4 June 2020

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Metford Road Pty Ltd

RE: NOISE ASSESSMENT – METFORD ROAD, TENAMBIT

This letter report presents the results of a noise impact assessment conducted for a proposed manufactured home estate (MHE) on land at Metford Road, Tenambit, NSW (see **Appendix A**). The proposal is to develop a lifestyle village with manufactured home sites, and associated community facilities. The assessment has been prepared to accompany a D.A. to the Maitland City Council (MCC).

The site is potentially impacted from noise emissions from the Regal Hunter Hotel (Hotel) and from the Hunter Water Morpeth Waste Water Treatment Works (WWTW).

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

TABLE 1
DEFINITION OF ACOUSTIC 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.

EXISTING ACOUSTIC ENVIRONMENT

The acoustic environment of the proposed MHE was monitored as part of the previous acoustic assessment for the neighbouring project site from Friday 20th to Monday 23rd January 2017.

Ambient noise levels were measured at 15 minute statistical intervals using an ARL EL 315 environmental noise logger. The measurements were conducted in accordance with relevant EPA 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 during the instrument's initialisation procedures, with calibration results being within the allowable ± 0.5 dB(A) range.

The approximate site and logger locations are shown in **Figure 1**.

Figure 1. Site Layout (approximate) and Noise Logger Location.

The relevant metrics as derived from the logger measurements are shown in **Table 2**. The data is shown graphically in **Appendix B**. A full set of logged data is not included in this report but is available on request.

Attended noise measurements and observations made at the time of the deployment and retrieval of the logger indicated that the acoustic environment of the area is dominated by natural noise (birds and insects) and noise from traffic on Metford Road.

TABLE 2 – SITE LOGGER MEASURED AMBIENT NOISE LEVELS dB(A)			
Percentile	**Leq (period)**	**L90 (period)**	**Lmax**
Day (i.e. 7am to 6pm)	47	35	86
Evening (6pm to 10pm)	45	37	75
Night (i.e. 10pm to 7am)	46	35	75

The measured noise levels and graphs of the noise data are consistent with the acoustic environment of a relatively quiet suburban area near a minor road.

The Noise Policy for Industry (NPI) details Amenity Criteria for various receiver types. These criteria are aimed at limiting noise from industry. The Acceptable Leq noise levels for a "suburban" area are 55dB(A) during the day, 45 dB(A) evening and 40 dB(A) at night. The existing measured noise levels (from the logger) show that Leq noise levels are within the Acceptable range for day and evening (bearing in mind that industrial noise was only a minor contributor to the overall measured levels). At night the measured Leq noise level is higher than the acceptable level. Analysis of the data and site observations, indicate that this is most likely attributable to noise from birds and insects and not industrial noise.

Noise Goals

The approach taken here is to determine the noise goals that would be applicable for the operation of any industrial or commercial enterprise in the area and then apply these to calculate the potential for noise impacts on the proposed MHE.

In setting noise goals for a particular project, the NPI 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. As described above the proposed MHE receivers would be considered "suburban" as per the definitions in the NPI.

The Project amenity noise level for an industrial development is equal to the recommended amenity noise level (from Table 2.2 in the NPI) 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 noise criteria determined for the site based on the logger data and procedures in the NPI.

TABLE 3 NOISE CRITERIA				
Location	Criterion	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
MHE	Intrusiveness dB(A),Leq(15-min.)[1]	40	40[2]	40
	Amenity dB(A),Leq(15 min)[2]	52	43	38
	Project Noise Trigger Level	**40 (15 min.)**	**40 (15 min)**	**38 (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. RBL for evening cannot be higher than for day as per the NPI.
3. Project amenity noise level (ANL) is urban ANL (NPI Table 2.1) minus 5 dB(A) plus 3 dB(A) to convert from a period level to a 15-minute level.

POTENTIAL NOISE IMPACTS

MCC had previously raised concerns about noise emissions from the WWTW and the Hotel to impact on the adjoining proposed subdivision. The acoustic assessment for that subdivision showed that there were no predicted impacts due to noise emissions from the WWTW. The current subdivision is further removed from the WWTW and, therefore, no further assessment of this noise is considered warranted here.

