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Environmental Noise Assessment

Proposed Feed Mill
Lot 501 (429) Springhill Road, Cuballing

Reference: 20075619-01

Prepared for:
Patmore Feeds

Report: 20075619-01

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1 INTRODUCTION

Patmore Feeds (the Applicant) is seeking approval to construct a feed mill at Lot 501 (429) Springhill Road, Cuballing. Cuballing is located approximately 190km south east of the Perth CBD, within the Shire of Cuballing. The site is located within a Rural Zone under the Shire of Caballing Local Planning Scheme No. 2. The proposed land use is compatible with the existing zoning.

This Environmental Noise Assessment will form part of the application package.

Figure 1-1, shows the location of the site together with the closest noise sensitive receivers. It should be noted that receivers R1 and R2 are owned by the Applicant, however, for the purposes of this assessment they are treated as separate properties.

The general layout of the feed mill, including the truck route through the plant, is presented in *Figure 1-2.*

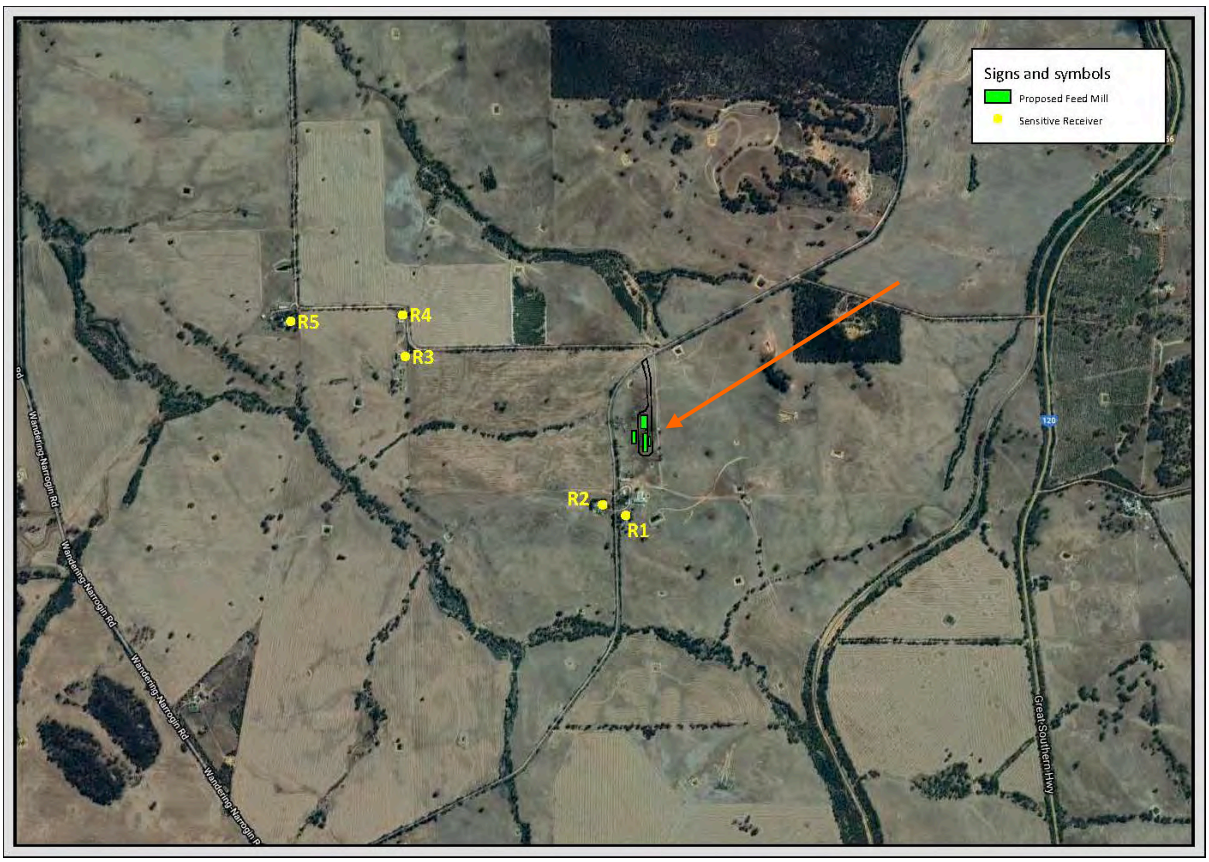


Figure 1-1 Feed Mill Locality & Closest Receivers

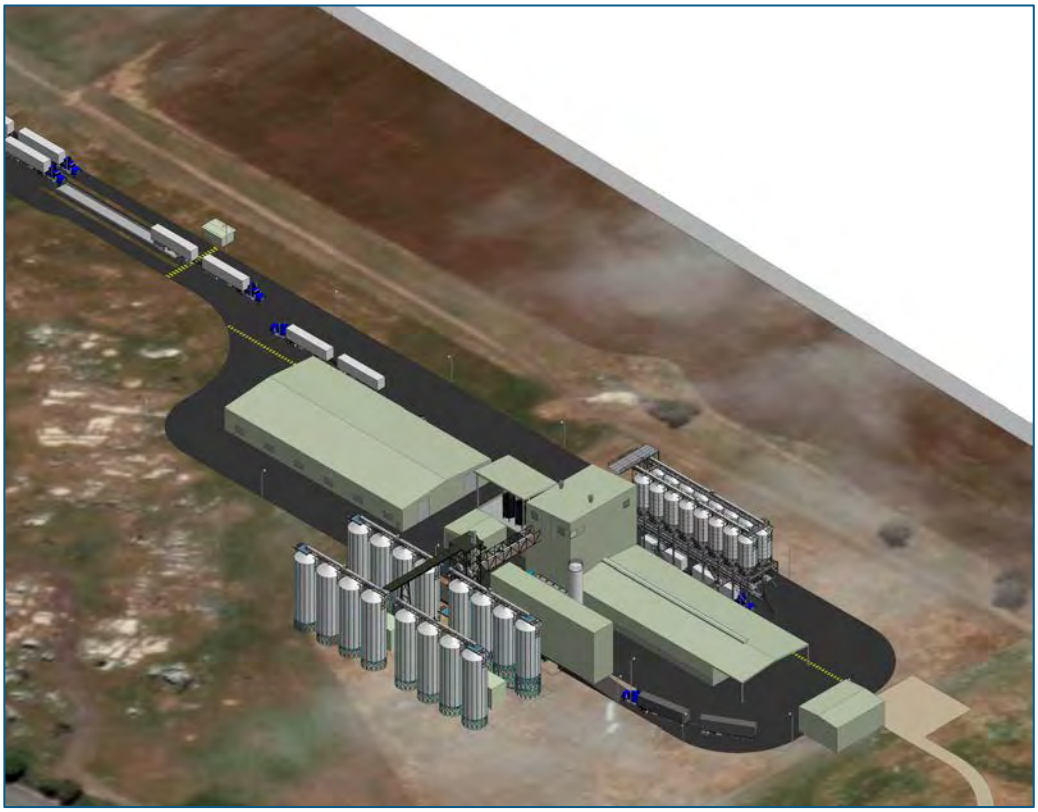


Figure 1-2 Feed Mill Layout

A feed mill facility operates by taking in raw materials of widely ranging physical, chemical and nutritional composition and converting this into a homogenous mixture suitable for producing animal feed.

During peak times the operating hours of the feed mill will be 24 hours a day, 6 days a week.

This report presents the assessment of the noise emissions from feed mill and compares them against the allowable levels of the *Environmental Protection (Noise) Regulations 1997*.

Appendix A contains a description of some of the terminology used throughout this report.

2 CRITERIA

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations).

