.

The Spectrum Acoustics technical database contains measurements of noise levels from bands playing at similar sized function centres. For the purposes of the current assessment, it is considered that music at this noise level is most likely to be played at the MOH.

The adopted noise level for this type of entertainment is shown in **Table 5**. This represents the calculated sound pressure level for a band, taken from measurements over a number of songs, at a similar style venue. For the purpose of assessing a worst case these measured noise levels were considered to be constant for the full 15 minute assessment period.

TABLE 5
Lw OF AMPLIFIED MUSIC (Leq)

	Octave Band Centre Frequency, Hz dB(A)							
dB(A)	31.5	63	125	250	500	1K	2K	4K
105	45	72	88	95	99	101	98	92

For determination of potential adverse noise impacts due to the worst case use of the MPH, a noise source representing the music, as described above, was assumed to be at the point located with a star on Figure 3.

Noise levels were then theoretically propagated to the most potentially affected residences taking into account the effects of transmission loss through building elements and hemispherical spreading (distance loss). From consideration of the dimensions and orientation of the various building elements, the sound pressure levels immediately outside these were propagated to the nearest receiver using an equation[1] giving the sound field due to an incoherent plane radiator.

[1] Equation (5.104), DA Bies and CH Hansen, *Engineering Noise Control*, E & FN Spon, 1996.

Note that a specific calculation of directivity loss for the roof, plus an area gain for the surface, was performed in lieu of the incoherent plane radiator calculation.

Table 6 shows a calculation of noise propagated through the northern facade of the MPH and impacting on the most potentially affected residential receiver in that direction, approximately 100m to the north, at 23 Heritage Drive (i.e., across Tigerhawk Drive), shown as R1 on Figure 2.

The plans for the MPH show that the northern facade of the MPH will be constructed almost entirely of glass. For the calculation of noise transmission loss, the STL of the glazing is based on data for 6.38mm laminated glass. The STL of the roof of the building is based on data for standard steel roof sheeting.

For the calculations the noise source was considered to be an average distance of 12m from the internal surface of the glazing and an average of 5m from the internal surface of the ceiling.

The predicted received noise has been compared to the adopted octave band noise criteria for evening and night. Compliance at these times implies compliance at all other times.

TABLE 6
CALCULATED SPL AT R1
ENTERTAINMENT IN MPH as dB(A) Leq

		Octave Band Centre Frequency, Hz							
Item	*dB(A)*	31.5	63	125	250	500	1K	2K	4K
Source Lw	105	45	72	88	95	99	101	98	92
Reverberant Field Loss (12m)		20	20	20	20	20	20	20	20
Lp at inner surface	85	25	52	68	75	77	81	78	72
STL of glazing		20	22	25	28	33	30	35	35
External SPL (glazing)	54	5	30	43	47	44	51	43	37
SPL @ receiver Leq (glazing)	**28**	**<0**	**4**	**17**	**21**	**18**	**25**	**17**	**11**
STL of Roof		9	13	17	18	21	25	23	20
Directivity Loss @ 135°		8	10	12	13	14	15	16	18
Reverberant Field Loss (5m)		15	15	15	15	15	15	15	15
Area Gain		17	17	17	17	17	17	17	17
External SPL (roof)	67	30	51	61	66	72	63	61	56
SPL @ receiver Leq (roof)	**19**	**<0**	**<0**	**7**	**12**	**18**	**9**	**8**	**2**
Total Received Noise	**28**	**0**	**4**	**18**	**21**	**21**	**25**	**20**	**11**
Criteria Leq (Evening)	37	22	22	24	25	31	33	30	28
Impact	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Criteria Leq (Night)	35	20	20	22	23	29	31	28	26
Impact	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

The results in Table 6 show that, under the assessed conditions during the evening and night, there will be no adverse noise impacts at the most potentially affected receiver to the north, due to the playing of amplified music in the MPH.

Table 7 shows a calculation of noise propagated through the western facade of the MPH and impacting on the most potentially affected residential receiver in that direction, approximately 100m to the west, at 29 Whitewater Street, shown as R2 on Figure 2.