Hotel

The relative location of the Hotel and the closest parts of the subdivision are shown in **Figure 2** (the boundary location is shown dotted).

Figure 2. – Approximate location of the hotel and boundary of the proposed subdivision

For this assessment it is considered that noise emissions from the Hotel may be associated with the delivery and unloading of stock, car parking and entertainment.

Stock Deliveries

In relation to stock deliveries the layout of the Hotel is such that all deliveries would most likely be made at the front of the building or in the drive through bottle shop area. A hotel of this size and location would likely get two to three deliveries per week with kegs and packaged beer usually delivered separately.

Given the location of the Hotel, deliveries would most likely occur during the day (i.e. there would be no requirement for early morning deliveries).

Any discussion of potential noise impacts from the Hotel should be prefaced with the note that there are existing residences within the vicinity of the Hotel. It is reasonable to assume that noise emissions from the Hotel are currently in compliance with all relevant criteria at all existing residences. In regards to noise that exceeds the relevant criteria at existing residences it would be typical for councils to consider that the onus for noise control is on the party making the noise (in this case the Hotel).

This location of unloading activities would be acoustically shielded from much of the MHE by the structure of the Hotel building. The most potentially affected receivers to this noise would be approximately 45m from the bottle shop.

To consider a worst case for the Hotel as would occur when, say, there was a beer delivery, the noise from such an activity was taken from the Spectrum Acoustics technical database. The database contains measurements of noise from the unloading of packaged beer at a bottle shop using an electric pallet lifting device. The measured noise level is shown in **Table 4**. For the calculation of potential impacts the noise from the unloading activity was assumed to be constant for a full 15 minute assessment period during the day.

Table 4 shows a sample calculation of noise from the unloading of a truck and manoeuvring of the pallet lifter in the bottle shop area. The noise criteria in the NPI relate to external noise levels and, therefore, the theoretical noise levels have been predicted to a standard 1.5m high reception point 3m inside the yard of the nearest proposed residence (with distance loss calculated to the boundary only as per procedures in the NPI). The calculation assumes line of sight from the bottle shop to the residential boundary.

The results of preliminary calculations showed that noise control would be required to minimise potential adverse noise impacts. The calculation in Table 4 includes allowance for a 2.2m high fence, acting as an acoustic barrier, along the boundary. R.L.s of the various source and receiver locations have been taken from Google Earth.

TABLE 4 CALCULATED SPL AT PROPOSED MHE BOUNDARY STOCK DELIVERIES									
	Octave Band Centre Frequency, Hz								
Item	dB(A)	63	125	250	500	1k	2k	4k	8k
Truck Unloading	92	68	73	77	82	86	88	83	84
Distance Loss to receiver (45m)		41	41	41	41	41	41	41	41
Barrier Loss (2.2m)		6	7	8	10	12	15	18	21
SPL @ receiver Leq (15 min)	38	22	26	28	32	33	32	24	22
Criterion Leq (15 min) (Day)	40								

The results in Table 4 show that, under the assessed conditions and with the recommended acoustic barrier in place, the received noise at the most affected point on the boundary will comply with the adopted day time noise criterion.

Car Park

The Hotel car park will share a boundary with the MHE. Noise emissions from the car park will vary depending on several factors including time of day and year and activities or events held at the Hotel.

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.

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 relatively busy time.

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 9 separate “banks” of approximately 8 to 10 parking spaces, each with an average sound power level of 75 dB(A) Leq (15 min) as shown in **Figure 3**.

Figure 3. – Car park noise source locations

The noise from the car park will be at different levels when measured at various points on the boundary. That is, depending on the distance from individual cars/noise events etc. and the varying effects of barrier insertion loss. To assess the practical impacts the noise was calculated for a theoretical reception point on the boundary of the residence. To this end, received noise levels were determined for each "bank" and the combined result calculated for the closest receiver at the boundary of the closest potentially affected residential boundary (RCP on Figure 3).