Regulation 7 defines the prescribed standard for noise emissions as follows:

"7. (1) Noise emitted from any premises or public place when received at other premises –

(a) Must not cause or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and

(b) Must be free of –

i. tonality;

ii. impulsiveness; and

iii. modulation,

when assessed under regulation 9"

A "…noise emission is taken to significantly contribute to a level of noise if the noise emission … exceeds a value which is 5 dB below the assigned level…"

Tonality, impulsiveness and modulation are defined in Regulation 9. Noise is to be taken to be free of these characteristics if:

(a) The characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and

(b) The noise emission complies with the standard prescribed under regulation 7 after the adjustments of *Table 2-1* are made to the noise emission as measured at the point of reception.

Table 2-1 Adjustments Where Characteristics Cannot Be Removed

Where Noise Emission is Not Music			Where Noise Emission is Music	
Tonality	Modulation	Impulsiveness	No Impulsiveness	Impulsiveness
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB

Note: The above are cumulative to a maximum of 15dB.

The baseline assigned levels (prescribed standards) are specified in Regulation 8 and are shown in *Table 2-2*.

Table 2-2 Baseline Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area[1]	0700 to 1900 hours Monday to Saturday (Day)	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays (Sunday)	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days (Evening)	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial	All hours	60	75	80
Industrial	All hours	65	80	90

1. ***highly sensitive area*** means that area (if any) of noise sensitive premises comprising —
   (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
   (b) any other part of the premises within 15 metres of that building or that part of the building.

The closest sensitive receiver is located approximately 400 metres to the southwest of the proposed feed mill (R2 in *Figure 1-1*).

For Receivers R1 and R2, the fertiliser retailers (Whitford Fertlisers Narrogin), which would be considered as light industrial, would result in an influencing factor of 1 dB. For the remianing receivers, the influencing factor is zero and the baseline assigned levels provided in *Table 2-2* would apply.

As the assigned noise levels are statistical levels and therefore the period over which they are determined is important. The Regulations define the Representative Assessment Period (RAP) as *a period of time of not less than 15 minutes, and not exceeding 4 hours*, which is determined by an *inspector* or *authorised person* to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission. An *inspector* or *authorised person* is a person appointed under Sections 87 & 88 of the *Environmental Protection Act 1986* and include Local Government Environmental Health Officers and Officers from the Department of Environment Regulation. Acoustic consultants or other environmental consultants are not appointed as an *inspector* or *authorised person*. Therefore, whilst this assessment is based on a 4 hour RAP, which is assumed to be appropriate given the nature of the operations, this is to be used for guidance only.

2.1 Reversing Alarms on Mobile Plant

With regards to noise from reversing alarms, regulation 3(1)(h) states:

(1) Nothing in these regulations applies to the following noise emissions —

(h) noise emissions from —

(i) a reversing alarm fitted to a motor vehicle, mobile plant, or mining or earthmoving equipment;

If -

(iii) it is a requirement under another written law that such an alarm be fitted; and

(iv) it is not practicable to fit an alarm that complies with the written law under which it is required to be fitted and emits noise that complies with these regulations;

It is considered that any reversing alarms fitted to the mobile plant and transport trucks are not necessarily exempt under the Regulations, since they are not specifically required under another written law.

The commonly used fixed noise output tonal reversing alarms also known as 'reversing beeper' emit, by their very nature, tonal and modulating noise at high levels. As such, this type of reversing alarm generally cannot comply with the Regulations even at distant receivers. Alternative alarms such as broadband alarms are commonly used to minimise the impact.

3 METHODOLOGY

Computer modelling has been used to predict noise levels at each nearby receiver. The advantage of modelling is that it is not affected by background noise sources and can provide the noise level for various weather conditions and operating scenarios.

The software used was *SoundPLAN 8.2* with the CONCAWE algorithms incorporating the ISO 171534-3 improved method selected. These algorithms have been selected as they include the influence of wind and atmospheric stability. Input data required in the model are:

- Meteorological Information;
- Topographical data;
- Ground Absorption; and
- Source sound power levels.

