

45.4883.R18:MSC

4<sup>th</sup> December, 2015

Office of Sport  
Sport and Recreation  
Locked Bag 1422  
**SILVERWATER NSW 2128**

Attention: Ms R. Ginger

**800 METRE RANGE TESTING - COMPLIANCE TEST**  
**SOUTHERN HIGHLANDS REGIONAL SHOOTING CENTRE**  
**WATTLE RIDGE ROAD, HILL TOP**

The purpose of this report is to present the results of acoustic testing carried out in relation to normal operations from the 800 metre firing position, on the 800 metre range at the Southern Highlands Regional Shooting Centre.

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

As a result of previous monitoring and analysis the 800 metre firing position was the most critical firing position on the 800 metre range and required the construction of an acoustic shelter to reduce the emission of noise from the 800m firing position.

Testing was undertaken on the afternoon of Saturday 10<sup>th</sup> October 2015 for a period of 1 hour on residential properties (locations B2A and A4B). As the Office of Sport was unable to gain access to residential monitoring location A1A, monitoring occurred outside the property in the cul-de-sac at reference location A1, as used by the EPA on the previous testing program.

In attendance in Rocky Waterholes Road (Location A1), Starlight Place (Location B2A) and Wattle Ridge Farm (Location A4B) during our monitoring were resident observers.



The resident observer at Location B2A was stationed behind the monitoring personnel and other than a few instances of interference there was no disturbance to the monitoring of levels. The resident observer at Location A4B was located immediately behind the TAG monitoring personnel and did not cause any disturbance.

However, at Rocky Waterholes Road, there was one observer seated adjacent to the microphone and another observer at times moving around the area and talking to other persons in the vicinity of the monitoring location. The acoustic environment at the monitoring location during the specific testing was subject to extraneous noise from road traffic, aircraft, chainsaws/grass cutters, motor vehicles and people that affected the measurements. As a result of the presence of observers at the Rocky Waterholes Road Location A1 there was interference with the monitoring results by reason of the observers generating noise in the vicinity of the microphone, by talking, rustling of pages and the movement of the chair for the seat of the observer.

The interference from the observers at Location A1 has necessitated a detailed post-processing analysis being undertaken to obtain valid results.

Consistent with previous testing the Peak Hold measurement results are presented as arithmetic levels and as an absolute level for each location.

## Measurement Instrumentation

For the purpose of compliance testing, measurements were conducted as attended measurements, with unattended measurements at Locations A1 and A4B for backup/supplementary analysis.

Attended sound level measurements in the residential area of Hill Top were carried out using two Bruel & Kjaer Modular Sound Level Meters Type 2260 (S/N 1772289 and 2274764). Additional unattended measurements external to the residence identified in Appendix A as A1 were conducted as a backup using a SVAN 979 Sound Level Meter (S/N 35808).

Attended sound level measurements at the residential property to the west of the range (location A4B) used a Bruel & Kjaer Modular Sound Level Meter Type 2260 (S/N 1824813) with a SVAN 957 Sound Level Meter (S/N 23806) for backup.



Attended measurements to the rear of the firing positions on the 800 metre range were conducted using a Bruel & Kjaer Sound Level Meter Type 2250 (S/N 3004338) and for backup, a SVAN 957 Sound Level Meter (S/N 15364).

All sound level meters are classified as Class 1 meters, incorporate Z-weighting filters and set to record/display the peak hold level. All sound level meters are calibrated to manufacturer's standards traceable (externally or internally) to the National Measurement Institute (NATA Registered Laboratory No. 1).

The reference calibration level of each meter was checked prior to and after measurements with a Bruel & Kjaer Sound Level Calibrator Type 4231 or Type 4230.

## Measurement Procedures

Appendix A identifies the measurement locations in the residential areas, with Appendix A2 and A3 highlighting the locations for A1 and B2 by expanded views.

In view of the need to obtain Peak Hold measurements each sound level meter was set to measure and display the Z-weighted Peak Hold value with the TAG monitoring personnel at each residential location manually writing down the results (including any extraneous noise or wind) when a shot was audible. The instrumentation used for measurement has a designated time delay for showing the peak level that generally would include the peak pressure level from the shot as well as the peak pressure level from wind if present at the same time of the shot or shortly thereafter.

In the case of impulsive noise from rifle shots the maximum overpressure of the sound wave (the linear or Z-weighted peak hold pressure level) is commonly used to measure the absolute pressure.

Because the peak pressure hold level is a measurement parameter that has no frequency weighting, and has no relationship to the A-weighted rms level used for environmental assessments, there is an entirely different relationship between measured levels and audibility.

For A-weighted levels one can hear a noise at levels 10 dB or more below the background level. For measurements when a noise is 10 dB below the background there will be no measureable increase above the background level (for either a linear level or an A-weighted level).



On previous tests a proportion of the shots have been found to be inaudible or not measureable at residential receivers leading to the compliance testing including a meter behind the firing position to identify the occurrence of shots. Because the microphone behind the firing position was at a stationary location the relationship of the firing position (individual lanes) to the microphone will lead to a range of levels.

In using the peak hold level a shot may be audible but show no measureable increase above the ambient background level on the meter, due to the relationship of the actual level versus the ambient/background level. At other times a shot may be audible and give rise to a measurable increase above the ambient background level, but the measured level may be the result of the shot, or wind, or extraneous noise. Hence the desire to have supplementary back-ups of the measurements for post processing and determination if the wind or extraneous noise affected the results.

In view of the variability in measured noise levels both during shooting and without shooting occurring, it is necessary to undertake attended measurements to identify the occurrence of distinct shots and then undertake post-processing analysis (where possible) to verify the shots in the environment in which they occur.

In the first instance an evaluation is able to be undertaken using the observed measured levels to indicate the range of levels occurring during the testing. The second step utilises the post-processing analysis discussed in the following section.

