ACOUSTIC REPORT

FOR

GREYHOUND KENNELS

5 November 2021

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EXECUTIVE SUMMARY

Acoustic Engineering Solutions (AES) has been commissioned by Ms Sarah Appleton to prepare an acoustic report as a supporting document for the application of greyhound kennels at 1282 Karnup Road Serpentine. The greyhound kennels operate 24 hours per day and 7 days a week. This report presents an environmental noise assessment of the proposed greyhound kennels. The aim of this assessment is to determine whether or not the proposed greyhound kennels would comply with the Environmental Protection (Noise) Regulations 1997 (the Regulations).

To reduce the noise emissions, the following noise control measures will be implemented:

- All of the greyhound kennels will be located inside a 10m X 15m shed. The shed walls and roof will be insulated with R2.5 Bradford SoundScreen Acoustic Insulation Batts. No gaps and holes are present on the walls and roofs.
- An outdoor area is designed to locate in the east of the shed. The shed and house are used to reduce noise propagation towards the closest neighbours R1 and R2.
- 1.8m colorbond fences will be installed on the boundaries of the outdoor area to reduce noise propagation towards the neighbours.
- Greyhounds are allowed to enter the outdoor area twice a day during the daytime: During the outdoor periods, the greyhounds are attended by trained staff. Any barking will be quickly stopped by the staff.
- Greyhounds will be kept inside the shed for the other time-periods and the shed is fully enclosed (all doors are fully closed).

An acoustic model is created and two worst-case operational scenarios are modelled:

Scenario 1: All of the greyhounds are in the fenced outdoor area and 6 of them are assumed to bark simultaneously. Staff is present.

Scenario 2: All of the greyhounds are kept inside the shed. All of them are assumed to bark simultaneously.

Both scenarios are short events occurring in less than 10% of any 4 hour periods.

Five closest residential receivers are selected for the detailed assessment of noise impacts. Noise levels are predicted for the worst-case meteorological conditions, and then adjusted to account for their dominant characteristics according to the Regulations. The adjusted noise levels are assessed against the criteria set by the Regulations. The compliance assessment concludes that full compliance is achieved for the proposed greyhound kennels.

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1.0 INTRODUCTION

Greyhound kennels are proposed at 1282 Karnup Road Serpentine. An acoustic report is required to assess if the noise emissions from the proposed greyhound kennels would comply with the Environmental Protection (Noise) Regulations 1997 (the Regulations).

Acoustic Engineering Solutions (AES) has been commissioned by Ms Sarah Appleton to prepare the acoustic report. This acoustic report presents an environmental noise impact assessment of the proposed greyhound kennels in accordance with the Regulations.

1.1 SUBJECT SITE

Figure 1 in APPENDIX A presents an aerial view of the subject site and surrounding area.

1.2 NOISE CONTROLS

18 greyhounds are proposed and each greyhound will have its own kennel. An outdoor area is designed for dog toileting and resting purposes.

To reduce the noise emissions, preliminary modelling was undertaken. Ms Sarah Appleton agrees to implement the following noise controls:

- All of the greyhound kennels will be located inside a 10m X 15m shed. The shed has metal walls and metal roof. Both the walls and roof will be insulated with R2.5 Bradford SoundScreen Acoustic Insulation Batts. No gaps and holes are present on the walls and roofs.
- An outdoor area is designed to locate in the east of the shed. The shed and house are used to reduce noise propagation towards the closest neighbours R1 and R2.
- 1.8m colorbond fences will be installed on the boundaries of the outdoor area to reduce noise propagation towards the neighbours.
- Greyhounds are allowed to enter the outdoor area twice a day during the daytime: During the outdoor periods, the greyhounds are attended by trained staff. Any barking will be quickly stopped by the staff.
- Greyhounds will be kept inside the shed for the other time-periods and the shed is fully enclosed (all doors are fully closed).

Figure 2 in APPENDIX A presents a zoomed view of the shed. Figure 3 and Figure 4 in APPENDIX A present the shed floor plan and site plan. The shed has one single door in the west, one roller door in the north and one roller door in the east.

2.0 NOISE CRITERIA

Noise management in Western Australia is implemented through the Environmental Protection (Noise) Regulations 1997 (the Regulations). The Regulations set noise limits which are the highest noise levels that can be received at noise-sensitive (residential), commercial and industrial premises. These noise limits are defined as 'assigned noise levels' at receiver locations. Regulation 7 requires that "noise emitted from any premises or public place when received at other premises 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".

Table 2-1 presents the assigned noise levels at various premises.