3.1 Meteorological Information

Meteorological information utilised is provided in *Table 3-1* and is considered to represent worst-case conditions for noise propagation. At wind speeds greater than those shown, sound propagation may be further enhanced, however background noise from the wind itself and from local vegetation is likely to be elevated and dominate the ambient noise levels.

Table 3-1 Modelling Meteorological Conditions

Parameter	Night (1900-0700)
Temperature (°C)	15
Humidity (%)	50
Wind Speed (m/s)	3
Wind Direction*	All
Pasquil Stability Factor	F

* Note that the modelling package used allows for all wind directions to be modelled simultaneously.

It is generally considered that compliance with the assigned noise levels needs to be demonstrated for 98% of the time, during the day and night periods, for the month of the year in which the worst-case weather conditions prevail. In most cases, the above conditions occur for more than 2% of the time and therefore must be satisfied.

3.2 Topographical Data

Topographical data for the quarry area natural ground surface was sourced from *GoogleEarth* in the form of spot heights. It is noted the land is relatively level so this data is considered acceptable for this assessment.

3.3 Ground Absorption

Ground absorption varies from a value of 0 to 1, with 0 being for an acoustically reflective ground (e.g. water or bitumen) and 1 for acoustically absorbent ground (e.g. grass). In this instance, a value of 1.0 has been used to represent for the rural land between the plant and the receivers.

3.4 Source Sound Levels

The sound power levels used in the modelling are provided in *Table 3-2*.

Table 3-2 Source Sound Power Levels

Description	Octave Band Centre Frequency (Hz)								Overall dB(A)
	63	125	250	500	1k	2k	4k	8k	
Mills (Internal)	67	77	84	90	93	94	94	92	**100**
Exhaust Fans	51	60	63	60	63	59	60	54	**69**
Bucket Elevator Drive Unit	66	73	74	81	87	84	80	71	**90**
Covered Conveyors	59	63	71	67	71	71	75	73	**80**
Trucks at 20km/h	90	97	97	94	92	93	90	78	**103**

The overall and spectral noise levels for the fixed plant were taken from library data used for previous noise studies.

In addition to the above, the following is noted in regard to each source:

- The sound power levels (except trucks) represent L_{10} source levels for normal operation; and
- The walls of the buildings are assumed to be typical sheet metal used for large sheds.

4 RESULTS

Detailed below are the results of the assessment, with a brief description of the assumptions made.

4.1 L_{A10} Noise Levels

The L_{A10} levels include all fixed plant associated with the mill. The internal reverberant noise level within the mill building itself, should not exceed 85 dB(A). However, as it is our understanding that noisy equipment, such as the hammer mill and dust extractors, are housed in an enclosure to reduce noise exposure to the mill operators, then this is expected to be easily complied with.

External sources are generally the covered conveyors, the conveyor drives and the extraction fans. It is important that the conveyor drive motors, particularly for the bucket elevator, do not exceed a sound power level of 90 dB(A) as detailed in *Table 3-2.*