As experienced in previous testing at Hill Top it was found at residential receivers, that apart from shots that are inaudible or not measureable in the ambient noise, the presence of a variable wind may provide limitations in obtaining valid measurements.

Examining the number of shots that occurred on the range (Table 1 below) reveals that not all shots were detected at the reference monitoring locations B2A and A4B in the existing natural ambient noise environment, whilst at Location A1 a significant number of the shots were masked by extraneous noise from vehicles and chainsaw/grass cutter operations removed from the monitoring location.

**Table 1: Number of Measured Shots**

Location	On Range	A1	B2A	A4B
No. of Shots Measured	198	100	102	46



The monitoring was slightly extended past the EPA nominated 1 hour period to provide additional data.

## Post-Processing – EPA Method

With respect to the post-processing undertaken for Locations A1 and A4B the NSW EPA document *Target Shooting Ranges: Application Note for assessing Noise Compliance* (“Application Note”) provides guidance on compliance assessment of shooting noise at shooting ranges. The preparation of the Application Note had the benefit of testing undertaken by the EPA in 2014 at Hill Top.

The methodology provided by the document seeks to characterise audible shots as “Category A” or “Category B”.

A “Category A” shot represents an accurate measurement of the noise contribution from the shot and is categorised as having a distinct peak level noticeably higher than the peak level immediately before the shot which is not attributed to wind gusts or other extraneous noise.

A “Category B” shot represents an upper estimate of the contribution from the shot and is defined as a shot which has a peak level that may have been elevated by wind gusts or other extraneous noise.

Section 4.3 of the Application Note requires the post-processing method of measuring shot noise to categorise shots into “Category A” and “Category B” by comparison of the shot peak level to the peak level immediately prior to the shot. Shots 5 dB greater than the immediately preceding level are categorised as “Category A” whilst shots less than 5 dB above the preceding level are categorised as “Category B”. An identified shot having a peak noise level that is less than the peak level immediately prior to the shot is considered invalid and discarded from the analysis.

Under the Application Note, calculation of the final noise level is determined by whether the number of “Category A” shots measured is less than or greater than 50. For the scenario of greater than 50 “Category A” shots measured, then the final noise level will be the arithmetic average of all “Category A” shots within one hour of commencing measurement. If the number of “Category A” shots is less than 50, then the final noise level will be the arithmetic average of all shots (“Category A” and “Category B”).



Appendices B – E inclusive present the measurement results in terms of the field observations and then the post-processed results following the EPA method, with the addition of superimposing the on-site shots with the shots received in the residential area.

In undertaking the EPA post-processing method the measurement results from Location A4B have been utilised to present an example as this residential monitoring location had less interference from extraneous noise sources (no grass cutters, no interference from resident observers and no vehicles, etc.) than residential monitoring location A1. The time splice graph in Appendix F1 is set out in the same format as the example in the EPA's Application Note and shows the first 5 minutes of the 800 metre range compliance test, as an expanded view of the measurement results that clearly show the timing of the shots and the relevant peak levels.

The blue line of the time splice graph represents the LZpeak levels recorded at Location A4B with green markers superimposed onto the graph to identify the occurrence of a shot. Where a marker immediately precedes/succeeds a peak in the time splice graph, then the marker is re-assigned to align with the peak (illustrated by a red marker). This is because the clock time displayed on the meter is running in seconds (and used manual notations) and therefore not as precise as the time splice output.

Appendix F2 provides a table of the measurement results from Appendix F1 in the format of the example in the EPA's Application Note for completeness.

Appendix F3 provides the measurement results from the same time and location period as the graph in Appendix F1 but with the addition of the on-site testing shots (shown as a green graph) that permits one to align the individual shots.

An additional tool that assists in post-processing to eliminate general extraneous noise is the addition of the purple time splice graph which is the A-weighted SEL level at the residential monitoring location.

The inclusion of the on-site shots clearly shows that a significant portion of the shots at the range were inaudible at Location A4B. The degree of inaudibility is relevant in that the EPA's Application Note does not identify what is to be done with such inaudible shots with respect to the arithmetic average.



## Measurement Results

Table 1 reveals that not all shots were measured or detected at the monitoring locations thereby indicating that in terms of compliance a proportion of the shots were lower than the existing ambient noise levels prevailing during the monitoring period.

Table 1 reveals that the TAG monitoring personnel at Location A1 noted approximately 50% of the shots as the influence of extraneous noise sources from vehicle movements, operation of a chainsaw/grass cutters, and noise generated by the resident observers impacted upon the monitoring at the Rocky Waterholes Road (Location A1). From previous monitoring it is expected that without extraneous noise, there would be a higher proportion of measureable shots.

At Location B2B (off Starlight Place) there was no interference from extraneous noise events with Table 1 showing that the TAG monitoring personnel detected slightly above 50% of the shots. There were a few events masked by the noise from the resident observer and the presence of the variable wind affected some measurement results.

Table 1 reveals the majority of shots (approximately 75%) were inaudible at location A4B for the compliance monitoring with some of the measurement results affected by variable wind. This is similar to that experienced on previous tests.

Appendix B1 presents the results of the measurements recorded at the rear of the firing position (at 800 metres) on the 800 metre range in a table format followed by graphical presentation of the levels recorded over time in Appendix B2.

The results in Appendix B reveal, as expected, consistent high peak levels in proximity to the firing position but with a spread of levels due to different individual rifles/position relative to the monitoring location.

The results in Appendix B2 show that the firing of individual rifles occurs on a random basis and does not follow a 20 second time sequence that occurs when undertaking specific testing to evaluate alternative noise controls on the range. In order to undertake the analysis of the peak pressure levels obtained at the residential locations all of the individual shots were tabled with respect to the time of the shot occurring on the range.



