

SOUTHERN HIGHLANDS REGIONAL SHOOTING
COMPLEX
COMPLIANCE NOISE MONITORING AUGUST 2019

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

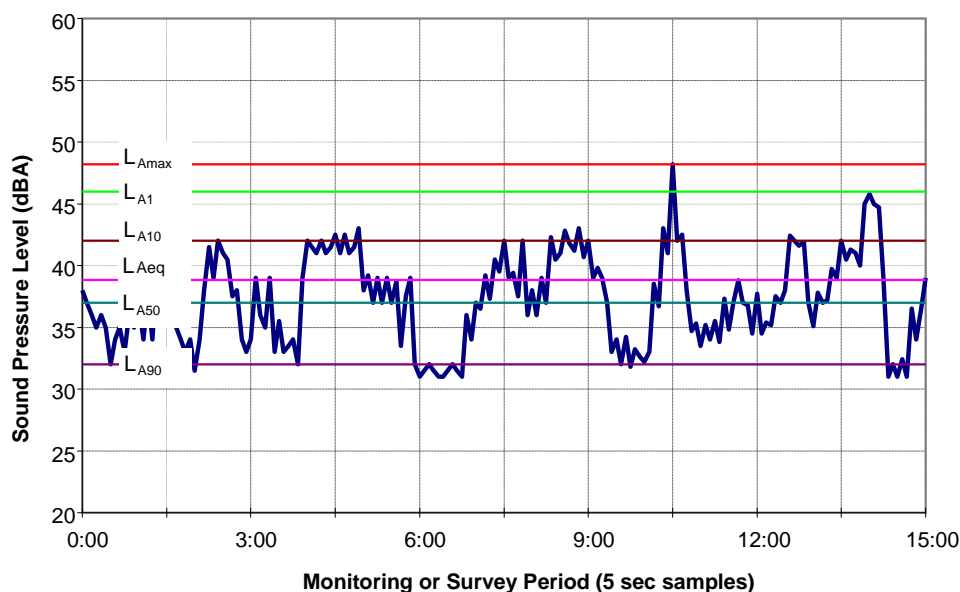
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

This report summarises the results of the attended compliance noise monitoring of the Southern Highlands Regional Shooting Complex (SHRSC), completed on 17 August 2019.

As part of its Conditions of Approval (MP 06_0232 MOD 5), the SHRSC must complete attended noise monitoring quarterly in the first 12 months of operation of annually thereafter. This report has been prepared for the third quarterly compliance monitoring session of the 800m range and second quarterly compliance monitoring session of the 50m and 500m ranges.

Noise compliance was determined based on the methodology outlined in the NSW EPA document "**Target Shooting Ranges: Application Note for Assessing Noise Compliance**" (EPA Application Note).

Condition A9 also stipulates the Firearm Noise Limits and states the following:

The noise from firearms or use of the site must not exceed LZpeak 75dB at the following locations:

- a) At the south-western end of Rocky Waterholes Road, Hill Top (representing residences at 1, 2 and 4 Rocky Waterholes Road); and*
- b) At Nattai Road, Hill Top, adjacent to the western entrance to the Wattle Ridge Farm (representing the existing residence).*

The assessment of noise compliance from the Southern Highlands Regional Complex shall be undertaken in accordance with the EPA's Target Shooting Ranges: Application Note for Assessing Noise Compliance (2015).

NSW Planning & Environment has reviewed previous compliance reports and has requested additional detail be included in the reports moving forward. Details which are to be included are as follows:

- Details of the types of firearms used on the ranges;
- Measurements of wind speed and direction on the ranges;
- Placement of a logger near the back of the firing range to record the number and time of shots; and
- The preparation of an improved project specific proforma report.