The facade of the MPH in this direction is to be made up of a combination of metal cladding and glass. For the calculations, the STL of the wall section is based on a steel framed wall system with a standard exterior wall cladding, lined with 10mm taped and set plasterboard with mineral fibre infill. The STL of the glazed section is based on 6.38mm laminated glass and the roof is standard steel roof sheeting.

TABLE 7
CALCULATED SPL AT R2
ENTERTAINMENT IN MPH as dB(A) Leq

	Octave Band Centre Frequency, Hz								
Item	*dB(A)*	31.5	63	125	250	500	1K	2K	4K
Source Lw	105	45	72	88	95	99	101	98	92
Reverberant Field Loss (12m)		20	20	20	20	20	20	20	20
Lp at inner surface	85	25	52	68	75	77	81	78	72
STL of glazing		20	22	25	28	33	30	35	35
External SPL (glazing)	54	5	30	43	47	44	51	43	37
SPL @ receiver Leq (glazing)	**24**	**<0**	**0**	**13**	**17**	**14**	**21**	**13**	**7**
STL of Walls		9	13	17	22	27	31	28	26
Reverberant Field Loss (12m)		20	20	20	20	20	20	20	20
External SPL (walls)	58	16	39	51	53	50	50	50	46
SPL @ receiver Leq (walls)	**23**	**<0**	**4**	**16**	**18**	**15**	**15**	**15**	**11**
STL of Roof		9	13	17	18	21	25	23	20
Directivity Loss @ 135°		8	10	12	13	14	15	16	18
Reverberant Field Loss (5m)		15	15	15	15	15	15	15	15
Area Gain		17	17	17	17	17	17	17	17
External SPL (roof)	67	30	51	61	66	72	63	61	56
SPL @ receiver Leq (roof)	**19**	**<0**	**<0**	**7**	**12**	**18**	**9**	**8**	**2**
Total Received Noise	**27**	**<0**	**4**	**17**	**21**	**21**	**22**	**17**	**12**
Criteria Leq (Evening)	37	22	22	24	25	31	33	30	28
Impact	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Criteria Leq (Night)	35	20	20	22	23	29	31	28	26
Impact	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

The results in Table 7 show that, under the assessed conditions during the evening and night, there will be no adverse noise impacts at the most potentially affected receiver to the west, due to the playing of amplified music in the MPH.

Noise levels at all other receivers will be lower than those shown in the table and, therefore, in compliance with the adopted criteria.

The calculations assume that the two double doors in the northern facade of the to the MPH are closed. It is recommended that these doors must be closed if there are events in those rooms that employ amplified music.

The calculations shown in Tables 6 and 7 are based on the STL's as detailed. Any variation to the construction types which may lower the STL of the various building elements must be approved by an acoustic consultant.

4.2 Outdoor Terrace

There is to be outdoor terrace at the northern side of the MPH. This terrace may be accessed directly from the MPH. It is envisaged that the terrace may be in use occasionally during the day and evening times when there are events in the MPH.

The major source of noise from the terrace is considered to be that of people, talking loudly and simultaneously.

Based on the size of areas, and the number of people who may be in attendance, it is anticipated that there may be up 35 to 40 people present on the terrace, at any one time. It has been assumed that of these, approximately 30% or say, 10 to 12 people may, at any one time, be conversing loudly.

The Lw dB(A) of 10 to 12 people speaking loudly is shown in **Table 8**. For the assessment of a worst case it was assumed the speech would be raised for a full 15 minute period.

TABLE 8
Lw OF RAISED SPEECH (Leq 15 min)

	Octave Band Centre Frequency, Hz dB(A)								
	dB(A)	63	125	250	500	1k	2k	4k	8k
10 - 12 People	83	35	52	67	78	77	78	67	53

For the calculation of potential impacts a noise source representing the raised speech of the patrons was considered to be located on the terrace, during the evening. The noise was theoretically propagated to the nearest potentially affected receivers at R1 and R2, taking into account loss for distance only. Both receivers are a similar distance

from the terrace and, therefore, the results in the Table represent the theoretical noise at both receivers.

The results of the calculations, assessed against the adopted octave band criteria for evening, are shown in **Table 9**.