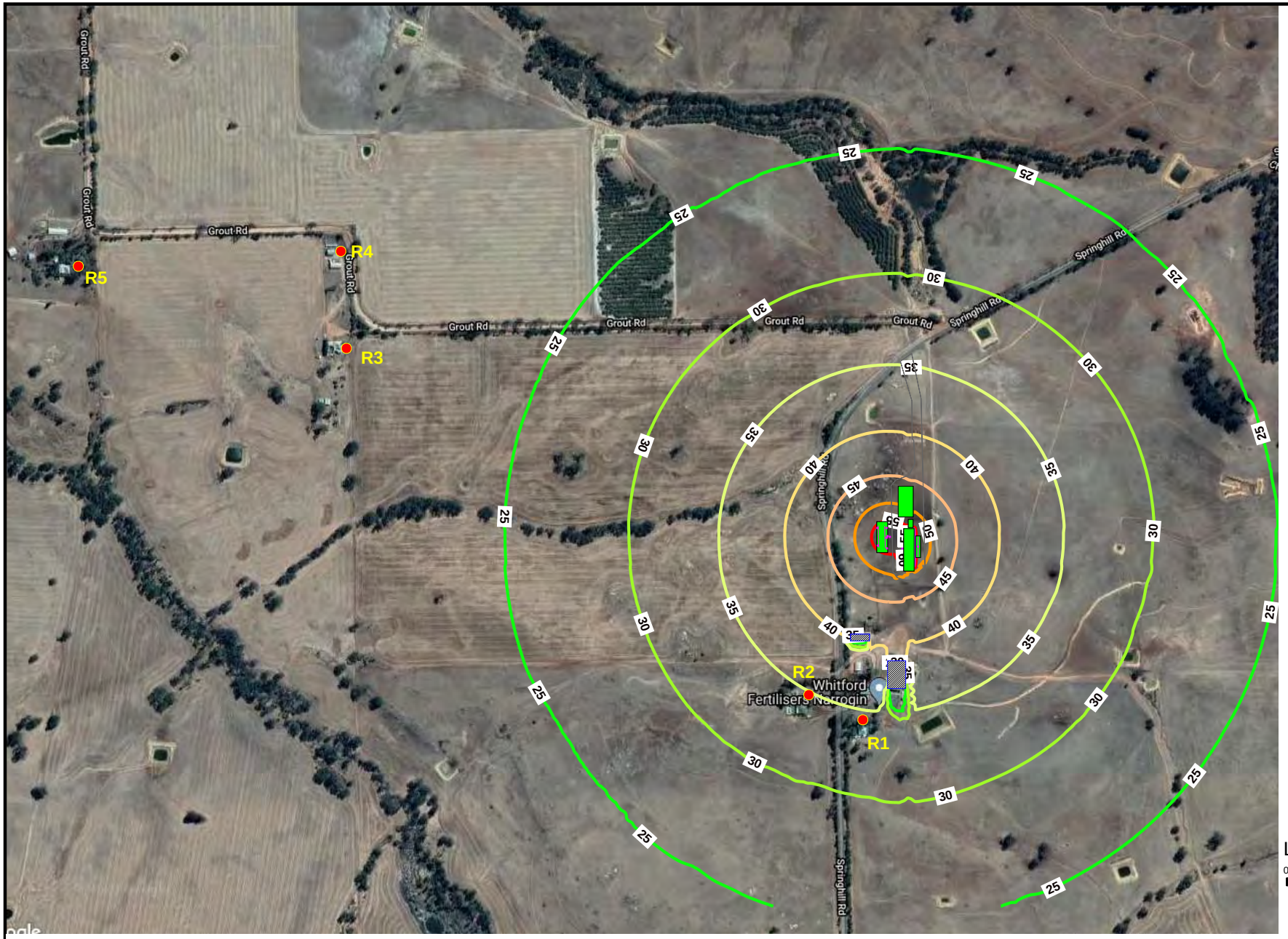
Due to the nature of the noise sources, we would not expect the noise to exhibit any annoying characteristics, such as tonality, and therefore no adjustments to the predicted noise levels are required.

The predicted L_{A10} noise levels to sensitive receivers, resulting from the mill, are presented in *Table 4-1* and shown graphically in *Figure 4-1.*

Table 4-1 Predicted L_{A10} Noise Levels

Receiver	Predicted Noise Level, L_{A10}, dB	Assigned Noise Level, L_{A10}, dB	Comment
R1	34	36	Complies with assigned level at all times
R2	35	36	Complies with assigned level at all times
R3	20	35	Complies with assigned level at all times
R4	19	35	Complies with assigned level at all times
R5	14	35	Complies with assigned level at all times

Figure 4-1



Signs and symbols

- Plant
- Point source
- Point receiver

Length Scale

0 50 100 200 300 400 m

Proposed Feed Mill - Lot 501 Springhill Road, Cuballing
Predicted L_{A10} Noise Levels from Mill
Wind from All Directions

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4.2 L_{A1} Noise Levels

The L_{A1} levels include all fixed plant associated with the mill, as detailed above, plus the truck movements in and out of the mill.