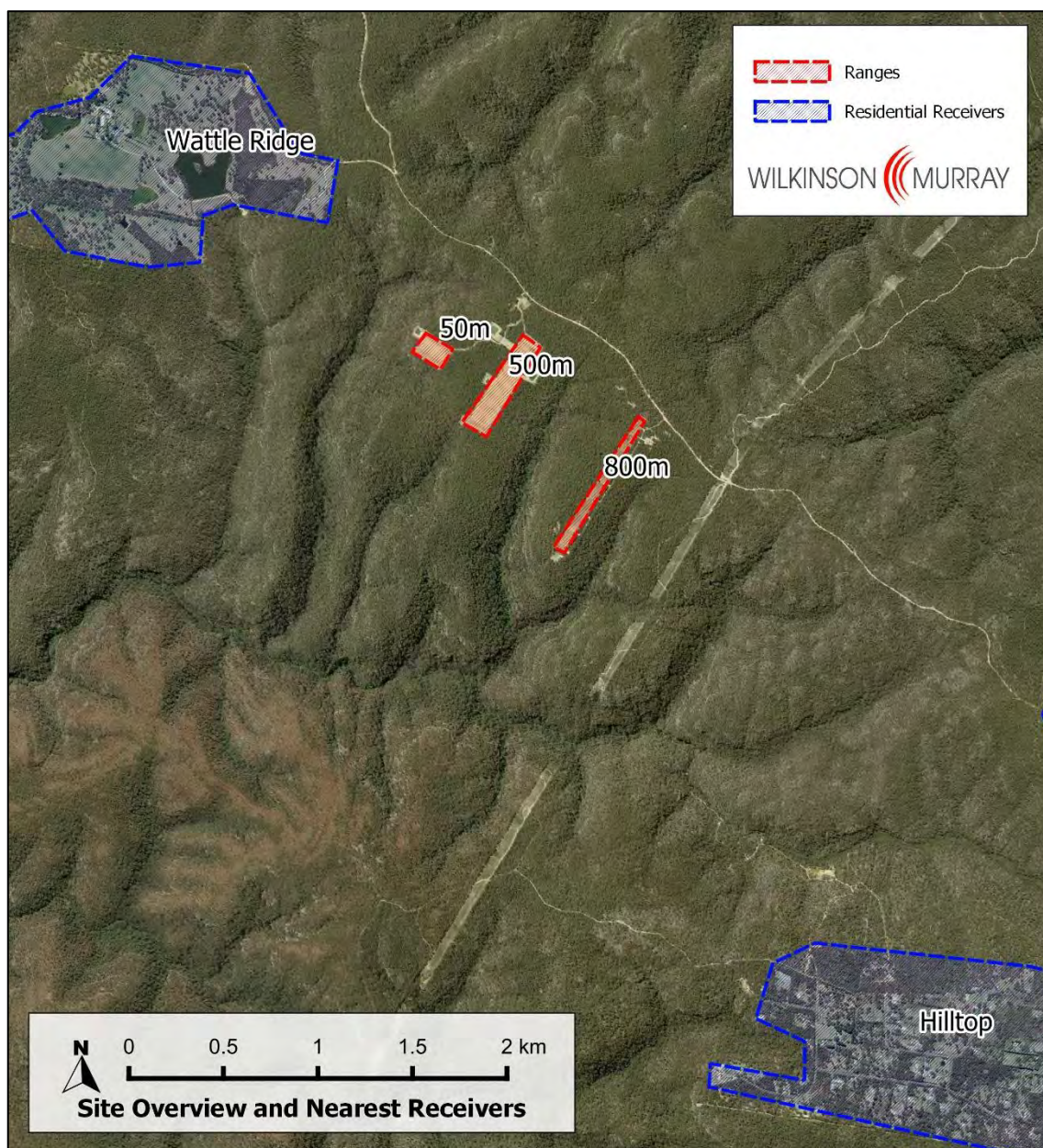
These items have been addressed in the report

2 SITE DESCRIPTION

The SHRSC is located on Wattle Ridge Road, Hilltop, NSW. The complex is situated within the Nattai National Park. The complex currently consists of a 50m range, a 500m range, and an 800m range. The range currently only operates on weekends between 10.00am and 5.00pm.

The nearest residential receivers include Wattle Ridge Farm, located approximately 2.5km to the north-west, and Hilltop township located approximately 3km to the south-east. No notable topographical shielding is present between the range and receivers.