From the material in Appendix B2 and utilising the timing for recorded measurements at the residential locations adjustments for the difference between the on-site shot time and the recorded time at each residential receiver is determined. For the post-processing analysis the recorded measurements at each receiver location are superimposed on the graphical result from Appendix B2 with the appropriate timing correction to permit synchronisation of the actual shot and identification of extraneous noise that is not associated with the shot.

The procedure of using the on-site material, apart from identifying the percentage of shots that are actually detected, is required to be undertaken for the subject sites because in relative terms the shots from the rifle range are at, below or slightly above the ambient peak levels. Extraneous noises from birds, the resident observers, can generate levels significantly greater than that of the shots the post-processing method identifies, for particularly the Rocky Waterholes Road location, that a number of the levels recorded by the TAG monitoring personnel were as a result of extraneous noise.

Appendix C1 provides a table of the measurement results for Location A1 noted by the TAG monitoring personnel from observations of the sound level meter with a coding to a number of the results that identifies at the time of the observations the presence of wind and noise from extraneous noise sources that impacted upon the observed value.

Appendix C2 tables the measurement results for Location A1 from the post-processing of the measured levels incorporating the EPA methodology for determining the validity of a measurement that was supplemented by listening to and following the analysis of a WAV file recorded by the SVAN meter located approximately 3-3.5 metres from the Bruel and Kjaer 2260 meter. It is noted a resident observer was seated directly behind the Bruel and Kjaer 2260 meter during the monitoring.

Appendix C3 provides a graph of the measurement results obtained for Location A1 with the on-site shots superimposed and time corrected for alignment. Appendix F2 shows an expanded view of the residential measurements with the on-range measurements for identification of individual shots. Appendix C3 presents the same format but for the entire monitoring period at Location A1. The blue lines are the measured levels behind the firing position to identify the occurrence of a shot.





The red graph in Appendix C3 is the Z-weighted peak hold level recorded at Location A1 that shows a significant proportion of the peak levels do not align with shots. The fluctuations in the average minimum level in the red graph identify the presence of extraneous noise.

The green graph in Appendix C3 is the A-weighted Sound Exposure Level at 1 second increments. The green graph is able to show audible noise events associated with extraneous noise sources such as cars, planes and grass cutters/chainsaws.

Comparing the red and green graphs allows the identification of an increase in the general trend of the peak hold level that is not attributed to audible extraneous noise but applies to the light intermittent wind.

The notation in the bottom of Appendix C3 reveals that during the monitoring at Location A1 noise from grass cutters/chainsaws and resident observers occurred throughout the monitoring period.

Appendix D1 tables the measurement results for Location A4B noted by the TAG monitoring personnel from observations of the sound level meter with a coding to a number of the results that identifies at the time of the observations the presence of wind and aircraft that impacted upon the observed value.

Appendix D2 presents the measurement results for Location A4B from the post-processing of the measured levels incorporating the EPA methodology for determining the validity of a measurement.

Appendix D3 shows a graph of the measurement results obtained for Location A4B with the on-site shots superimposed and time corrected for alignment. Appendix D3 includes notation to identify occurrence of extraneous noise that clearly shows an increase in the A-weighted level (bottom graph) and the occurrence of wind that gives rise to an increase in the Z-weighted level.

Appendix E tables the measurement results for Location B2A noted by the TAG monitoring personnel from observations of the sound level meter.

There is no post-processing of Location B2A due to a corrupt file on the meter for which Bruel & Kjaer Australia were unable to extract. Therefore, the results for Location B2A rely upon the field measurements.



## Analysis

The following table provides a summary of the range of noise levels identified in Appendix B with the levels in parenthesis relating to post-processed results.

**Table 2: Summary of Results**

Location	Measured Shooting Levels (Peak Hold dB)			
	Min	Max	Arithmetic Average	No of Shots Measured
On Range	115	131	123	198
A1	57 (57)	70 (70)	65 (65)	100 (77)
B2A	46	73	61	102
A4B	53 (52)	69 (69)	64 (65)	46 (42)

In terms of the field measurement results (the results not in parenthesis in Table 2) as an absolute maximum peak hold level the operation of firing from the 800 metre position at the 800 metre range did not exceed 73 dB.

In terms of the post-processed measurement results (the results in parenthesis in Table 2) as an absolute maximum peak hold level the operation of firing from the 800 metre position at the 800 metre range did not exceed 70 dB for locations A1 and A4B.

Examination of the last column in Table 2 reveals that a significant number of shots were not recorded. Putting aside Location A1, which was subject to extraneous noise, the results for Location B2A and A4B (that did not have extraneous noise) would therefore have an arithmetic average lower than that shown in Table 2.



The results of compliance testing for normal shooting at the 800 metre position at the 800 metre range of Southern Highlands Regional Shooting Centre carried out on Saturday 10<sup>th</sup> October, 2015 revealed full compliance with the conditions of consent.

We trust the above satisfies your immediate requirements.

