

41.4883.R5:ZSC

8th February, 2011

Communities NSW

Locked Bag 1422

SILVERWATER NSW 2128

Attention: Mr D. Clout

ACOUSTIC COMPLIANCE TESTING
SOUTHERN HIGHLANDS REGIONAL SHOOTING COMPLEX
WATTLE RIDGE ROAD, HILL TOP

The purpose of this report is to present the results of an acoustic compliance test carried out in relation to operations of the existing 800 metre range at the Southern Highlands Regional Shooting Complex.

The Southern Highlands Shooting Complex is required under conditions of consent from the Minister of Planning to undertake acoustic compliance monitoring of noise emission from the existing rifle range.

Noise measurements for shooting ranges have since the early 1980s been based on a “Linear Peak Hold” measurement. This descriptor indicates the absolute maximum level measured using a Linear (no weighting) frequency response.

Typical noise level measurements for general noise matters utilise the A-weighting response. The A-weighted filter has rise times that are too slow for a peak impulse from a rifle shot and therefore cannot be used for the measurements of rifles.

Utilising the Linear Peak Hold method results in the measurement of pressure fluctuations (including the wind). Testing undertaken by GHD In June 2010 was subject to excessive wind that on examination of previous testing results made the “compliance” measurement results somewhat questionable.

20-22 FRED STREET, LILYFIELD, 2040, NSW, AUSTRALIA

ph: (612) 9555 4444

fx: (612) 9555 4442

tag1@acoustics.com.au

A.B.N. 73 082 704 701



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Compliance testing was carried out in October 2010 as set out in our report 40.4883.R3 (dated 24th November 2010). The testing was influenced to some extent by light winds.

Another compliance test was scheduled for December 2010 but was delayed due to unsatisfactory weather and the Christmas break.

A site visit was carried on Saturday 15th January 2011 with testing carried out using a similar format to the previous testing with attended monitoring in Hill Top (locations A1, A2 and B2) and near the rural residential property to the north west of the range (location A4 and A4a).

Monitoring of the 100 metre firing position occurred in the morning and monitoring of the 500 metre firing position was carried out in the afternoon.

Supplementary measurements were conducted for the morning and afternoon firings at a position approximately 50 metres to the east of the firing position to provide an identification of the number of shots occurring at the time of the measurements in the residential area.

Measurement Techniques

For the purpose of compliance testing, measurements were conducted as unattended and attended measurements.

Attended sound level measurements in the residential area of Hill Top were carried out using three Bruel & Kjaer Modular Sound Level Meters Type 2260 with Sound Enhanced Software Package BZ7206. One meter is NATA Calibrated and the other two meters are calibrated to manufacturer's standards. All meters hold current calibration certificates.



Attended measurements at the rural property north west of the range (locations A4 and A4A) used a Larson Davis LD831 Sound Level Meter. The meter holds current calibration to manufacturer's standards.

Unattended measurements to the side of the firing position were conducted using a SVAN 957 Sound Level Meter with the data being recorded for subsequent analysis. This sound level meter has current calibration to manufacturer's standards.

All sound level meters are classified as Type 1 meters.

The reference calibration level of each meter was checked prior to and after measurements with a NATA Calibrated Bruel & Kjaer Sound Level Calibrators Type 4231.

All attended measurements incorporated time splice recording for subsequent analysis if required.

Measurement Procedures & Results

Appendix A shows the location of the Southern Highlands Shooting Complex off Wattle Ridge Road. The Google map shows the existing 800 metre range and 7 measurement locations used for the compliance testing.

The nature of the distance from the range to the residential receiver locations A1, A2, A4, and B2 (reference locations identified by GHD) can result in many of the shots being inaudible. Providing a logarithmic average of the measured levels without identifying the number of inaudible (or un-measurable shots that were audible) provides an incorrect average.

Accordingly unattended (logger) measurements were recorded using ½ second sampling at Locations L4 and L5 being 50 metres to the east of the 100 and 500 metre firing positions respectively.



As the targets remain in a fixed position, the use of different firing distances involves the firing position moving back from the targets. Therefore for fixed receiver locations there can be a significant difference in noise levels – dependent upon the firing position, which can vary from day to day and even on a single day.