The results of the assessment of car park noise, to the boundary of the nearest residence, are shown in **Table 5**. Car park numbers referred to in the tables are as shown in Figure 3. The calculation in Table 5 includes the barrier insertion loss for a 2.2m high acoustic fence as described above for stock deliveries.

TABLE 5
CALCULATED SPL AT PROPOSED MHE BOUNDARY
CAR PARK

Car Park Number	Distance Loss	Barrier Loss	Received Noise
1	36	12	27
2	36	12	27
3	36	12	27
4	36	12	27
5	38	11	26
6	42	10	23
7	42	10	23
8	42	10	23
9	42	10	23
Total Leq (15 min)	**35**		
Criterion Leq (15 min) Day/Evening	**40**		

The results in Table 5 show that, under the assessed conditions, there will be no adverse impacts due to the use of the car park, provided there is a minimum 2.2m high acoustic fence along the boundary of the car park.

Entertainment Noise

The following discussion should be considered indicative only. A detailed assessment of noise emissions from the Hotel has not been undertaken as part of the current assessment.

The Hotel has an outdoor terrace at the rear which will face towards parts of the MHE, as depicted with a star in **Figure 4**.

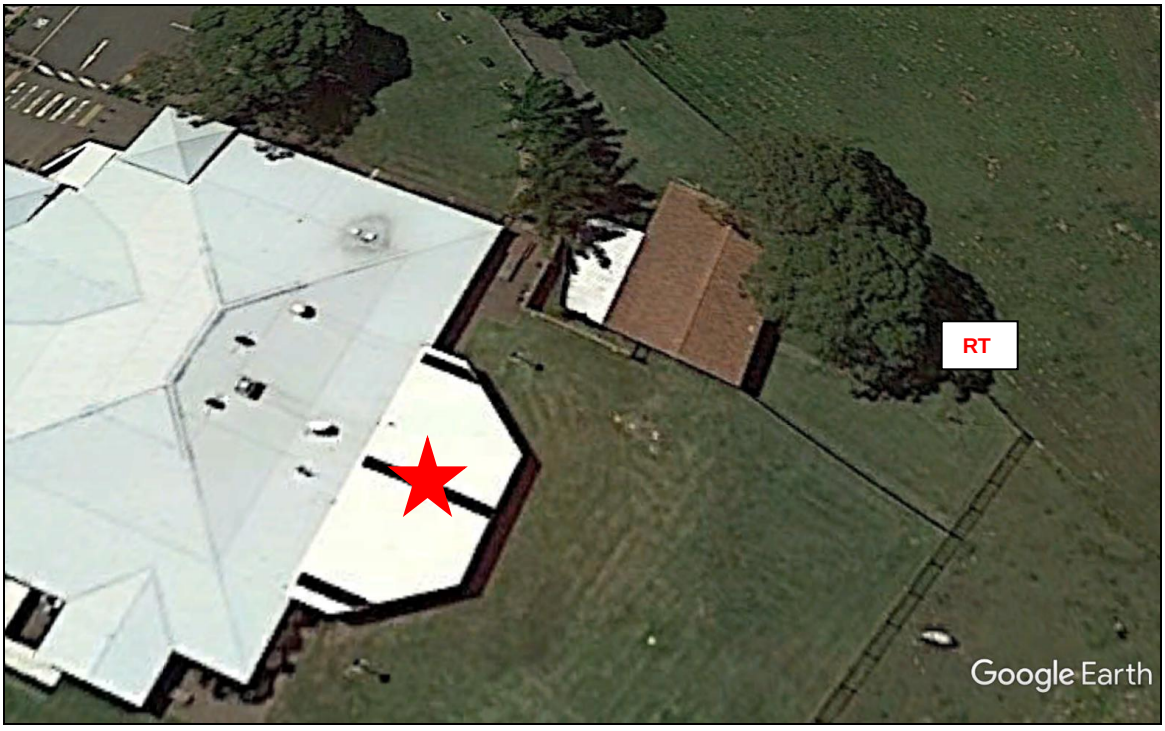


Figure 4. – Location of Outdoor Terrace

The major source of noise from an outdoor terrace is considered to be that of patrons talking loudly and simultaneously. For this assessment it was assumed that, based on the size of the area, there were 80 people in the outdoor terrace either sitting and/or standing in groups of approximately 12 to 15.