Figure 2-1 Site Overview and Nearest Receivers



3 NOISE ASSESSMENT

3.1 Methodology

Attended monitoring was completed on 17 August 2019. On the day of monitoring, all three ranges (800m, 500m, and 50m) were scheduled for use. Monitoring was completed over two separate periods on the day in order to capture shots from all three ranges. Table 3-1 summarises the monitoring periods and active ranges for each period. Table 3-1 also provides information relating to the firing distance and calibre of ammunition used on each of the ranges. This information was collected by and provided by the Office of Sport.

Table 3-1 Monitoring Periods and Range Use

Time	800m	500m	50m
11.15am – 12.45pm	100m firing distance 0.223 to 7mm	100m firing distance 0.223 – 0.308	N/A
2.45pm – 3.45pm	700m firing distance 0.223 to 7mm	100m firing distance 0.223 – 0.308	50m range 9mm & 0.357

Measurements were conducted using a **Brüel & Kjær** Type 2250 Sound Level Meter and a NTI XL2 Sound Level Meter. Both meters conform to Australian Standard 1259 *Acoustics – Sound Level Meters* as a Type 1 Precision Sound Level Meter which has an accuracy suitable for field and laboratory use. The calibration of the meters was checked before and after the measurements with a **Brüel & Kjær** Type 4231 sound level calibrator and no significant drift was noted.

All equipment has been laboratory calibrated within the previous two years in accordance with our in-house Quality Assurance Procedures.

Both meters were set to measure L_{zPeak} **levels in accordance with EPA’s Application**. Noise compliance was determined by the manual method described in the Application note. Unattended noise monitors were also installed near the attended noise monitoring locations to record shots in case further post processing is required.

Noise monitoring locations were selected to be consistent with Condition A9 of the Consent Conditions. ARL Ngaras were also installed at the rear of the three ranges to allow confirmation of the timing and number of shots fired from each range.

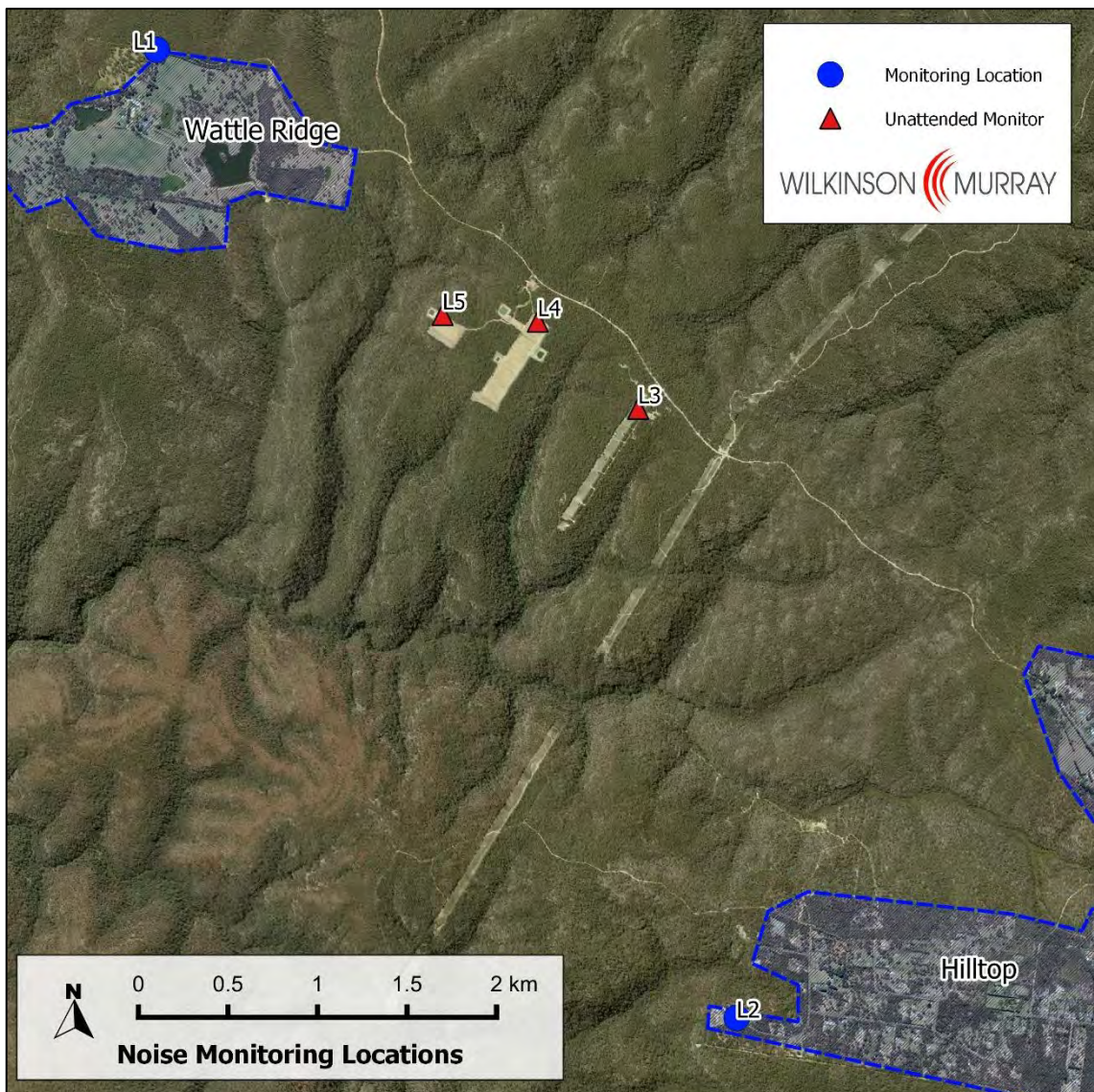
A La Crosse WS-3502 weather station was installed at the rear of the 800m range, adjacent to the 700m firing position. Regular attended wind measurements were also conducted at both monitoring locations with handheld anemometers.