For the distances to residential receivers used in this compliance test the influence of ambient noise and wind can result in peak hold linear levels greater than that of shooting.

It is noted that there is some confusion in the GHD reports as to identification of the location in Starlight Place (location B2). For some reports Location B2 appears to be the nearest residential boundary location to the existing (and future) range, and is considered by some residents to be the most critical/nearest residential receiver location.

The B2 location was identified by GHD as a test site for military weapons and became a request for monitoring from residents. In one GHD report location B2 is identified as A2 with a description of Rocky Waterholes Road. On this basis the compliance monitoring for this test program utilised GHD locations A1, B2 and A2. We see that on some occasions GHD had location A2 on private property off the western end of Rocky Waterholes Road whereas we were located at the western end of the bitumen road.

With respect to the property to the NW location A4 (used by GHD) is removed from the residence on that property. For the purpose of the compliance test we utilised location A4A being on the site boundary of the property adjacent to the bushwalkers car park at the end of the road and the same distance as the dwelling from the range.

In the afternoon testing, a short sample measurement was also conducted at location A4.



In view of the need to obtain Linear Peak Hold measurements each B & K 2260 meter was set to measure and display the Linear Peak Hold value with the observer at each location manually writing down the results (level and time) when a shot was audible. At times a shot may be audible but show no measureable increase on the meter.

The B & K 2260 meter display provides the maximum value in each second and permits identification of the noise level, whereas other digital displays have different updates and may not actually show the maximum level. Furthermore it is essential to utilise attended measurements at critical residential locations in view of the ambient noise and wind in the area that can give rise to levels higher than shooting.

Use of the unattended meter time splice recordings necessitates manual processing of the data.

On the Saturday 15th January 2011 measurements there was no wind in the morning during shooting of Rimfire off the 100 metre firing position.

None of the rimfire shots were detected at the residential monitoring locations.

At the end of the morning shooting off the 100 metre position, some of the attendees conducted shots from two centrefire rifles (223 and 308 at the 100 metre mound) that gave rise to higher noise source levels. All of these shots were detected at the residential monitoring locations in Hilltop and generated measureable levels..

The Saturday afternoon shooting was associated with the Full Bore discipline (predominately .303 and .223 calibres) from the 500 metre position. After 3.15pm a light wind developed with occasional wind puffs up to 3 km/hr. After 3.30pm the wind puffs increased and produced ambient peak hold levels at the residential receiver locations greater than that of shooting.

It was noted that the wind also increased the background level at location B2 due to the rustling of the leaves of the various trees in the immediate proximity. Locations A1 & A2 do not have the same tree cover immediately adjacent to the monitoring position.



Appendix B sets out the results of the attended monitoring in relation to the 5 residential assessment locations. The results for the operator observed levels correlated with the audible shot are shown in the tables. Where the wind affected the measured levels (particularly at Location B2) those maximum level are shown in brackets.

Location A1 does not have the same number of total shots identified as for Locations A2 & B2 due to extraneous noise from the operation of a mulcher, grass cutting and the emission of drums/electric guitar noise from a garage building on 4 Rocky Waterholes Road.

The results of the unattended monitoring near the firing bench utilised the time splice facility of the meter (with some attended monitoring). Due to the close proximity of the unattended meter the identification of individual shots is very obvious.

Assessment Criteria

Under the Noise Control Act 1975 rifle and pistol shooting ranges were classified as Scheduled Premises and the matter of responsibility for noise lay with the State Pollution Control Commission.

In the early 1980s the SPCC convened a State Shooter's Liaison Committee to address noise emission from ranges. Noise criteria suggested by the National Acoustics Laboratories for Commonwealth rifle ranges recommended the use of Linear (Un-weighted) Peak Hold based on a large number of shots per day. Extrapolation of the data indicated a sliding scale of noise levels per number of shots/days per week.

I prepared a draft set of guidelines based upon the NAL criteria and testing at various ranges that was then amended by the SPCC and issued as the noise limits set out in Chapter 164 in the SPCC's *Environmental Noise Control Manual*.

Various ranges were assessed by the SPCC/State Shooter's Liaison Committee under the guideline (attached) that provided practical use of the guideline and clarification of the use of the guideline.