A worst case has been assessed where approximately 25% of the people in each group are conversing loudly and at the same time, to constitute an Leq noise level. It is noted that in outdoor areas there is no reverberant build up of noise and people have less need to raise their voice to converse in small groups. The raised speech of a small group of people would, typically, range from about 78 to 82 dB(A) Leq (15 min).

Table 6 shows the Lw of the combined raised speech of the various groups of people as noted above (i.e. seated or standing sitting in six groups) in the outdoor terrace propagated to the nearest potentially affected residential boundary (RT on Figure 4).

The calculation assumes an effective line of sight from the outdoor terrace to the boundary (that is, with no shielding from the structure of the main Hotel building, or outbuildings) and takes into account the loss for hemispherical spreading (distance loss) and the barrier loss for the acoustic fence.

The barrier calculation assumes groups of people standing at a source height of 1.8m above ground level at the outdoor with a receiver at a standard height 1.5m (R.L. taken from Google Earth) at 3m inside the boundary (distance loss calculated to the boundary only).

The distance loss from each noise source (group of people talking) to the barrier is shown in the table.

TABLE 6
CALCULATED SPL AT PROPOSED MHE BOUNDARY
PATRON NOISE – OUTDOOR AREA

Patron Noise Source Number	Distance Loss	Barrier Loss	Received Noise
1	38 (30m)	10	32
2	38 (30m)	10	32
3	39 (35m)	10	31
4	49 (35m)	10	30
5	40 (40m)	10	30
6	40 (40m)	10	30
Total Leq (15 min)	**39**		
Criterion Leq (15 min) Day/Evening/Night	**40/40/38**		

The results in Table 6 show that, under the assessed conditions and with the recommended barrier in place, the noise emissions from the patrons the outdoor areas will not exceed the day or evening criterion.

Under the assessed conditions, the predicted noise level would exceed the night time (i.e. after 10pm) criterion by 1 dB(A). An exceedance of a noise criterion by up to 2 dB(A) would, typically, be regarded as marginal. A 2dB(A) exceedance for example would not be regarded as a non-compliance during a noise monitoring survey.

Based on the layout of the Hotel it is most likely that any entertainment would be set up towards the rear of the venue. A cursory inspection of the Hotel building indicated it is a relatively solid construction which would have good sound transmission loss properties. The most potentially affected existing receiver in relation to entertainment noise would, therefore, be at 35 Metford Road. There are residences across Metford Road which are closer to the Hotel but the internal design of the building would acoustically shield these from the entertainment noise.

Assuming the Hotel is currently operating in compliance with the Standard OLGR Noise Conditions, the reception point at 35 Metford Road (pre midnight) which is approximately 150m from the likely location of entertainment at the Hotel.

The nearest proposed residence in the subdivision will be about 50m from the entertainment. This could result in approximately 8 to 10 dB(A) difference in noise at the proposed receivers.

A barrier height of 2.2m was used in the calculations. As detailed, this was based on the existing ground levels at each of the noise source, boundary and receiver taken from Google Earth. The accuracy of these inputs must be confirmed by survey and the resultant barrier heights also confirmed by calculation based on the actual existing and proposed R.L.'s. The proposed location of the barrier is shown as a dotted line on the figure in Appendix A.

CONCLUSION

In conclusion, the results of the current noise assessment have shown that there is little potential for noise from the WWTW or the Hotel to create adverse impacts on any residences in the proposed manufactured home estate.

Previously modelled noise emission from the WWTW and current site measurements and observations have shown that this will create no adverse impacts on any proposed residences.

The assessment has also shown that, under the assessed conditions, the operations of the Hotel are not likely adversely impact on the subdivision site, provided the recommended acoustic barrier is in place.