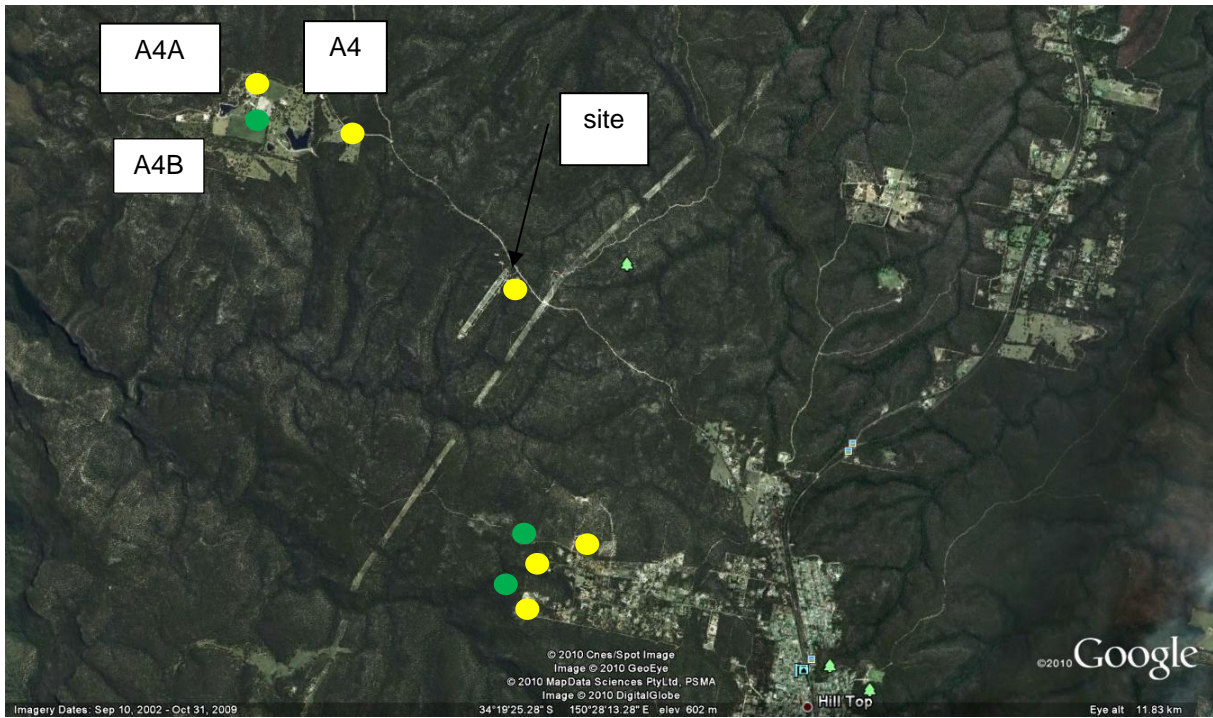
Yours faithfully,

**THE ACOUSTIC GROUP PTY