Table 2-1: Assigned noise levels in dB(A)

Type of Premises Receiving Noise	Time of Day	Assigned Noise Levels in dB(A)[1]		
		$L_{A\ 10}$	$L_{A\ 1}$	$L_{A\ max}$
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	45 + Influencing factor	55 + Influencing factor	65 + Influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + Influencing factor	50 + Influencing factor	60 + Influencing factor
	1900 to 2200 hours all days	40 + Influencing factor	50 + Influencing factor	60 + Influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	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 premises	All hours	60	75	80
Industrial and utility premises other than those in the Kwinana Industrial Area	All hours	65	80	90

[1] Assigned level L_{A1} is the A-weighted noise level not to be exceeded for 1% of a delegated assessment period.
Assigned level L_{A10} is the A-weighted noise level not to be exceeded for 10% of a delegated assessment period.
Assigned level L_{Amax} is the A-weighted noise level not to be exceeded at any time.

For highly noise sensitive premises, an "influencing factor" is incorporated into the assigned noise levels. The influencing factor depends on road classification and land use zonings within circles of 100 metres and 450 metres radius from the noise receiver locations.

2.1 CORRECTIONS FOR CHARACTERISTICS OF NOISE

Regulation 7 requires that that "noise emitted from any premises or public place when received at other premises must be free of:

(i) tonality;

(ii) impulsiveness; and

(iii) modulation.

when assessed under Regulation 9".

If the noise exhibits intrusive or dominant characteristics, i.e. if the noise is impulsive, tonal, or modulating, noise levels at noise-sensitive premises must be adjusted. Table 2-2 presents the adjustments incurred for noise exhibiting dominant characteristics. That is, if the noise is assessed as having tonal, modulating or impulsive characteristics, the measured or predicted noise levels have to be adjusted by the amounts given in Table 2-2. Then the adjusted noise levels must comply with the assigned noise levels. Regulation 9 sets out objective tests to assess whether the noise is taken to be free of these characteristics.

Table 2-2: Adjustments for dominant noise characteristics

Adjustment where noise emission is not music. These adjustments are cumulative to a maximum of 15 dB.			Adjustment where noise emission is music	
Where tonality is present	Where Modulation is present	Where Impulsiveness is present	Where Impulsiveness is not present	Where Impulsiveness is present
+5 dB	+5 dB	+10 dB	+10 dB	+15 dB

2.2 INFLUENCING FACTOR

Five closest residences surrounding the subject site are selected for the detailed assessment of noise impact, as shown in Figure 1 in APPENDIX A.

Influencing factor varies from residence to residence depending on the surrounding land use. Traffic flows on roads in the vicinity of the closest residences are insufficient for any of the roads to be classified as either the major or secondary roads. No industrial or commercial zones are present within the vicinity (within 450m in radius) of the closest residences. Therefore influencing factor is zero for all of the closest residences.

3.0 NOISE MODELLING

3.1 METHODOLOGY

An acoustic model is developed using SoundPlan v8.0 program, and the CONCAWE[2,3] prediction algorithms are selected for this study. The acoustic model is used to predict noise levels at the selected receiver locations and generate noise level contours for the area surrounding the subject site.

The acoustic model does not include noise emissions from any sources other than from the greyhounds. Therefore, noise emissions from birds, insect, animal, aircraft, road traffic, etc are excluded from the modelling.

3.2 INPUT DATA

3.2.1 Topography

Ms Sarah Appleton advised that the subject site and surrounding area are reasonably flat. Therefore an absorptive flat ground is assumed.

The existing building and sheds on the subject site were digitised to the acoustic model together with the proposed (1.8m) boundary fences of the outdoor area.

3.2.2 Noise Sensitive Premises

Five residences are selected for the detail assessment of noise impact, as shown in Figure 1 in APPENDIX A. All of them are the ground level receivers (1.5m above the ground).

3.2.3 Source Sound Power Levels

The only major noise source is the dog barking for this study. Table 3-1 presents the sound power level of a dog barking, obtained from the AES database for large dog barking.

Table 3-1: Sound power levels.

Equipment	Overall Sound Power Level in dB(A)
Dog barking	99

[2] CONCAWE (Conservation of Clean Air and Water in Europe) was established in 1963 by a group of oil companies to carry out research on environmental issues relevant to the oil industry.

[3] The propagation of noise from petroleum and petrochemical complexes to neighbouring communities, CONCAWE Report 4/81, 1981.