Many ranges are multi-disciplinary ranges that are utilised on different days/nights. In such cases since the issue of the guideline the SPCC/EPA procedure has been to determine the energy (logarithmic) average of each firearm classification. For multi-discipline ranges there will be a range of noise levels for the different types of firearms/ranges leading to different permissible operating days per week.

The SPCC became the EPA, then the DEC, then the DECC and at present the DECCW. With the change to the EPA and then the introduction of the *Protection of the Environment Operations Act* rifle and pistol target shooting ranges were removed from the list of Scheduled Premises, thereby placing the responsibility for noise with the Council. Additional noise policy guidelines from the EPA/DEC/DECC/DECCW have replaced the Environmental Noise Control Manual have not provided any new noise limits for pistol and rifle ranges.

The following table provides a summary of the range of noise levels identified in Appendices B & C.



TABLE 1: Linear Peak Hold Levels

Shooting Position	Discipline	Location	Measured Shooting Levels			
			Min	Max	Log Ave	No of shots
Saturday 15 th January 2011						
100m	Rimfire	A1	NA	NA	NA	0
		A2	NA	NA	NA	0
		B2	NA	NA	NA	0
		A4A	NA	NA	NA	0
		L4	90	109	102	243
100m	Centrefire	A1	60	78	72	25
		A2	57	69	63	25
		B2	61	78	70	25
		A4A	NA	NA	NA	0
		L4	123	126	125	25
500m	Big Bore	A1	57	82	69	171
		A2	56	83	68	388
		B2	57	87	76	307
		A4A	NA	NA	NA	0
		A4	NA	NA	NA	0
		L5	103	117	111	388



As stated above the shooting from rimfire rifles at 100 metres was inaudible at all residential locations over the occurrence of 243 shots in a 90 minute period.

For the two centrefire rifles off the 100 metre position all of those shots were audible at the Hilltop residential locations and occurred for a noticeably higher source level (125 dB Lin vs 105 dB Lin).

An examination of the Hilltop results reveal that locations A1, A2 & B2 received similar levels from shooting at 500 metres, with location B2 being slightly higher than A1 or A2.

In the afternoon for the centrefire rifles at 500 metres locations A2 identified all 388 shots over three hours of monitoring and agrees with the total of 388 shots recorded at the side of the firing mound.

Location B2 identified a slightly lower number of shots (342 shots) with the notation of the later part of the monitoring being affected by wind. Excluding the wind affected results one is left with an average of 307 shots.

Location A1 was subject to interference from noise generated at 4 Rocky Waterholes Road that masked noise from the range in the afternoon session.

Accordingly the derivation of a logarithmic average of the shots detected at the locations for the afternoon session (not affected by the wind) is appropriate for comparison with the SPCC Guidelines.

The operation of a multi-disciplinary range leads to different noise levels for the different classification (or grouping) of firearms which will also change as the firing positions change.

Therefore in terms of assessing the acoustic compliance of an existing or future range one needs to identify the classification of the weapons being used and the position from which shooting occurs.



The SPCC Guidelines provide a range of days shooting versus noise levels for both existing ranges and future ranges. The range used at the complex is an existing range and has been in existence for many years. The range has different firing positions and therefore can have different noise emission levels depending upon the bench at which firing occurs.

Approval has been given for additional firing ranges at the complex which will be located further away from Hill Top and therefore would automatically fall under the future range classification.

With respect to the SPCC Guideline for an existing range on the basis of the actual measured levels, Rimfire at 100 metres, Mixed Use from 100 metres and Big Bore from 500 metres would be permitted seven days shooting a week.

With respect to the SPCC Guideline for a future range on the basis of the actual measured levels, Rimfire at 100 metres would be permitted seven days shooting a week. Centrefire from 100 metres would be permitted five days shooting a week and Centrefire from 500 metres would be permitted three days shooting a week.

Conclusion

Compliance testing of the Southern Highlands Regional Sporting Complex was conducted by GHD in June 2010 under excessive wind conditions that should have automatically cancelled any testing program.

Compliance testing was carried out on Saturday 9th October 2010 under suitable weather conditions and testing on the morning of Sunday 10th October under weather conditions that deteriorated towards the end of the testing.