TABLE 9
CALCULATED SPL AT R1/R2
PATRONS ON TERRACE as dB(A) Leq

		Octave Band Centre Frequency, Hz							
Propagation Elements	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Source Lw Leq (15 min)	83	35	52	67	78	77	78	67	53
Distance loss 1 (100m)		48	48	48	48	48	48	48	48
Received Noise	**35**	<0	4	19	30	29	30	19	5
Criteria Leq (Evening)	37	22	24	25	31	33	30	28	25
Impact	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Criteria Leq (Night)	35	20	22	23	29	31	28	26	23
Impact	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**0**	**0**

The results in Table 9 show that, under the assessed conditions, there will be no adverse noise impacts, during the evening, at the most potentially affected receivers, due to the noise from patrons on the terrace.

The total noise from patrons will not exceed the total night time criterion, however, it may be up to 2dB over the criterion at 2kHz. Such an exceedance would, typically, be considered negligible (per definitions in the NPfI).

For considering a worst case the noise from the patrons on the terrace was assessed as being constant for a full 15 minute period. In reality, the nature of most conversation in such circumstances is not constant.

In addition to this, the use of the terrace will be occasional and the nose source will, therefore, not be continuous. Any impacts will be sporadic and receivers will get significant respite. As such, the noise from the breakout areas is not considered likely to adversely impact on the acoustic amenity of the area.

4.3 Mechanical Plant

Mechanical plant for the CCC will be housed in a plant room on the eastern side of the building.

It is likely that the plant for this sort of application will consist of four x condenser units with a, typical, combined sound power level of up to 84 dB(A) when they are operating at full capacity.

As the closest receivers are over 100m from the plant room, and the room will be fully enclosed, there is no potential for any adverse noise impacts due to the operation of the mechanical plant, and, therefore, no further assessment of this is considered warranted.

Any changes to the proposed location of the mechanical plant, or the construction of the plant room, must be approved by an acoustic consultant.

There is also to be an air conditioning condenser located in the services court between the two sections of the building, as shown schematically with a star on **Figure 4**.

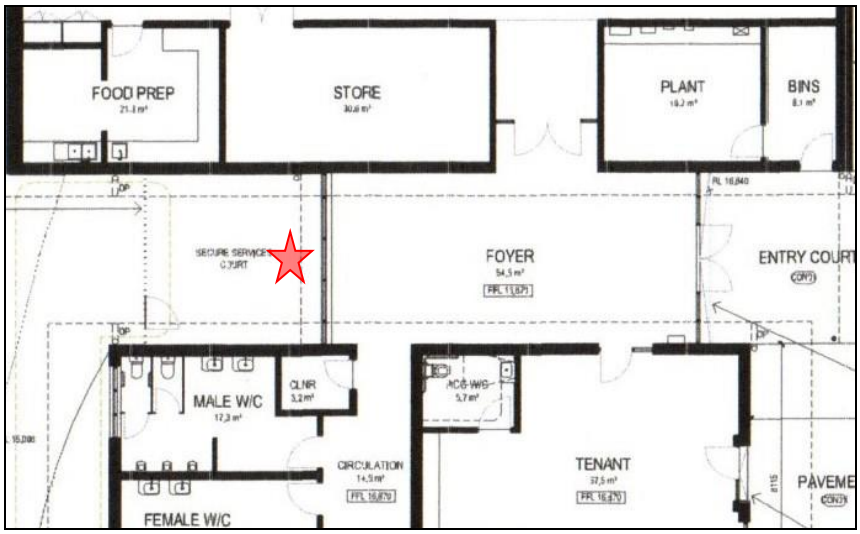


Figure 4 – A/C Condenser Location

Air conditioning condenser units for this type of application, typically, would have an Lw of up to 78 dB(A) when they are operating at full capacity.

The most potentially affected residential receiver boundary is in Whitewater Street, which is approximately 100m to the waset. For a condenser unit with an Lw of 78 dB(A) working constantly, this equates to an SPL of 30 dB(A) Leq (15 min) at that boundary. This is in compliance with the evening time criterion.

To ensure compliance it is recommended that the final location and type of mechanical plant to be installed must be approved by an acoustic consultant.

4.4 Car Park

There will be an approximately 30 car parking spaces at the southern side of the building. Note that some of these parking spaces are already there and are associated with the existing play area.