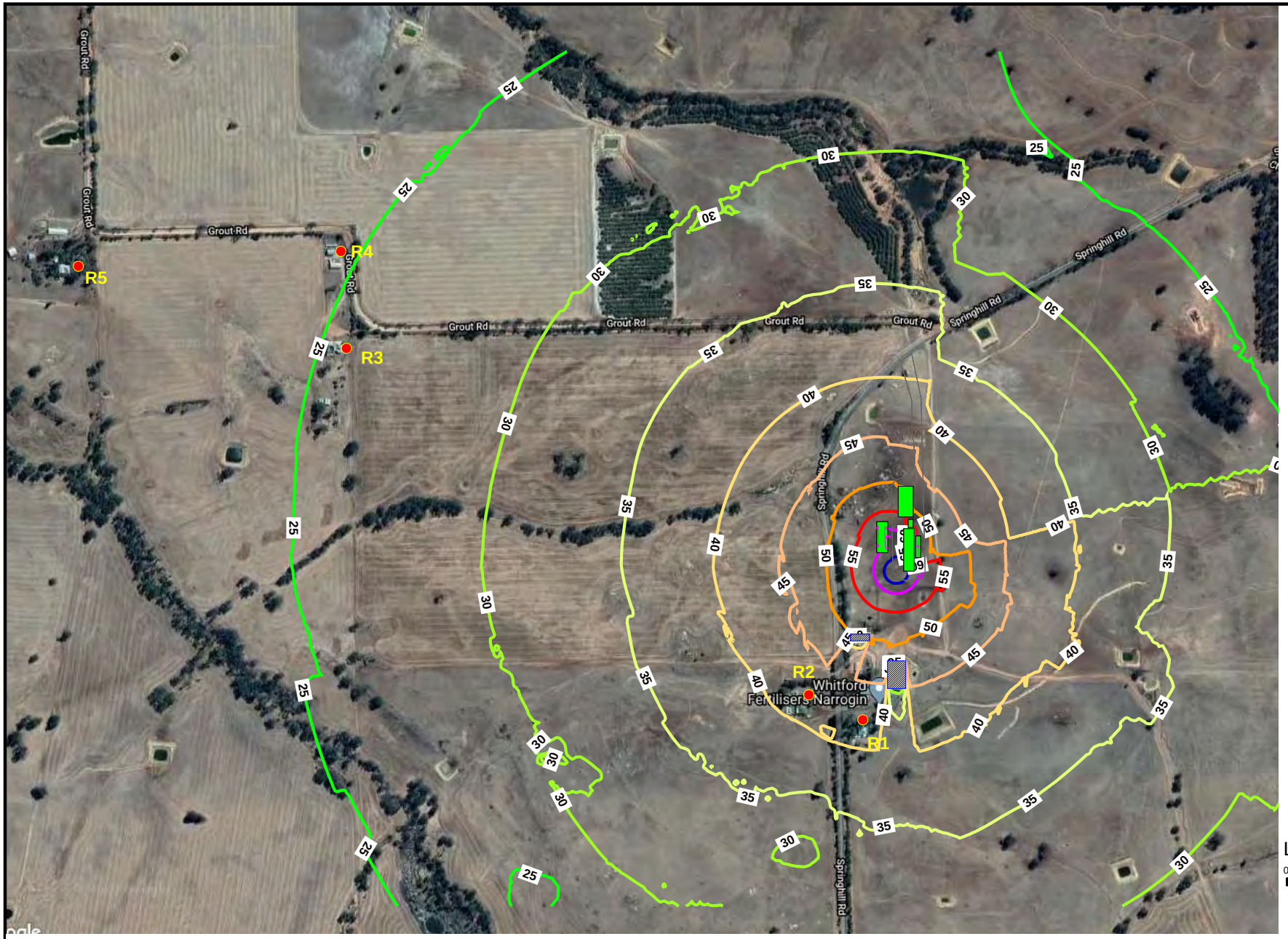
It is our understanding that that there will be an average of 19.2 loads a day, which equates to 1.6 loads in any 1 hour period. Assuming a truck speed of 20km/h, it would take approximately 65 seconds to drive the route in and out of the plant without stopping. This equates to 416 seconds of driving in any four-hour representative time period. Providing that the total noise from the trucks does not exceed 1,440 seconds (24 minutes) in any four-hour period, the L_{A1} level will apply to this source.