LTD**

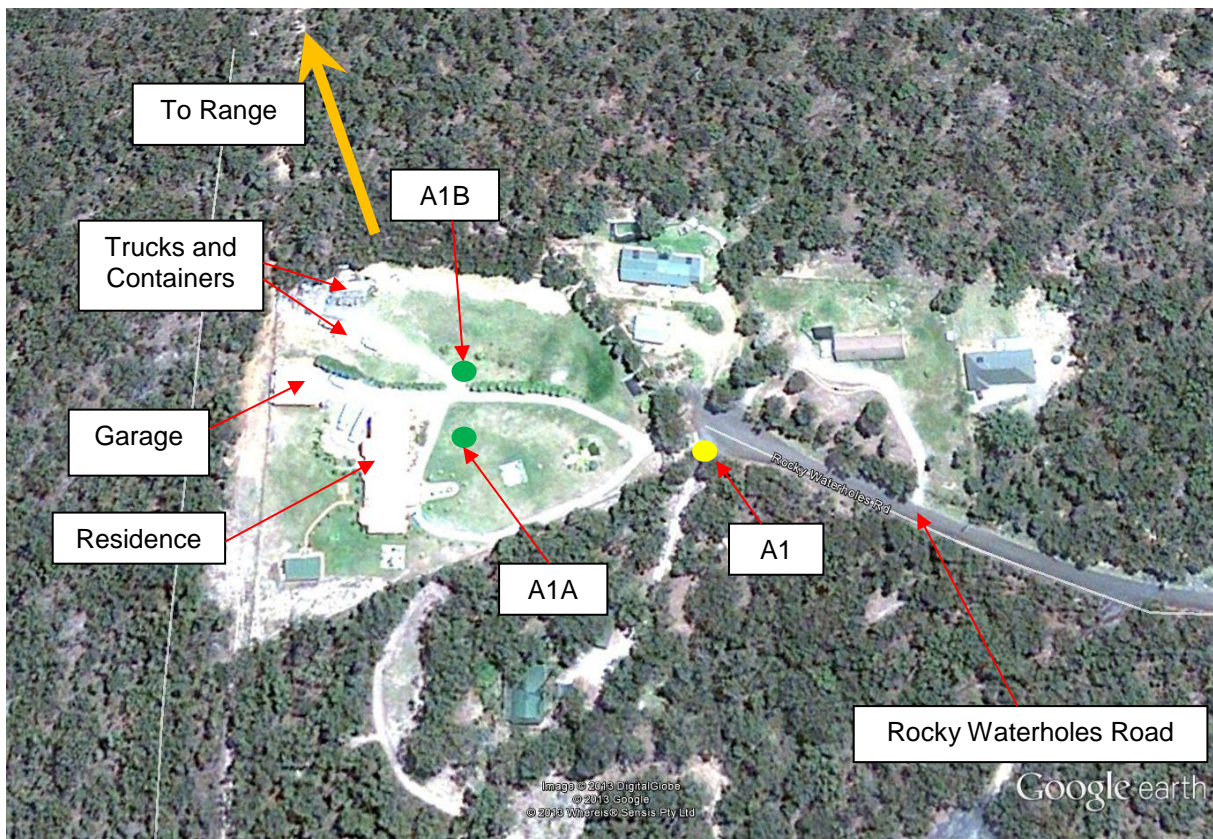
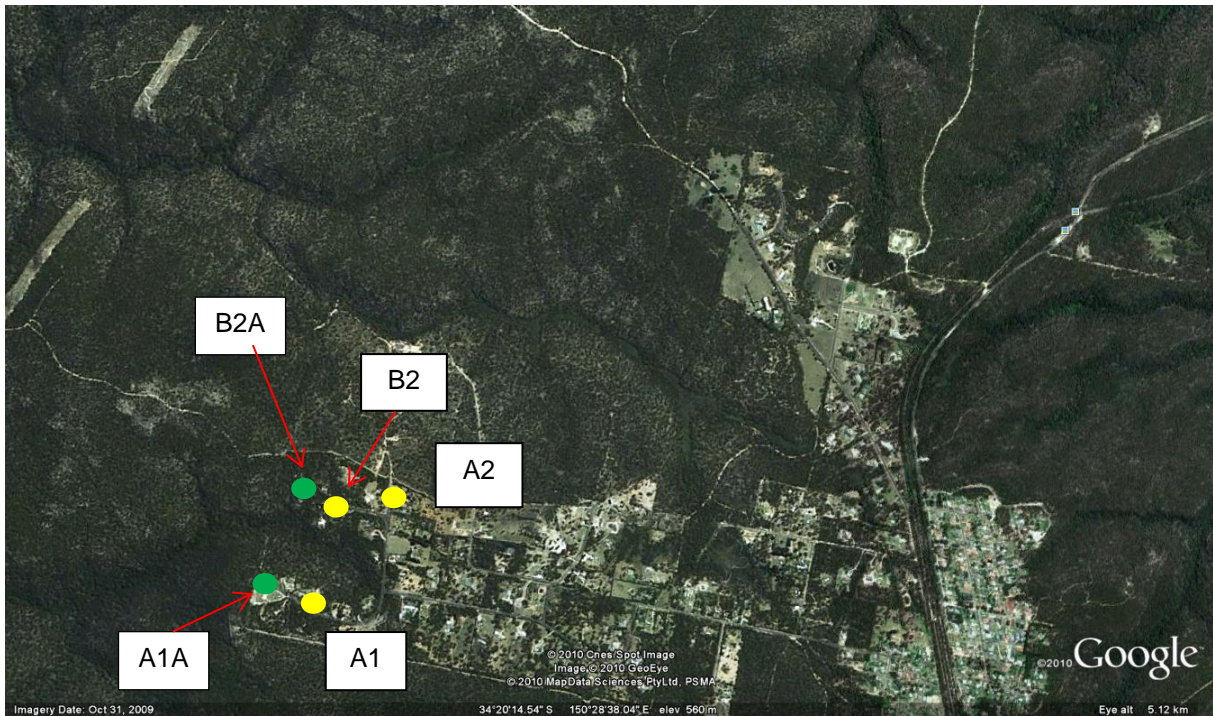
  