A further compliance test was carried out on Saturday 15th January 2011 under still conditions in the morning and the early part of the afternoon, with wind developing in the later part of the afternoon shooting.



The assessment procedure for rifle ranges adopted by the SPCC since the 1985 utilises an energy (logarithmic) average which was not identified by GHD as the correct method of assessment.

The SPCC guidelines provide an existing range and a future range classification in terms of a sliding scale for the number of days, dependent upon the noise level and daytime operations or night time operations.

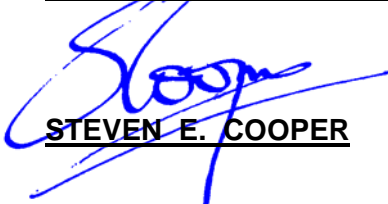
Utilising the shooting noise guidelines issued by the SPCC/EPA when such premises were Scheduled Premises under the Noise Control Act (and its derivatives) there is no issue with respect to current operations of the Range for the firing positions that were monitored.

The logarithmic average of the actual measured levels was found to be less than the 77 dB limit that permits 7 days and 2 nights usage per week for an existing range.

We trust the above satisfies your immediate requirements.

Yours faithfully,

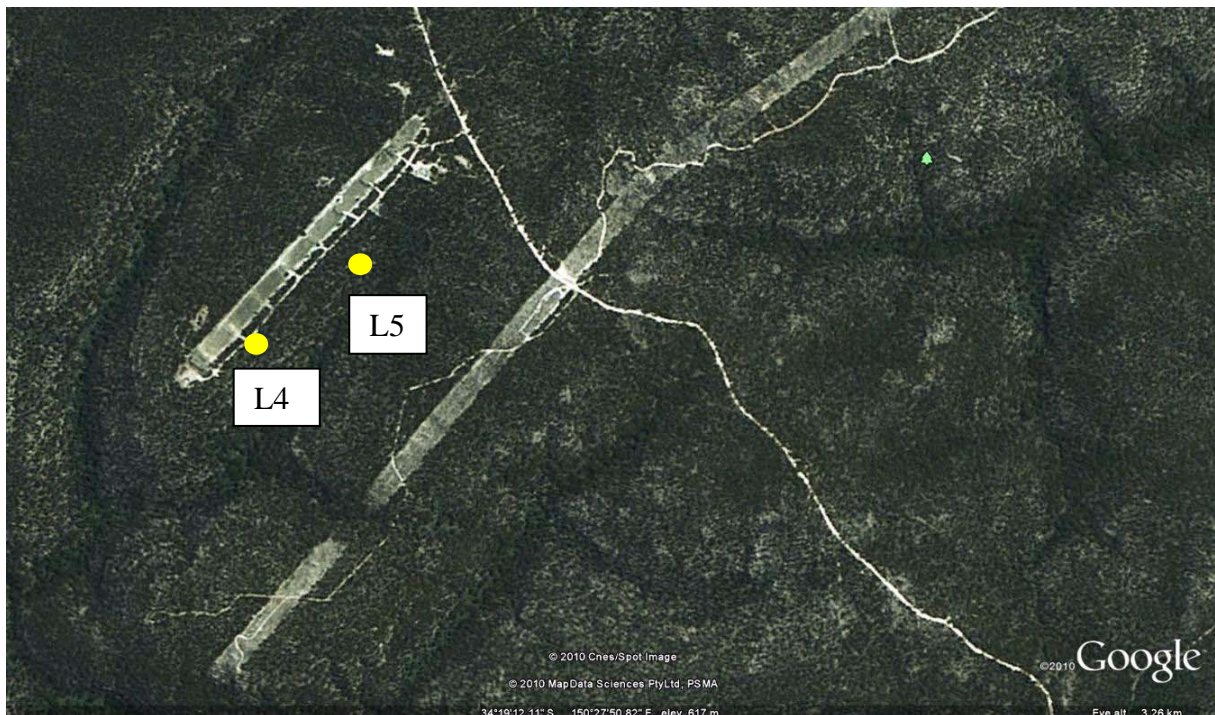
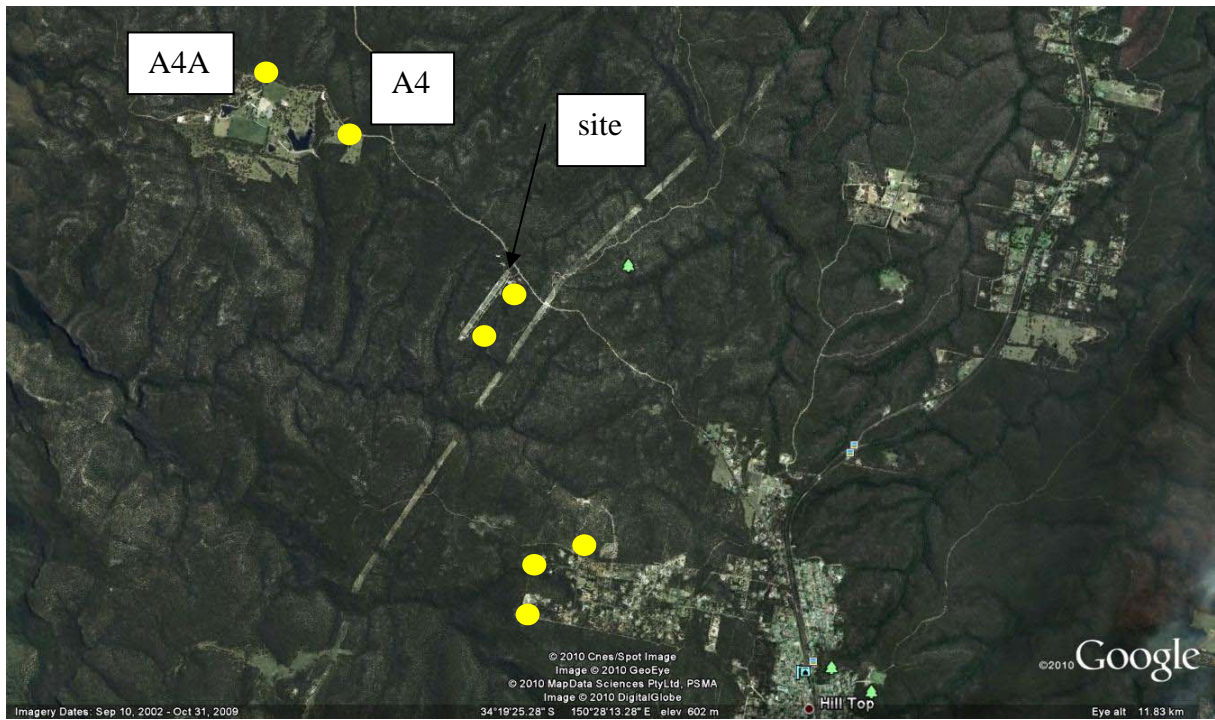
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APPENDIX A: Measurement Locations