The predicted L_{A1} noise levels to sensitive receivers, resulting from the mill, are presented in *Table 4-2* and shown graphically in *Figure 4-2.*

Table 4-2 Predicted L_{A1} Noise Levels

Receiver	Predicted Noise Level, L_{A1}, dB	Assigned Noise Level, L_{A1}, dB	Comment
R1	42	46	Complies with assigned level at all times
R2	42	46	Complies with assigned level at all times
R3	26	45	Complies with assigned level at all times
R4	25	45	Complies with assigned level at all times
R5	20	45	Complies with assigned level at all times

Figure 4-2



Signs and symbols

- Plant
- Point source
- Point receiver

Length Scale

0 50 100 200 300 400 m

Proposed Feed Mill - Lot 501 Springhill Road, Cuballing
Predicted L_{A1} Noise Levels from Mill
Wind from All Directions

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5 ASSESSMENT

From *Tables 4-1 and 4-2*, it can be seen that noise levels are predicted to comply with the assigned levels at locations and at all times. As such, noise mitigation does not require further consideration.

However, to ensure compliance, it is important that the conveyor drives are selected not exceed the sound power levels presented in *Table 3-2*, or if they do, they should be enclosed to reduce the noise emissions.

6 CONCLUSIONS

The noise emissions resulting from the proposed feed mill at Lot 501 (429) Springhill Road, Cuballing, has been assessed by means of noise modelling and the results compared against the assigned levels within the *Environmental Protection (Noise) Regulations 1997*.

Based on the modelling results and assumptions described in *Section 4,* it is concluded that compliance with the applicable assigned noise level is achieved at all noise sensitive receiver locations.

In addition, the following best practices will be implemented to further minimise noise impacts:

- The plant is specifically designed to only have a clockwise flow of trucks. All items are also designed so no reversing is required;
- The site is also designed in a way that car traffic is always kept separate from truck traffic on the site; and
- Plant starting alarms will not be used.

Appendix A

Terminology

The following is an explanation of the terminology used throughout this report.

Decibel (dB)
The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

A-Weighting
An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A dB.

Sound Power Level (L_w)
Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure levels at known distances. Noise modelling incorporates source sound power levels as part of the input data.

Sound Pressure Level (L_p)
The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

L_{ASlow}
This is the noise level in decibels, obtained using the A frequency weighting and the S (Slow) time weighting as specified in IEC 61672-1:2002. Unless assessing modulation, all measurements use the slow time weighting characteristic.

L_{AFast}
This is the noise level in decibels, obtained using the A frequency weighting and the F (Fast) time weighting as specified in IEC 61672-1:2002. This is used when assessing the presence of modulation only.

L_{APeak}
This is the greatest absolute instantaneous sound pressure in decibels using the A frequency weighting as specified in IEC 61672-1:2002.

L_{Amax}
An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

L_{A1}
An L_{A1} level is the A-weighted noise level which is exceeded for one percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{A10}
An L_{A10} level is the A-weighted noise level which is exceeded for 10 percent of the measurement period and is considered to represent the "*intrusive*" noise level.