Figure 3-1 presents monitoring locations relative to the site and receivers and Table 3-2 summarises the attended monitoring information. Photos of the monitoring set up are shown in Appendix B.

Table 3-2 Summary of Monitoring Setup

Location No.	Location	Equipment	SN
L1	Wattle Ridge Farm	Brüel & Kjær 2250	3008381
		SVANTEK 977B	45738
		Windmate WM-200	10783
L2	Rocky Waterhole	NTI XL2	A2A15945E0
		SVANTEK 977B	45737
		Digitech QM1642	08068830
L3	800m Range	ARL Ngara	878094
		La Crosse WS-3502	0681
L4	500m Range	ARL Ngara	8780F9
L5	50m Range	ARL Ngara	8780FA

Figure 3-1 Noise Monitoring Locations



3.2 Noise Monitoring Results and Discussion

Table 3-3 summarises monitoring results from both monitoring sessions and Table 3-4 summarises the number of shots measured on range during the monitoring period. The recorded noise levels at the assessment location are presented in Appendix A

Table 3-3 Receiver Noise Monitoring Results – dB L_{zPeak}

Monitoring Period	Location	No. of Shots Measured	Category		Arithmetic Average
			A	B	
11.15am – 12.45am	L1 Wattle Ridge	88	41	47	63
	L2 Rocky Waterhole	51	17	34	60
2.45pm – 3.45pm	L1 Wattle Ridge	32	23	9	64
	L2 Rocky Waterhole	20	8	12	60
Overall	L1 Wattle Ridge	120	64	56	63
	L2 Rocky Waterhole	71	25	46	60

Table 3-4 Number of Shots on Range (Range Noise Monitoring)

Range	No. of Shots Measured		
	11.15am – 12.45am	2.45pm – 3.45pm	Total
800m Range	180	52	232
500m Range	380	57	437
50m Range	0	172	172

Note: Appendix C presents time splices for each of the on-range noise monitors.