APPENDIX B: Measurement Results 100m position – Saturday 15th January 2011

Location L4 (Svan) - Rimfire

108	108	107	104	103	102	104	102	104	103
102	109	103	104	103	104	104	104	103	103
103	103	102	95	100	96	95	103	101	101
100	100	103	103	102	101	103	102	103	99
94	91	91	95	99	97	98	98	93	97
100	100	95	97	94	92	100	101	95	101
95	97	91	95	97	97	95	90	95	92
92	92	103	105	105	105	102	104	103	105
103	104	103	102	105	104	105	102	102	101
90	92	91	91	104	103	103	104	104	103
103	103	102	104	100	97	96	102	98	103
102	99	100	102	100	96	102	98	100	100
97	97	103	96	102	96	98	101	95	101
97	100	102	98	96	99	100	98	99	100
97	108	106	95	106	97	100	106	98	98
105	98	96	100	99	99	102	100	106	101
98	104	97	104	98	96	105	103	95	95
95	100	96	94	99	96	105	106	101	101
106	93	100	99	101	101	101	105	96	103
97	104	102	105	97	94	101	107	93	104
95	96	98	100	99	99	104	94	103	103
93	103	101	92	102	100	103	103	94	101
103	101	102	104	101	102	103	94	100	102
104	100	93	104	101	103	99	91	102	102
90	100	91							

Log average 102 over 243 shots (recording for 1½ hours)



Location A1 – Rimfire

No shots detected (observations for 1 ½ hours)