**STEVEN E. COOPER**



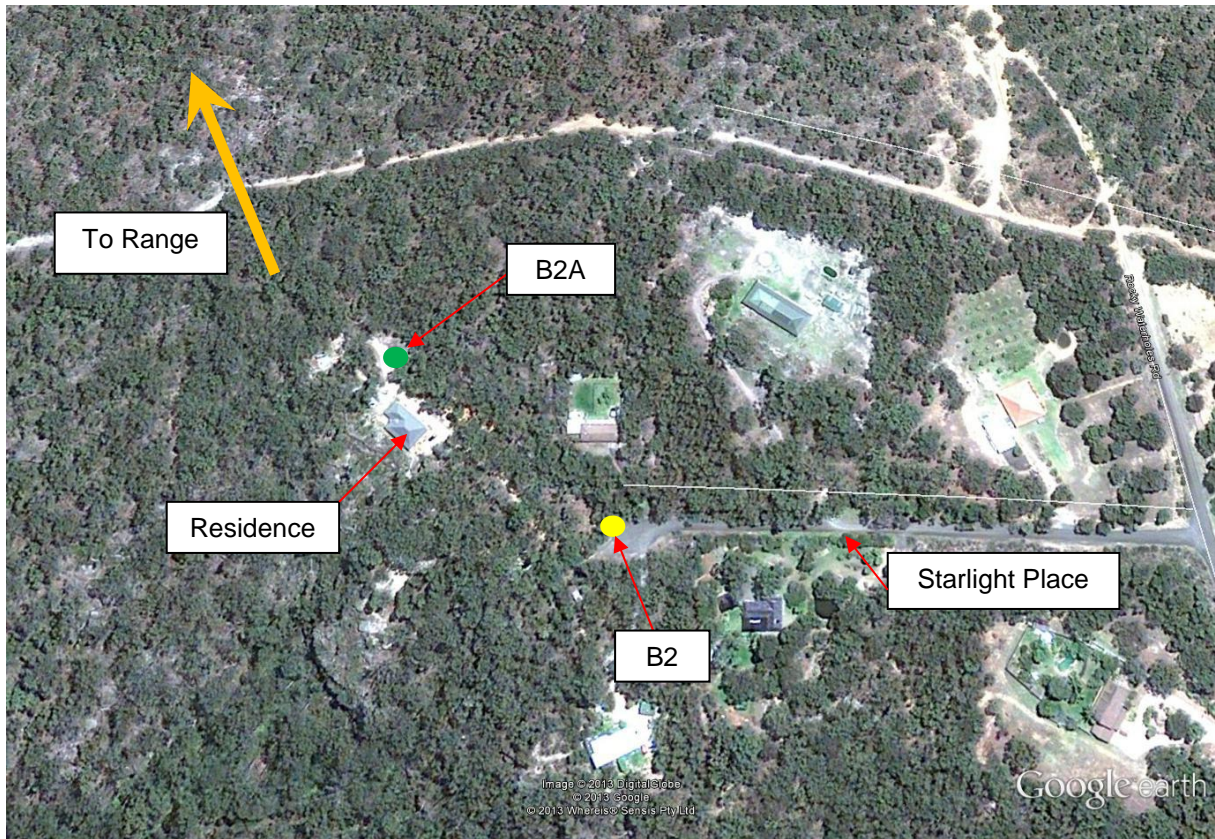
**APPENDIX A: Measurement Locations**











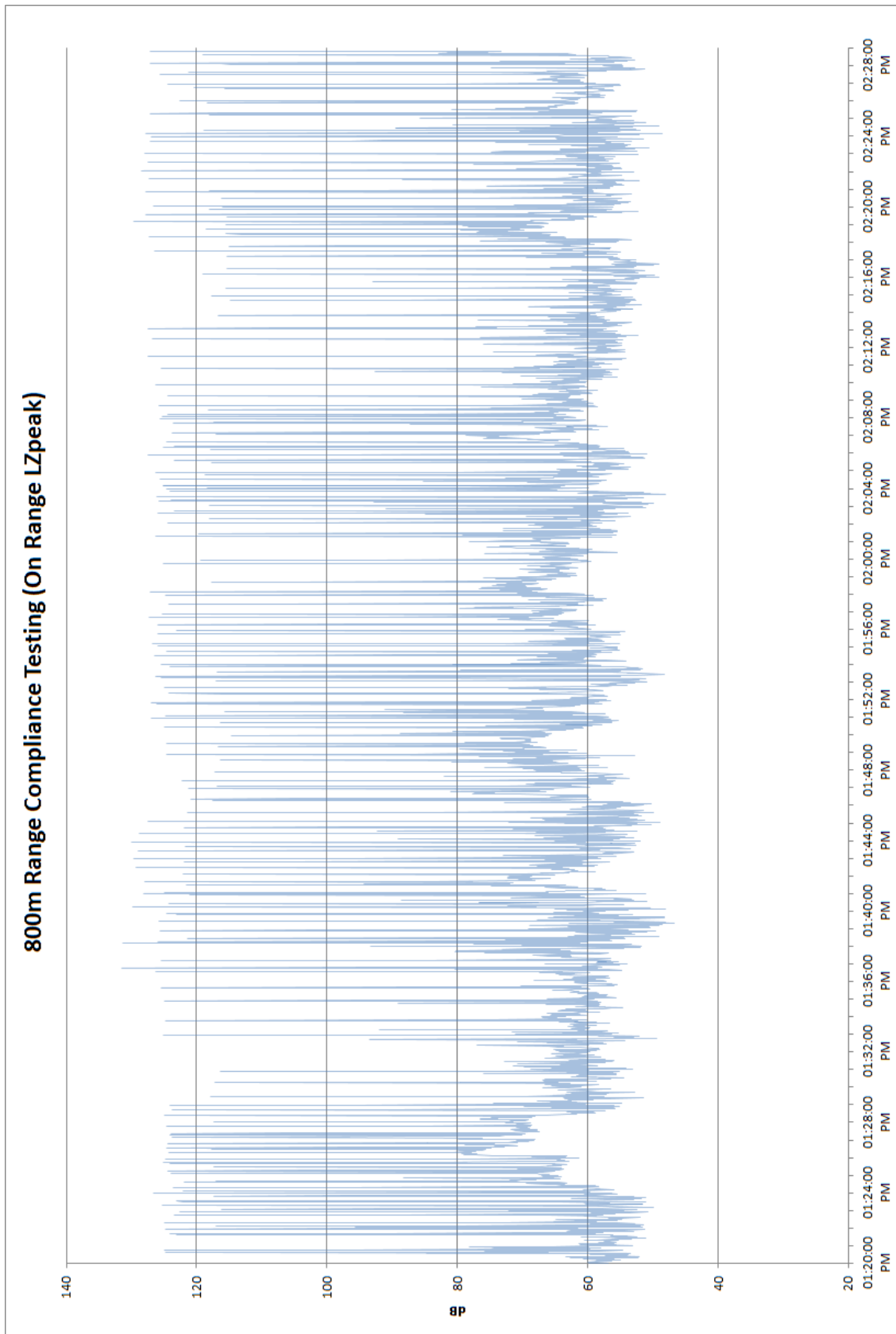
**APPENDIX B: Measurement Results – On Range**

**Measurement Location - Shooting Range (Onsite). Saturday 10/10/2015**

**13:20:35 until 14:28:36**

125	125	123	124	125	117	125	124	123	116
125	123	117	127	122	124	122	117	124	124
117	124	125	125	124	118	124	125	125	124
118	124	124	125	117	125	124	119	124	118
117	116	125	125	125	125	126	132	126	131
126	122	126	126	123	125	130	124	121	128
125	122	125	128	122	129	122	130	129	122
130	129	122	128	121	118	121	121	117	122
117	116	125	117	125	115	125	116	127	125
116	126	127	124	125	117	125	124	126	117
124	125	126	125	126	127	126	123	126	127
125	124	125	127	118	125	119	126	120	125
118	126	124	118	126	124	126	124	125	118
125	126	119	126	118	123	128	118	125	123
125	117	124	124	117	126	125	125	118	126
124	126	125	127	127	127	117	115	118	115
119	115	115	127	115	127	116	119	116	130
115	128	118	116	127	116	128	118	127	129
127	128	127	127	128	119	118	127	118	123
116	120	124	126	121	116	127	119		