Noise in car parks typically comes from people walking to and from cars, doors opening and closing etc., as well as vehicles moving at slow speeds. Each noise event is characterised by a brief peak which when averaged out over a 15 minute period has a relatively low Leq. The impact of each noise event on any single receiver is also variable depending upon the location of individual cars within a car park and as they move in and out. In addition to this, people arriving or departing a Community Centre would normally be expected to do so in a relatively quiet and orderly fashion.

Some activities at the CCC will have a discrete starting and finishing time and the worst case for noise generation would be at the end of an activity where all car parks would be expected to be vacated in a single 15 minute period.

Typical noise levels from car parks have been sourced from the Spectrum Acoustics technical database. This contains noise measurements from a series of vehicles arriving and departing a car park with people moving to and from vehicles. The measurements were made over a representative period to ascertain a typical noise level from these activities. The measurements were made at varying distances from each car to approximate the situation in relation to an adjacent residence over a 15 minute interval. That is, at any time throughout each 15 minute interval various car parks, at different distances from the nearest residences, will be in use.

The measurements in the database show a noise level of 53 dB(A) Leq measured over a 5 minute period where up to 6 vehicles moved in and out of a car park. The measurements were made at an average distance of 7m.

Assuming the noise from the 6 vehicles is consistent for a full 15 minutes at a distance of 7m this equates to a sound power level of 73 dB(A) Leq (15 min) for car park noise. This value has been used to determine impacts over a 15 minute assessment period during the evening at the end of an event. For most of the remainder of the day there will be very little activity in the car park.

Due to the layout of the car park, individual parking spaces will be at various distances from receivers. To assess potential impacts the car park has been considered to be 5 separate “banks” of 6 to 7 parking spaces, each with an average sound power level of 73 dB(A) Leq (15 min).

Received noise levels were determined for each "bank" and the combined result calculated for the most potentially affected receiver in Whitewater Street.

The results of the assessment of car park noise, to the boundary of the most potentially affected receiver at 23 Whitewater Street, are shown in **Table 10**. Car park numbers referred to in the table are as shown diagrammatically in **Figure 4**.

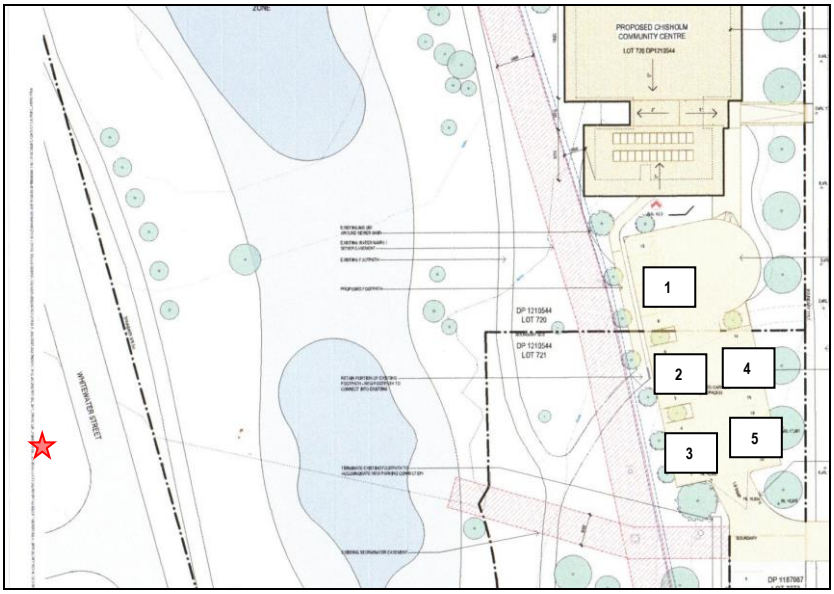


Figure 4 – Car Park Locations

TABLE 10 CALCULATED SPL AT 23 WHITEWATER St. CAR PARK as dB(A) Leq (15 min)		
Car Park Number	Distance Loss	Received Noise
1	47	26
2	47	26
3	47	26
4	48	25
5	48	25
SPL at Receiver	**33**	
Criterion Evening/Night	**37/35**	

The results in Table 10 show that, under the assessed worst case scenario, the evening and night time noise criteria will not be exceeded due to noise emissions from the use of the car park.