3.3 METEOROLOGY

SoundPlan calculates noise levels for defined meteorological conditions. In particular, temperature, relative humidity, wind speed and direction data are required as input to the model. For this study the worst-case meteorological conditions[4] are assumed, as shown in Table 3-2.

Table 3-2: Worst-case meteorological conditions.

Time of day	Temperature Celsius	Relative Humidity	Wind speed	Pasquill Stability Category
Day (0700 --- 1900)	20º Celsius	50%	4 m/s	E
Evening (1900 --- 2200)	15º Celsius	50%	3 m/s	F
Night (1900 --- 2200)	15º Celsius	50%	3 m/s	F

3.4 NOISE MODELLING SCENARIOS

Ms Sarah Appleton advised:

- Greyhound kennels operate 24 hours a day and 7 days a week.
- 18 greyhounds are proposed.
- The noise control measures stated in section 1.2 will be implemented.
- No other major noise sources operate on site.

Based on the provided information, two worst-case operational scenarios are modelled:

Scenario 1: All of the 18 greyhounds are in the fenced outdoor area and 6 (one third of) greyhounds are barking simultaneously. The staff is present.

Scenario 2: All of the 18 greyhounds are kept within the enclosed shed and all of them are barking simultaneously.

It is the AES experience from visiting the other dog care centres that when a dog starts barking other dogs may follow. But staff is able to quickly stop barks. Only a few of but not all of dogs barks simultaneously when staff are present. For scenario 1, staff is assumed to be present. Six (one third of) greyhounds are assumed to bark immediately. This may rarely happen in practice but represents the worst-case outdoor activities.

[4] The worst case meteorological conditions were set by the EPA (Environmental Protection Act 1986) Guidance note No 8 for assessing noise impact from new developments as the upper limit of the meteorological conditions investigated.

For scenario 2, staff is not present. Without staff attention, it is possible but rare to happen that all of greyhounds bark simultaneously. Scenario 2 represents the worst-case operation when all of the 18 greyhounds are kept within the enclosed shed.

Scenario 1 is a day-time scenario while scenario 2 occurs at any times (the day, evening and night). Both scenarios 1 and 2 are short events occurring in less than 10% of any 4 hour periods. They unlikely happen for a prolong time.

Both scenarios 1 and 2 are the worst-case scenarios but for different operational conditions. Scenario 1 is the worst-case scenario for the condition of outdoor activities. When the greyhounds are in the fenced outdoor area, there may be no bark for most times or one to two barks may be occasionally present. However, scenario 1 assumes a worst-case operation where 6 barks happen simultaneously. Scenario 1 gives the worst-case noise levels received at the neighbours for the outdoor activities.

Scenario 2 is the worst-case scenario for the condition of indoor activities. When the greyhounds are located inside the enclosed shed, no bark may be for most times or one to two barks may be occasionally present. However, scenario 2 assumes an extreme case where all of the 18 greyhounds bark simultaneously. Scenario 2 may never happen in practice but gives the worst-case noise levels received at the neighbours for the indoor activities.

4.0 MODELLING RESULTS

4.1 POINT MODELLING RESULTS

Table 4-1 presents the predicted worst-case A-weighted overall noise levels for different operational conditions. The worst-case noise levels are not the highest noise levels received for all times. The predicted worst-case noise levels for scenario 1 represent the potential highest noise levels received for the periods of outdoor activities while those for scenario 2 are for the other periods. It is shown that the outdoor activities have the potential to generate higher noise emissions.

For scenario 2, the day and evening/night have similar noise levels. The highest worst-case noise level is predicted at R3 for scenario 1 but R2 for scenario 2.

Table 4-1: Predicted worst-case noise levels in dB(A).

Receivers	Scenario 1	Scenario 2	
	Day	Day	Evening/Night
R1	35.3	23.2	23.2
R2	32.7	26.0	26.0
R3	38.2	22.2	22.3
R4	35.2	18.9	19.0
R5	37.1	22.2	22.3

4.2 NOISE CONTOURS

Figure 5 and Figure 6 in APPENDIX B present the worst-case noise level contours at 1.5m above the ground. These noise contours represent the worst-case noise propagation envelopes, i.e., worst-case propagation in all directions simultaneously.

The predicted noise contours show that the closest residences are located outside the noise contour of:

- 40 dB(A) for scenario 1; but
- 30 dB(A) for scenario 2.

5.0 COMPLIANCE ASSESSMENT

5.1 ADJUSTED NOISE LEVELS

The noise from dog barks may exhibit implusiveness characteristics when being measured at locations close to dogs. According to Table 2-2, the predicted noise levels shown in Table 4-1 should be adjusted by 10 dB if the noise received exhibits impulsiveness.