Due to a technical issue with the La Crosse weather station, no wind data was obtained on range. However, BOM weather stations Moss Vale and High Range both reported wind levels between 9-17 km/h at 10m during the monitoring period, which is approximately 1-3m/s at 1.5m. Additionally, wind measurements at both monitoring locations ranged between 0-2m/s with peaks of 3m/s in a south-easterly direction. On this basis, wind conditions on the day were suitable for noise monitoring as wind speeds at microphone height was less than 5m/s, as recommended in **the NSW EPA's Noise Policy for Industry**.

In the first monitoring session, the background noise at the Rocky Waterhole location was heavily influenced by a resident operating a chainsaw intermittently. Shots from SHRSC were audible and measurable between periods of chainsaw noise. In the second monitoring session, noise from the resident operating the chainsaw was still present. Additionally, there were regular high-level noise events from what is assumed to be wood being loaded into a metal trailer. Recorded shots were measured in periods where there was no extraneous noise from wind or nearby residents. It is to be noted that where shots were audible but not measurable due to extraneous noise, the L_{zPeak} level did not rise above the ambient level and seldom above 75dBZ.

At the Wattle Ridge monitoring location, the general noise environment for both monitoring sessions was consistent. Ambient noise generally consisted of noise from rustling of nearby trees from occasional gusts with some intermittent noise from birds, insects, and aircraft.

After approximately 3.00pm, shots were barely audible and not measurable at both monitoring locations. Review of the on-range noise monitors determined that use of the 500m and 800m ranges both concluded at approximately 3.00pm. After 3.00pm only the 50m range was in use.

The arithmetic average of the received shot levels is below the L_{zPeak} 75dBZ criteria when measured at both monitoring locations. On this basis, noise from firearms from the SHRSC complies with relevant noise limits when assessed at locations stipulated in Condition A9 of the consent conditions.

4 CONCLUSION

Wilkinson Murray has conducted noise monitoring of the operation of the 800m, 500m, and 50m ranges at the Southern Highlands Regional Shooting Complex. Monitoring was conducted on 17 August 2019 over two periods, between 11.15am to 12.45pm and between 2.45pm to 3.45pm. The results of the noise monitoring determined that the operation of all three ranges complies with relevant criteria when assessed at residential receivers and satisfies all conditions of consent relating to noise.

APPENDIX A
NOISE MEASUREMENT RESULTS

L1 – Wattle Ridge Farm Noise Monitoring Data

No.	Pre-Shot L _Z Peak	Shot L _Z Peak	Difference	Category
1	73	75	2	B
2	67	71	4	A
3	71	71	1	B
4	62	63	1	B
5	64	68	4	A
6	70	75	5	A
7	51	53	2	B
8	61	61	1	B
9	55	58	3	B
10	51	52	1	B
11	56	58	2	B
12	52	57	5	A
13	60	63	2	B
14	65	68	3	B
15	55	58	3	B
16	51	52	1	B
17	68	73	4	A
18	66	73	8	A
19	65	66	1	B
20	55	57	3	B
21	56	59	3	A
22	54	58	3	A
23	51	54	3	B
24	57	62	5	A
25	59	66	7	A
26	56	58	2	B
27	58	60	2	B
28	51	51	1	B
29	52	55	3	B
30	55	60	5	A
31	53	58	5	A
32	71	74	3	B
33	68	69	1	B
34	56	60	4	A
35	71	74	3	B
36	59	63	4	A
37	59	62	3	B
38	54	64	10	A
39	58	60	2	B
40	54	63	9	A
41	52	52	1	B
42	53	55	3	B
43	58	59	2	B

No.	Pre-Shot L _z Peak	Shot L _z Peak	Difference	Category
44	60	63	3	B
45	71	75	3	A
46	64	67	3	B
47	67	69	2	B
48	66	71	5	A
49	68	70	2	B
50	70	72	2	B
51	63	66	3	B
52	64	69	5	A
53	69	71	2	B
54	68	70	2	B
55	68	70	2	B
56	64	66	2	B
57	71	73	2	B
58	53	61	8	A
59	61	65	4	A
60	59	63	4	A
61	62	65	3	B
62	61	63	2	B
63	60	61	2	B
64	58	62	4	A
65	60	63	3	A
66	53	58	5	A
67	67	70	2	B
68	65	68	3	B
69	58	61	3	B
70	65	70	5	A
71	69	71	2	B
72	63	70	6	A
73	49	53	4	A
74	58	62	4	A
75	60	61	1	B
76	61	64	4	A
77	60	66	6	A
78	63	66	3	A
79	57	59	2	B
80	62	66	4	A
81	56	59	4	A
82	50	55	5	A
83	53	57	4	A
84	51	55	4	A
85	51	55	4	A
86	52	55	3	A