As with the comments relating to noise from the terrace, the noise from the car park will only be present occasionally. As per those previous comments then the car park noise is not considered likely to adversely impact on the acoustic amenity of the area.

4.5 Commercial Tenancy

As detailed previously, there is to be a commercial tenancy located in the southernmost of the two buildings on the site.

The future occupant of the tenancy is not known at the time of the current assessment. The D.A. for the project includes the construction of the tenancy but does not cover the operation of any commercial premises.

It is envisaged that the tenancy will be operated by a community service provider. Noise levels from this sort of commercial activity are generally relatively low and are, typically, limited to occasional conversations in outdoor areas. Under such circumstances there is little potential for adverse noise impacts.

5.0 – DISCUSSION OF RESULTS AND CONCLUSION

An acoustical assessment of theoretical noise emissions has been carried out for proposed Chisholm Community Centre at the corner of Heritage and Tigerhawk Drives, Chisholm NSW.

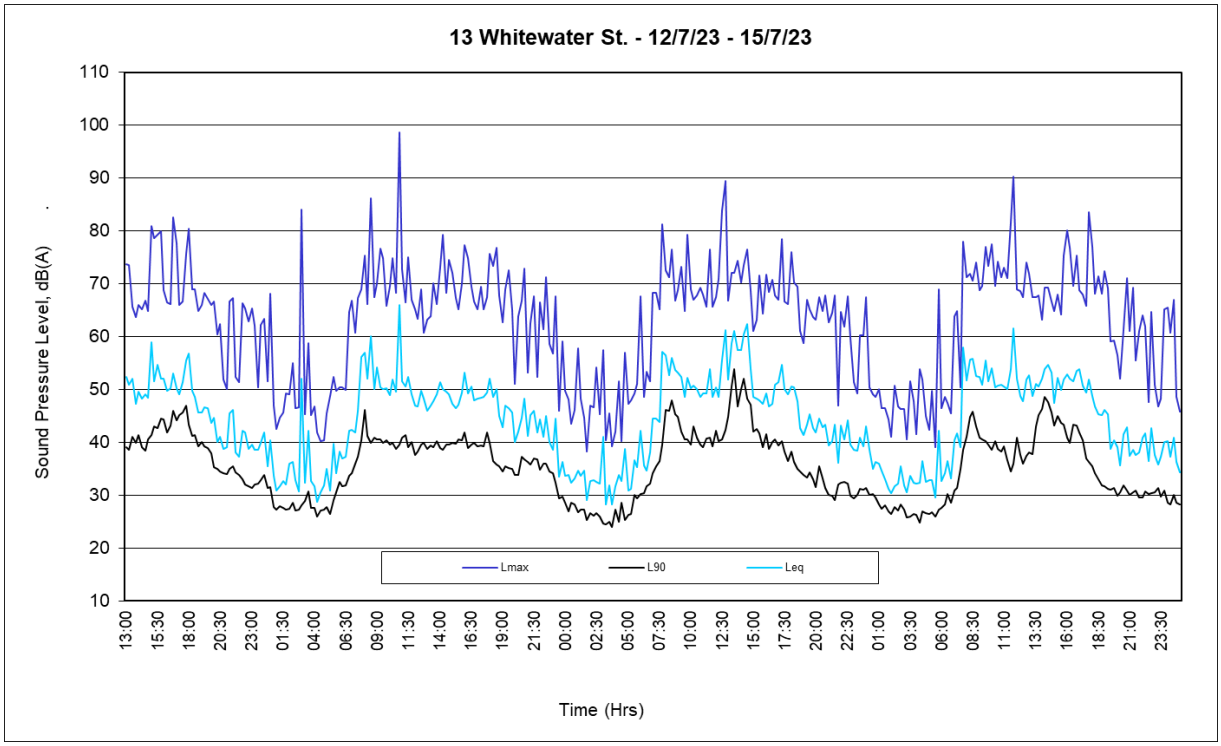
The noise impacts at the most potentially affected residential boundaries have been assessed, due to the noise emissions from each of;

- Multi Purpose Hall,
- Terrace,
- Mechanical Plant, and
- Car Park.