**APPENDIX C: Measurement Results – Location A1**

**Measurement Location A1 – Rocky Waterholes Road (Field Observations). Saturday  
10/10/2015**

**13:20:35 until 14:28:36**

64	63	60	64	XW (84)	60	60	62	66	XR (68)
66	63	67	66	66	X (83)	X (77)	69	XR (73)	XR (75)
62	64	XW (70)	XR (73)	XR (67)	67	67	XW (70)	X (71)	68
XR (70)	63	XW (71)	XW (70)	65	XW (77)	XW (75)	67	65	65
XW (74)	XR (74)	68	68	68	61	64	69	67	XR (66)
XR (68)	XR (71)	XR (73)	67	XR (71)	XR (70)	XR (71)	XR (69)	67	66
62	68	XR (65)	68	66	XW (68)	XW (70)	65	69	66
67	XR (74)	XR (69)	XR (73)	XR (68)	XR (75)	XR (70)	XW (71)	XR (68)	XR (64)
68	59	63	XW (77)	66	XR (76)	69	69	64	66
69	XW (77)	67	XR (70)	64	62	65	65	67	XR (66)
XR (66)	X (72)	69	69	XW (78)	68	68	66	67	70
65	67	63	61	XW (73)	XW (71)	XW (79)	XW (74)	XW (74)	65
64	XR (69)	66	62	XR (75)	XR (84)	57	61	59	67
63	XR (63)	XR (67)	XR (65)	XR (66)	XR (64)	XR (66)	XR (67)	65	66
63	XR (63)	62	65	XW (71)	XW (74)	XR (64)	68	70	XW (75)
65	XR (74)	63	XR (68)	63	69	68	64	XR (70)	63
61	XW (70)	67	67	XW (71)	68	67	XW (68)	69	65
68	63								

- X = Audible but not measureable in ambient (background noise level or birds)  
 XW = Audible but not measureable due to wind at time of shot  
 XR = Not measureable due to extraneous noise from resident's observer, vehicle or plane  
 ( ) = Extraneous peak level  
 - = No measurement  
 NA = Not audible



**Measurement Location A1 – Rocky Waterholes Road (Data File). Saturday 10/10/2015**

**13:20:35 until 14:28:36**

NA (78)	NA (77)	NA (74)	67	69	63	64	XW (84)	60	64
66	XR (68)	68	64	XR (78)	67	66	66	X (84)	X (77)
69	XR (75)	XR (73)	64	XW (70)	XR (73)	XR (73)	XR (71)	XR (78)	XW (73)
NA (78)	XR (70)	64	XW (71)	XW (72)	65	XW (77)	67	65	65
XW (74)	XR (74)	68	68	66	61	64	69	67	XR (72)
XR (68)	XR (80)	XR (73)	XR (73)	XR (73)	XR (74)	XR (69)	X (77)	66	X (75)
68	XR (65)	NA (88)	NA (94)	68	66	XW (71)	XW (70)	65	69
66	67	XR (74)	XR (69)	XR (73)	XR (68)	XR (75)	XR (70)	XW (70)	XR (68)
XR (64)	68	62	63	XW (77)	67	XR (77)	X (75)	NA (71)	69
66	69	XW (77)	67	64	62	NA (83)	XW (76)	X (72)	69
69	XW (78)	XR (73)	68	66	67	70	65	67	X (72)
61	XW (74)	XW (75)	XW (79)	XW (75)	XW (74)	XR (90)	64	XR (69)	66
62	XR (75)	XR (84)	57	61	59	67	63	XR (68)	XR (65)
XR (67)	XR (64)	XR (67)	65	66	63	NA (73)	NA (77)	65	XW (75)
NA (74)	XW (74)	NA (82)	NA (81)	NA (85)	NA (71)	NA (84)	XW (80)	XR (82)	XR (74)
NA (74)	61	XR (68)	66	70	65	64	58	XW (69)	62
67	62	XW (74)	XW (71)	66	67	68			

- X = Audible but not measureable in ambient (background noise level or birds)  
 XW = Audible but not measureable due to wind at time of shot  
 XR = Not measureable due to extraneous noise from resident's observer, vehicle or plane  
 ( ) = Extraneous peak level  
 - = No measurement  
 NA = Not audible





**APPENDIX D: Measurement Results – Location A4B**

**Measurement Location A4B – Wattle Ridge Farm (Field Observations). Saturday**

**10/10/2015**

**13:20:35 until 14:28:36**

67	69	XW (70)	68	68	XR (69)	63	67	62	64
66	59	56	62	67	62	68	66	64	61
62	XR (73)	65	XW (70)	66	XW (76)	67	XW (73)	68	XW (74)
XW (85)	XW (75)	XW (73)	68	XW (76)	XW (81)	XW (83)	XW (78)	XW (73)	62
66	XW (75)	XW (73)	XW (75)	XW (75)	68	XW (70)	69	XW (71)	XW (74)
XW (77)	XW (84)	XW (78)	XW (76)	XW (76)	68	XW (73)	69	62	68
XW (74)	XW (70)	68	XW (78)	XW (71)	XW (83)	XW (82)	XW (74)	XW (70)	67
XW (71)	60	53	XW (74)	XW (88)	XW (77)	XW (78)	XW (79)	XW (75)	XW (78)
XW (79)	60	XR (70)	60	67	63	62	62	64	XW (73)
65	59	59							

- X = Audible but not measureable in ambient (background noise level or birds)  
 XW = Audible but not measureable due to wind at time of shot  
 XR = Not measureable due to extraneous noise from resident's observer, vehicle or plane  
 ( ) = Extraneous peak level  
 - = No measurement  
 NA = Not audible