The acoustic amenity of future residents is not likely to be adversely impacted by noise from entertainment at the Hotel.

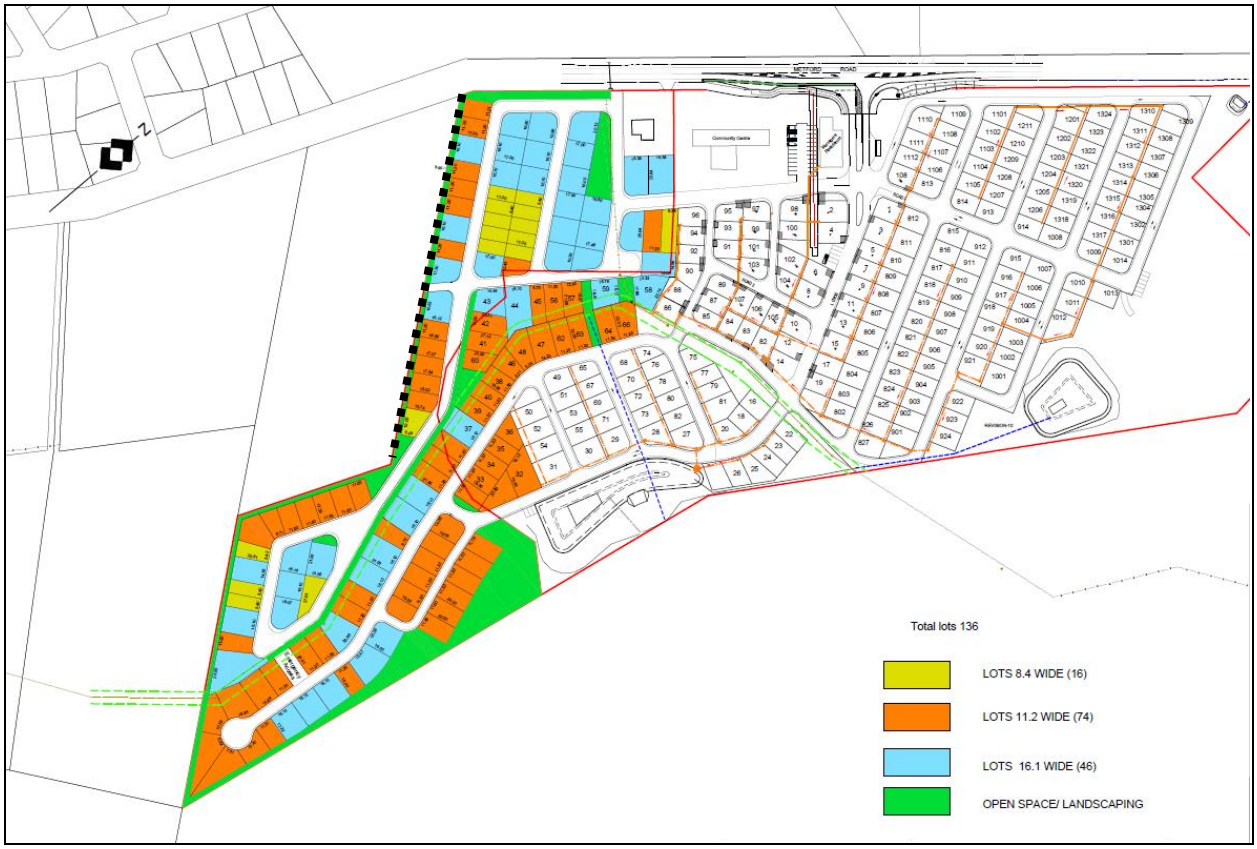
We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please do not hesitate to contact the undersigned.

SPECTRUM ACOUSTICS PTY LIMITED

Ross Hodge
Principal/Director

APPENDIX A

SITE LAYOUT and ACOUSTIC BARRIER LOCATION



Acoustic Barrier ▪▪▪▪▪▪▪▪

APPENDIX B

SITE NOISE LOGGER CHART