Table 5-1 presents the adjusted worst-case A-weighted noise levels.

Table 5-1: Adjusted worst-case noise levels in dB(A).

Receivers	Scenario 1	Scenario 2	
	Day	Day	Evening/Night
R1	45.3	33.2	33.2
R2	42.7	36.0	36.0
R3	48.2	32.2	32.3
R4	45.2	28.9	29.0
R5	47.1	32.2	32.3

5.2 COMPLIANCE ASSESSMENT

As mentioned in section 3.4, both scenarios 1 and 2 are short events occurring at less than 10% of any 4 hour periods. Therefore, the assigned noise levels L_{A1} apply.

Table 2-1 shows that the day-time assigned noise levels on Sunday are 5dB lower than those on Monday to Saturday. Therefore, for scenario 1 the day-time compliance on Sunday will guarantee the day-time compliance on Monday to Saturday.

The night has stringent assigned noise levels. For scenario 2, the predicted day and evening/night-time noise levels are very similar with the level difference of 0.1 dB. The night-time compliance will guarantee the day and evening-time compliance.

Table 5-2 presents compliance assessments for the day of Sunday and for the night. It is shown that the adjusted noise levels are below the assigned noise levels at all of the receivers for both scenarios. This demonstrates that full compliance will be achieved for the proposed greyhound kennels.

Table 5-2: Compliance assessment.

Receivers	Sunday Day-time Assigned Levels L_{A1} in dB(A)	Scenario 1	Night-time Assigned Levels L_{A1} in dB(A)	Scenario 2
		Day		Night
R1	50	45.3	45	33.2
R2	50	42.7	45	36.0
R3	50	48.2	45	32.3
R4	50	45.2	45	29.0
R5	50	47.1	45	32.3

6.0 NOISE CONTROL AND MANAGEMENT

6.1 NOISE CONTROLS

Full compliance with the Regulations is concluded in the above section. The compliance assessments are made based on the modelling results shown in section 4. The modelling results are obtained after preliminary modelling and discussions with Ms Sarah Appleton, who agrees to implement the noise control measures indicated in section 1.2.

6.2 NOISE MANAGEMENT

6.2.1 Outdoor Activities

Table 4-1 and noise contours in APPENDIX B shows that the noise emissions from outdoor activities are much higher than the indoor activities. One of the noise control measures listed in section 1.2 is that the greyhounds are attended by trained staff. Any barking will be quickly stopped by the staff.

To reduce the noise emissions from outdoor activities, staff must be attended for all of the outdoor periods. Staff will be well trained and know the tricks for quickly stopping dog barking.

6.2.2 The Shed

Scenario 2 assumes that the shed is fully enclosed. Any gaps and holes should be sealed. A maintenance programme should be developed to ensure the shed is functioned as designed.

Staff should ensure that no doors are open when they leave the site.