Location A2 – Rimfire

No shots detected (observations for 1 ½ hours)

Location B2– Rimfire

No shots detected (observations for 1 ½ hours)

Location A4A– Rimfire

No shots detected (observations for 1 hour)

Location L4 – Centrefire

124	123	124	125	126	124	124	124	124	126
125	125	126	123	125	125	125	125	126	123
126	126	125	125	125					

Log average 125 over 25 shots (observations for 10 minutes)

Location A1 – Centrefire

73	78	77	68	68	69	69	73	69	68
75	75	74	71	60	65	65	69	67	67
66	75	67	71	74					

Log average 72 over 25 shots (observations for 10 minutes)

Location A2 – Centrefire

64	63	68	62	62	62	61	64	63	61
60	58	62	58	64	64	67	69	63	61
59	57	58	61	62					

Log average 63 over 25 shots (observations for 10 minutes)



Location B2– Rimfire

66	74	68	72	61	64	65	69	66	77
66	66	66	65	64	69	66	61	63	66
78	65	65	68	64					

Log average 70 over 25 shots (observations for 10 minutes)

Location A4A– Rimfire

No shots detected (observations for 10 minutes)



APPENDIX C: Saturday 15th January 2011 – 500 metre position

L5 Svan

109	109	110	109	108	111	111	111	107	109
109	106	110	109	109	106	108	104	109	106
111	109	104	109	109	104	109	104	109	105
114	113	104	111	105	112	104	113	106	113
113	106	113	112	111	105	105	106	106	115
105	107	115	104	104	117	106	105	117	106
116	110	116	110	115	110	111	117	110	116
109	115	110	115	109	116	107	112	110	111
110	113	111	111	109	113	107	112	108	111
108	111	108	111	107	111	108	115	108	109
115	115	109	109	115	108	115	116	116	105
115	115	103	116	116	106	111	105	111	105
113	104	111	105	112	109	105	111	104	111
104	111	110	104	105	104	105	110	105	105
109	104	109	104	105	110	105	109	105	110
105	105	106	110	110	105	110	109	106	109
106	105	109	106	109	106	108	106	109	106
109	106	106	110	109	105	107	108	108	108
109	108	108	109	109	109	109	111	109	109
112	109	112	111	105	112	111	106	104	112
105	104	111	104	111	105	112	105	106	104
112	107	112	113	113	109	112	107	112	107
111	108	110	112	109	110	108	111	109	110
110	112	108	111	110	111	109	112	112	112



113	113	109	111	113	110	112	110	114	113
114	110	109	114	114	108	115	109	114	109
115	109	114	114	108	115	109	111	104	110
103	112	103	103	111	104	105	112	104	109
104	110	105	105	103	111	104	112	113	104
112	106	111	112	105	112	113	105	112	113
104	111	112	105	112	105	116	106	116	117
107	117	116	106	116	106	115	116	107	116
106	115	116	105	105	104	111	110	110	104
109	111	110	103	111	109	105	111	110	104
114	106	111	116	106	114	112	106	116	114
105	113	113	103	114	111	114	104	113	113
111	104	111	114	112	112	104	114	112	105
111	113	113	104	112	105	112	111	104	111
104	112	112	106	111	103	113	105		

Log average 111 over 388 shots (monitoring for 3 hours)

Residential Location A1

63	62	<60	<60	<60	<60	66	65	<60	64
61	64	62	66	66	63	61	65	66	61
66	62	66	65	66	65	58	66	61	73
63	64	63	72	65	62	62	62	64	72
66	71	66	70	64	64	63	64	66	63
67	69	73	63	66	69	75	74	76	71
69	65	73	65	66	75	66	63	66	65
68	65	65	66	65	68	65	69	63	72
69	69	64	64	65	67	71	67	64	62



69	63	65	62	61	67	59	59	<60	69
<60	65	62	64	64	66	62	66	66	66
60	<60	62	<65	<65	64	65	64	63	69
65	<65	64	60	63	62	65	57	<60	64
61	62	60	62	64	67	74	71	66	62
76	65	67	73	71	68	65	64	68	<65
<65	<65	72	70	77	71	67	67	76	82
81	70	72	68	77	74	71	70	80	72
70									

log average 69 over 171 shots (monitoring results for 3 hours)