No.	Pre-Shot L _{zPeak}	Shot L _{zPeak}	Difference	Category
87	56	61	5	A
88	63	70	7	A
89	50	57	7	A
90	65	69	4	A
91	53	56	4	A
92	50	56	6	A
93	57	58	1	B
94	53	58	5	A
95	62	62	1	B
96	55	60	5	A
97	59	64	5	A
98	53	58	5	A
99	64	66	2	B
100	69	74	5	A
101	63	67	4	A
102	64	70	6	A
103	69	72	3	B
104	65	67	2	B
105	60	64	4	A
106	73	76	3	B
107	47	54	6	A
108	65	73	9	A
109	58	63	5	A
110	59	64	6	A
111	55	59	4	A
112	51	54	3	B
113	62	64	2	B
114	66	72	6	A
115	69	71	2	B
116	58	67	8	A
117	58	62	4	A
118	49	53	4	A
119	59	70	11	A
120	52	57	5	A
Total no. of Category A Shots				64
Total no. of Category B Shots				56
Final Noise Level				63

L2 – Rocky Waterhole Noise Monitoring Data

No.	Pre-Shot LzPeak	Shot LzPeak	Difference	Category
1	60	63	3	B
2	61	65	4	A
3	63	64	1	B
4	65	67	2	B
5	65	66	1	B
6	66	67	1	B
7	63	64	1	B
8	60	63	3	B
9	68	69	1	B
10	60	66	6	A
11	65	67	2	B
12	62	66	4	A
13	65	66	1	B
14	64	67	3	B
15	55	57	2	B
16	54	60	6	A
17	52	54	2	B
18	54	59	5	A
19	54	55	1	B
20	53	56	3	B
21	62	66	4	A
22	60	63	3	B
23	58	59	1	B
24	55	60	5	A
25	60	62	2	B
26	60	61	1	B
27	53	57	4	A
28	51	55	4	A
29	54	59	5	A
30	60	62	2	B
31	61	63	2	B
32	62	64	2	B
33	54	59	5	A
34	55	57	2	B
35	56	58	2	B
36	54	56	2	B
37	50	52	2	B
38	52	57	5	A
39	55	56	1	B
40	53	54	1	B
41	58	61	3	B
42	55	56	1	B

No.	Pre-Shot L _{zPeak}	Shot L _{zPeak}	Difference	Category
43	57	64	7	A
44	52	53	1	B
45	52	58	6	A
46	54	57	3	B
47	59	64	5	A
48	51	56	5	A
49	53	54	1	B
50	54	58	4	A
51	50	52	2	B
52	60	61	1	B
53	57	59	2	B
54	53	57	4	A
55	53	59	6	A
56	54	57	3	B
57	55	57	2	B
58	54	55	1	B
59	60	62	2	B
60	54	63	9	A
61	60	64	4	A
62	55	56	1	B
63	58	59	1	B
64	57	58	1	B
65	56	61	5	A
66	60	61	1	B
67	60	63	3	B
68	59	64	5	A
69	58	66	8	A
70	55	59	4	A
71	60	62	2	B
Total no. of Category A Shots				25
Total no. of Category B Shots				46
Final Noise Level				60

APPENDIX B
TYPICAL NOISE MONITORING SETUP

Typical Noise Monitoring Setup – Wattle Ridge



Note: This is an image from a previous monitoring session and is to present a typical monitoring setup at Wattle Ridge

NGARA and Weather Station on 800m Range



APPENDIX C
ON RANGE NOISE PROFILES