APPENDIX A AERIAL VIEW

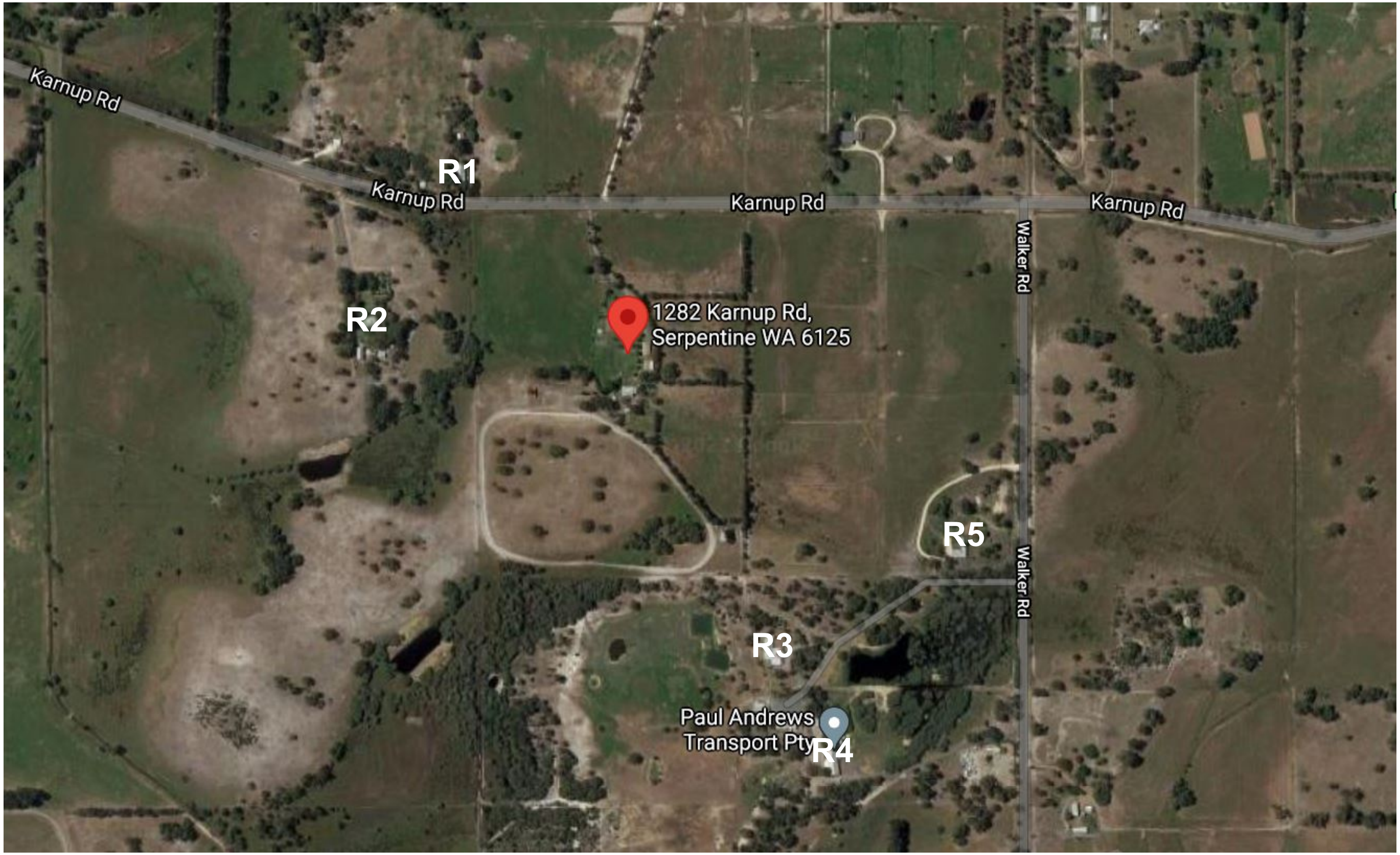

Figure 1: Aerial view of subject site and surrounding area.

Figure 2: Zoomed view of kennel shed.