Residential Location A2

66	63	64	63	72	66	67	65	68	68
67	63	64	63	63	65	68	70	65	60
68	63	67	67	64	67	67	62	69	73
70	73	65	75	65	83	65	64	73	65
61	69	72	72	64	67	67	67	82	73
76	70	70	67	64	70	69	69	68	71
68	64	66	66	64	64	62	63	62	62
60	65	65	59	59	60	62	61	63	59
64	59	63	63	64	61	61	60	60	59
62	59	62	62	66	62	60	60	67	60
63	63	61	61	62	60	60	70	63	65
61	60	61	59	60	59	63	62	66	60
69	69	62	63	67	56	59	59	63	63
61	59	62	63	63	62	61	64	62	62
63	58	58	56	57	57	60	69	67	68



72	66	63	63	70	67	68	66	68	66
65	71	65	62	59	72	67	67	65	60
63	66	66	65	69	73	71	68	61	67
68	65	69	70	71	64	67	68	70	68
71	64	71	70	65	64	66	72	64	65
75	67	76	61	67	63	59	70	72	64
68	65	64	63	62	62	64	60	65	62
63	64	63	65	67	70	80	67	66	60
60	61	69	61	62	66	64	67	67	68
65	67	68	69	69	66	66	63	63	66
65	71	68	66	75	73	74	74	68	68
66	66	60	59	60	65	63	61	60	61
64	68	64	58	58	63	60	60	59	61
62	60	61	67	68	69	60	65	68	66
63	60	60	65	65	60	60	61	67	63
62	66	67	64	59	60	58	64	65	63
67	58	64	65	63	67	61	66	65	70
62	67	68	60	61	63	62	63	63	63
63	64	62	60	67	61	63	67	70	72
73	70	67	65	61	67	65	63	63	58
60	62	60	61	61	59	62	63	62	62
69	61	59	59	60	67	63	65	68	62
62	61	65	60	63	66	67	65	65	67
60	65	68	63	61	60	64	72		

Log average 68 over 388 shots (monitoring results for 3 hours)



Residential Location B2

68	75	69	68	68	62	58	68	67	63
62	61	68	64	67	66	67	64	67	63
64	63	67	58	64	64	64	66	63	65
60	68	63	63	71	63	65	59	74	70
74	68	65	63	60	74	66	67	68	63
79	68	67	69	68	68	67	68	67	68
65	67	62	70	68	68	62	69	77	72
67	62	62	68	62	62	65	64	69	65
69	67	62	63	70	65	71	63	64	65
59	67	63	64	70	70	68	66	66	66
65	64	64	64	63	65	66	76	61	62
73	64	68	66	60	58	63	59	66	62
60	74	67	59	60	63	64	63	61	63
63	67	61	62	61	58	66	75	62	63
66	69	69	59	58	64	59	59	60	60
59	64	64	65	63	66	72	62	65	61
57	60	63	69	63	68	63	58	68	67
65	64	64	65	64	64	64	66	66	63
67	67	72	72	66	61	60	66	62	61
67	64	64	60	60	61	64	64	72	(86)
64	(85)	(88)	78	(83)	64	(91)	77	77	63
66	75	70	75	69	85	(86)	69	73	(68)
(71)	88	86	(77)	77	(83)	(84)	85	(84)	(88)
(85)	87	(79)	(89)	83	(81)	76	85	81	83
82	87	67	76	78	75	71	78	79	79
72	81	82	81	79	86	80	78	79	77
85	79	82	81	87	86	75	82	84	84



(81)	84	(81)	(74)	75	66	78	76	72	70
75	69	63	70	74	75	69	73	75	82
(76)	71	70	65	(80)	(97)	(73)	65	63	(72)
72	77	(86)	78	68	87	87	61	86	86
(89)	(71)	(89)	(81)	(80)	77	66	78	73	71
72	69	68	70	81	74	66	77	(85)	(85)
(84)	79	79	78	78	80	62	76	64	(77)
78	64								

Total number of shots 342 (monitoring results for 3 hours)

35 shots affected by wind

log average 76 over 307 shots

Residential Location A4A

No shots audible over 1 ¼ hours of monitoring

Residential Location A4

No shots audible over 30 minutes of monitoring