The assessment has shown that, under the assessed conditions, the adopted noise criteria will not be exceeded. The operation of the community centre is, therefore, not considered likely to adversely impact on the acoustic amenity of the area.

APPENDIX I

NOISE LOGGER CHARTS


13 Whitewater St. - 12/7/23 - 15/7/23
Sound Pressure Level, dB(A)
110
100
90
80
70
60
50
40
30
20
10
Lmax
L90
Leq
13:00
15:30
18:00
20:30
23:00
01:30
04:00
06:30
09:00
11:30
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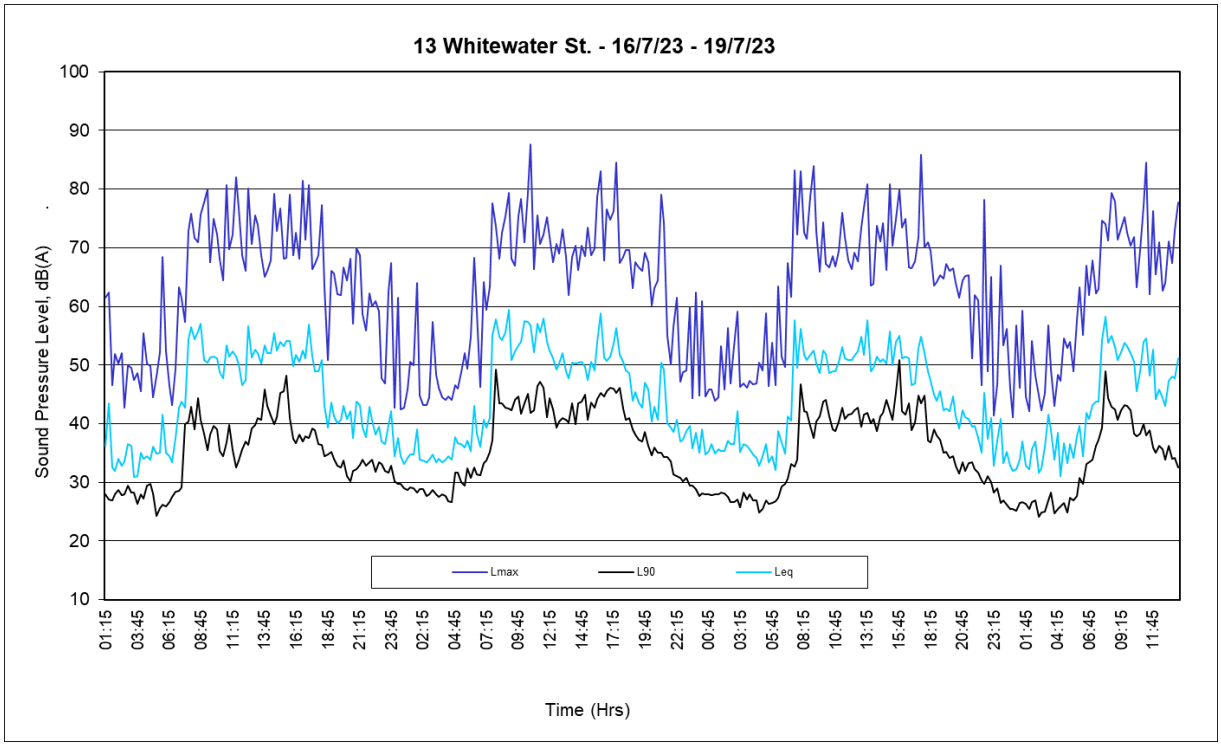
13 Whitewater St. - 16/7/23 - 19/7/23
Sound Pressure Level, dB(A)
100
90
80
70
60
50
40
30
20
10
Lmax
L90
Leq
01:15
03:45
06:15
08:45
11:15
13:45
16:15
18:45
21:15
23:45
02:15
04:45
07:15
09:45
12:15
14:45
17:15
19:45
22:15
00:45
03:15
05:45
08:15
10:45
13:15
15:45
18:15
20:45
23:15
01:45
04:15
06:45
09:15
11:45
Time (Hrs)