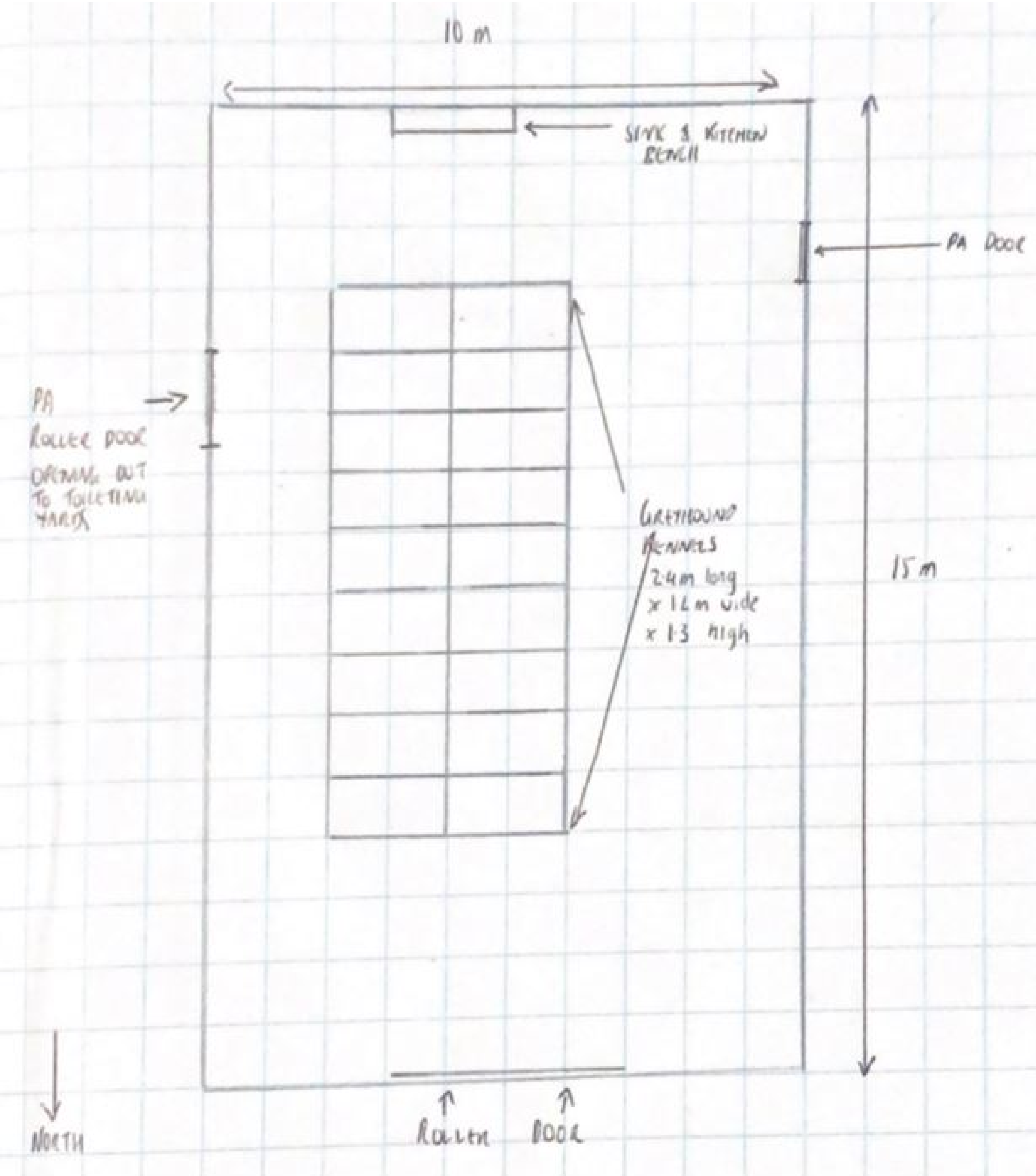

Figure 3: Shed floor plan.