L_{Aeq}
The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

L_{A90}
An L_{A90} level is the A-weighted noise level which is exceeded for 90 percent of the measurement period and is considered to represent the "*background*" noise level.

One-Third-Octave Band
Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20 000 Hz inclusive.

L_{Amax} assigned level
Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded at any time.

L_{A1} assigned level
Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 1% of the representative assessment period.

L_{A10} assigned level
Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 10% of the representative assessment period.

Tonal Noise
A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

the presence in the noise emission of tonal characteristics where the difference between -

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

This is relatively common in most noise sources.

Modulating Noise
A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of modulation is:

a variation in the emission of noise that —

(a) is more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band;

(b) is present for at least 10% of the representative.

Impulsive Noise
An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness is:

a variation in the emission of a noise where the difference between $L_{A\ peak}$ and $L_{A\ Max\ slow}$ is more than 15 dB when determined for a single representative event;

Major Road
Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

Secondary / Minor Road
Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

Influencing Factor (IF)

$$= \frac{1}{10}(\%\ \text{Type A}_{100} + \%\ \text{Type A}_{450}) + \frac{1}{20}(\%\ \text{Type B}_{100} + \%\ \text{Type B}_{450})$$

where:

$\%\ \text{Type A}_{100}$ = the percentage of industrial land within a100m radius of the premises receiving the noise

$\%\text{TypeA}_{450}$ = the percentage of industrial land within a 450m radius of the premises receiving the noise

$\%\ \text{Type B}_{100}$ = the percentage of commercial land within a100m radius of the premises receiving the noise

$\%\text{TypeB}_{450}$ = the percentage of commercial land within a 450m radius of the premises receiving the noise

+ Traffic Factor (maximum of 6 dB)

= 2 for each secondary road within 100m

= 2 for each major road within 450m

= 6 for each major road within 100m

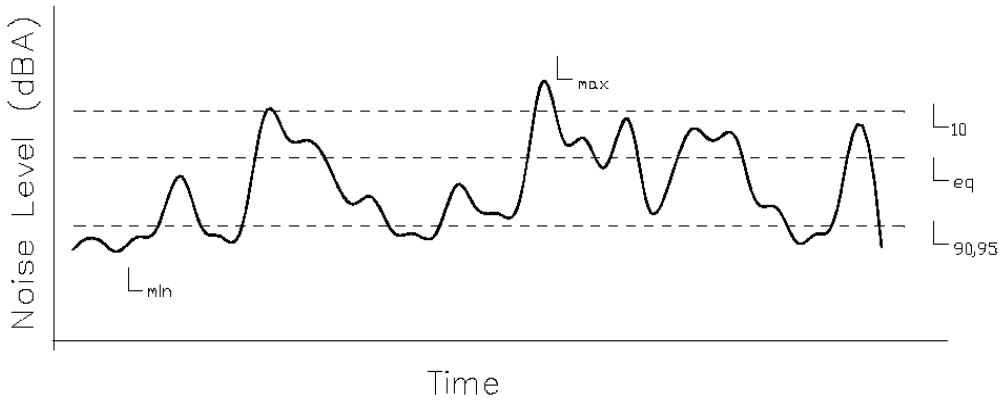
Representative Assessment Period
Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

Background Noise
Background noise or residual noise is the noise level from sources other than the source of concern. When measuring environmental noise, residual sound is often a problem. One reason is that regulations often require that the noise from different types of sources be dealt with separately. This separation, e.g. of traffic noise from industrial noise, is often difficult to accomplish in practice. Another reason is that the measurements are normally carried out outdoors. Wind-induced noise, directly on the microphone and indirectly on trees, buildings, etc., may also affect the result. The character of these noise sources can make it difficult or even impossible to carry out any corrections.

Ambient Noise
Means the level of noise from all sources, including background noise from near and far and the source of interest.

Specific Noise
Relates to the component of the ambient noise that is of interest. This can be referred to as the noise of concern or the noise of interest.

Chart of Noise Level Descriptors



Typical Noise Levels