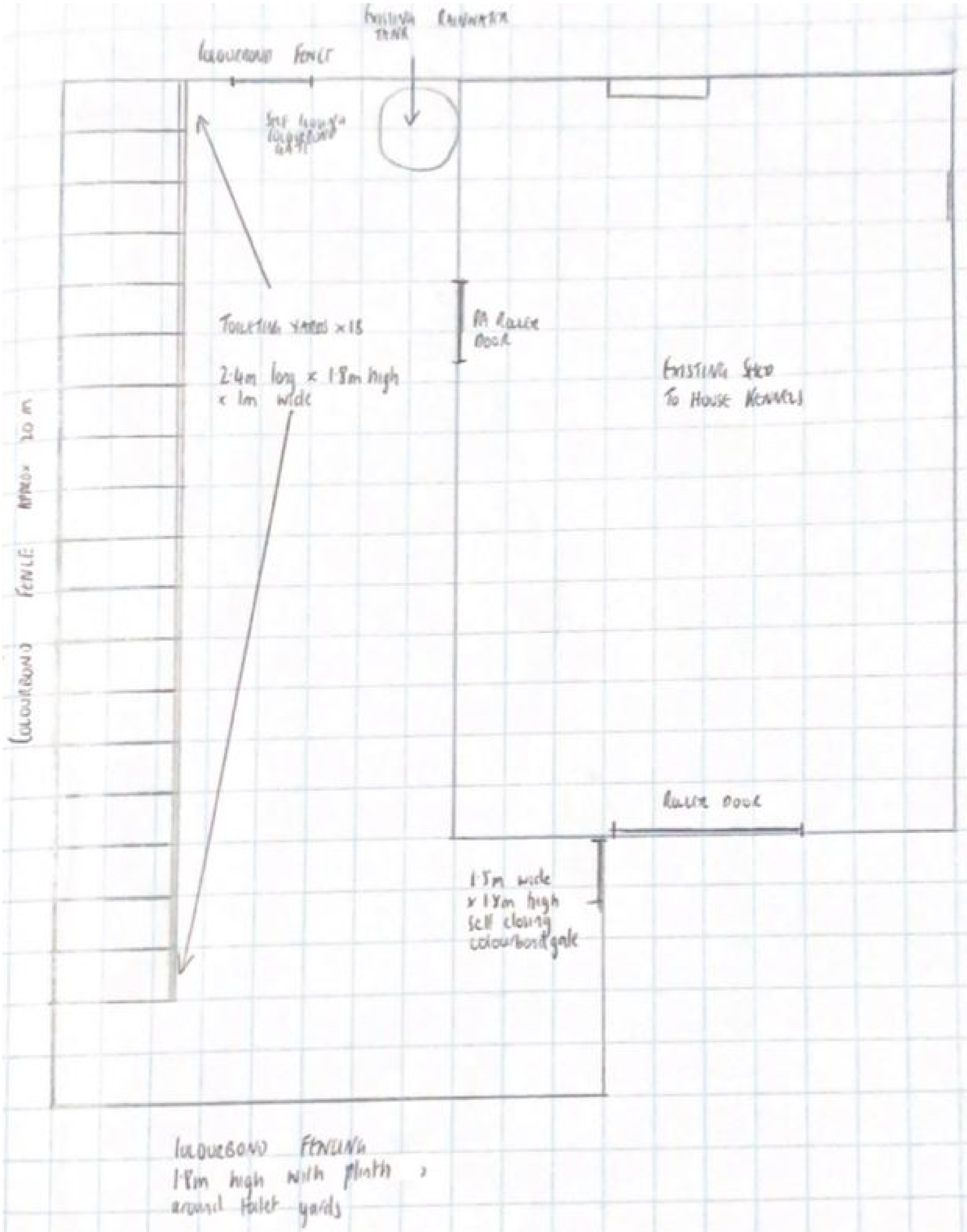

Figure 4: Site plan.

APPENDIX B NOISE CONTOURS

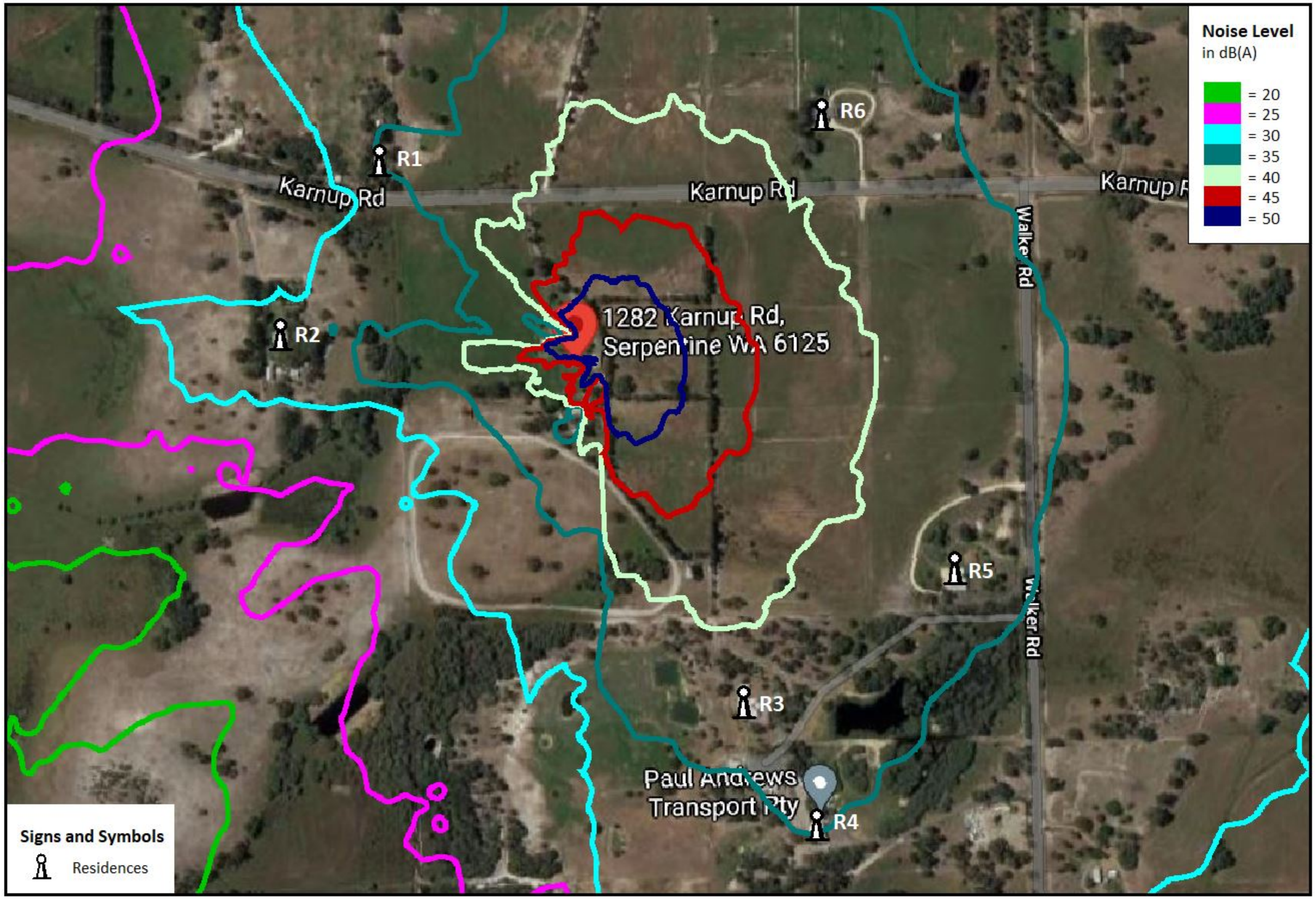

Figure 5: Worst-case noise contours for scenario 1.

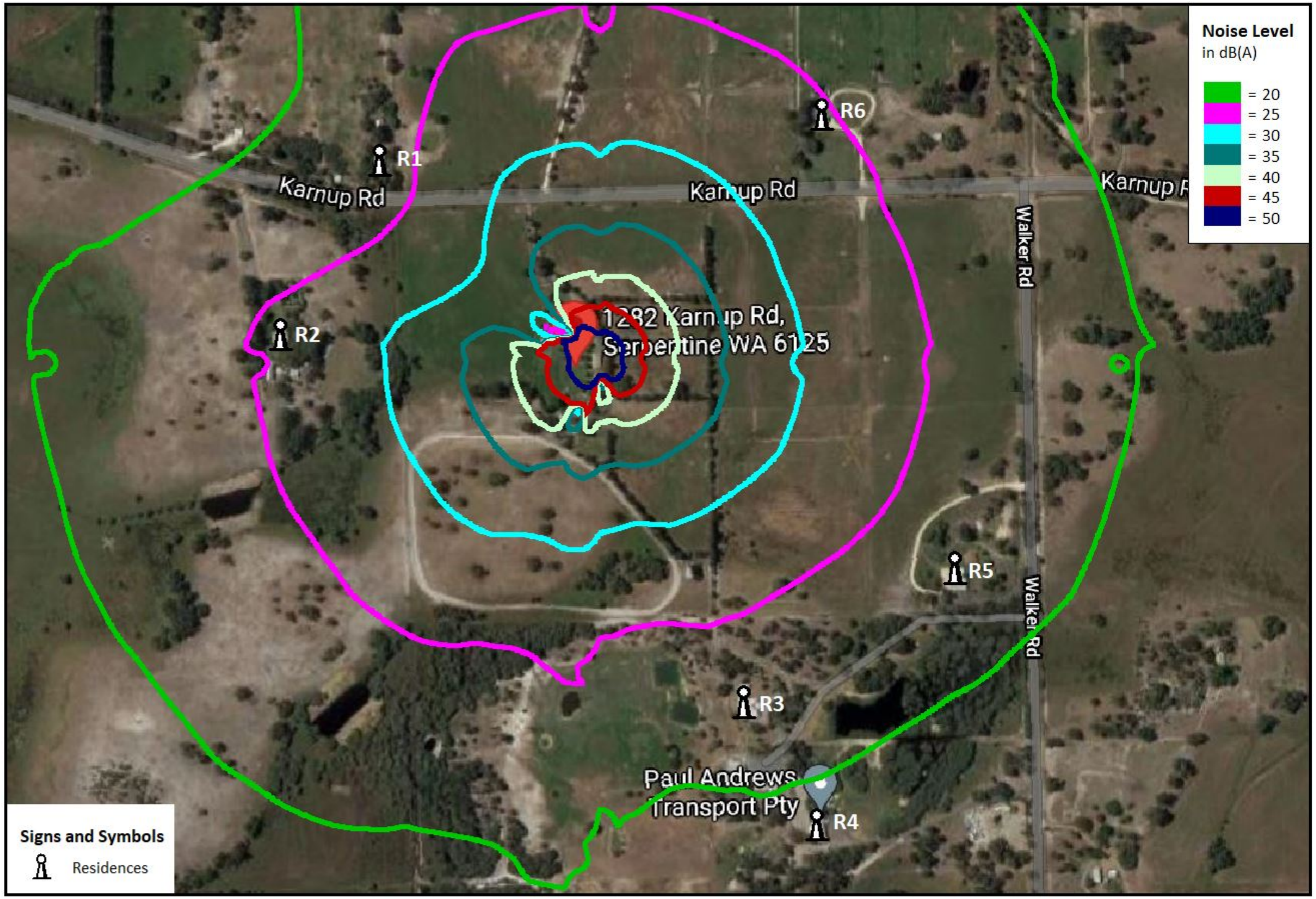

Figure 6: Worst-case noise contours for scenario 2.