**Measurement Location A4B – Wattle Ridge Farm (Data File). Saturday 10/10/2015**

**13:20:35 until 14:28:36**

NA (56)	NA (68)	67	NA (98)	69	XW (70)	X (78)	NA (67)	68	XR (67)
NA (69)	NA (72)	NA (68)	63	67	NA (70)	62	64	66	56
NA (59)	68	NA (70)	NA (67)	68	66	62	NA (78)	X (70)	62
66	XW (77)	X (72)	XW (74)	X (73)	XW (76)	XW (85)	NA (85)	XW (73)	NA (78)
NA (74)	NA (80)	XW (80)	NA (85)	NA (84)	XW (88)	XW (85)	NA (79)	62	64
XW (75)	XW (78)	66	XW (71)	NA (70)	NA (81)	XW (71)	XW (76)	XW (77)	NA (85)
NA (82)	NA (78)	NA (84)	NA (89)	XW (84)	XW (81)	XW (77)	NA (75)	NA (85)	NA (83)
NA (87)	NA (90)	X (72)	X (78)	NA (81)	X (72)	NA (84)	NA (78)	XW (76)	NA (78)
NA (85)	NA (78)	NA (74)	XW (71)	NA (82)	XW (86)	XW (74)	NA (88)	XW (83)	NA (87)
NA (88)	NA (86)	XW (88)	NA (86)	XW (85)	NA (85)	XW (77)	67	XW (73)	X (74)
59	NA (77)	NA (80)	NA (81)	NA (85)	NA (78)	NA (78)	XW (74)	NA (74)	NA (70)
NA (81)	XW (78)	NA (68)	NA (73)	XW (79)	XW (78)	XW (81)	XW (84)	NA (73)	NA (75)
NA (82)	NA (80)	X (71)	NA (71)	NA (62)	NA (68)	NA (66)	NA (64)	NA (71)	X (72)
NA (69)	NA (70)	NA (69)	NA (67)	64	69	XW (73)	64	NA (52)	NA (67)
59	NA (83)	NA (74)	NA (82)	NA (67)					

- X = Audible but not measureable in ambient (background noise level or birds)
- XW = Audible but not measureable due to wind at time of shot
- XR = Not measureable due to extraneous noise from resident's observer, vehicle or plane
- ( ) = Extraneous peak level
- = No measurement
- NA = Not audible





**Measurement Location B2A – Starlight Place (Field Observations). Saturday 10/10/2015**

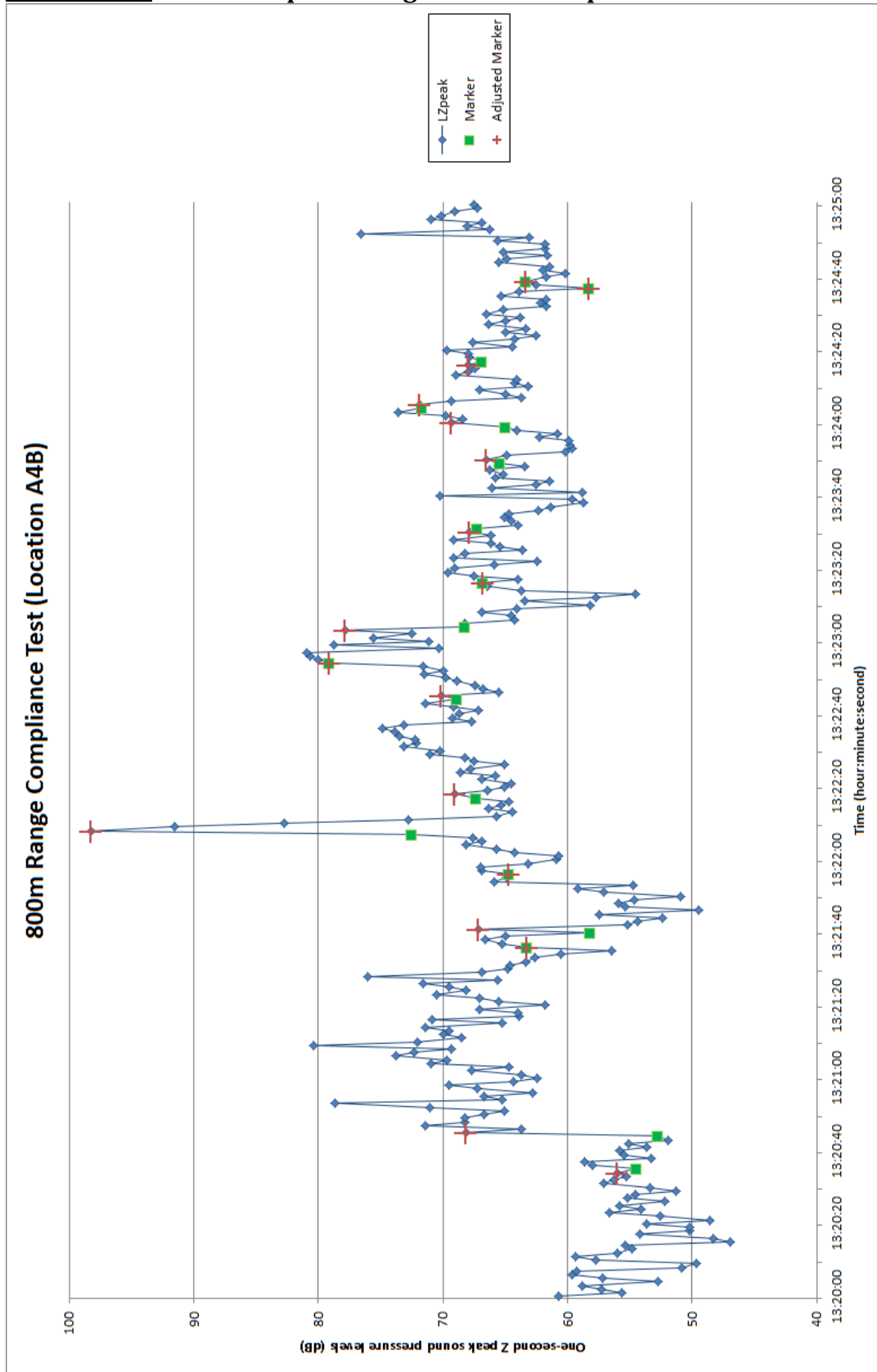
**13:20:35 until 14:28:36**

73	68	59	68	63	63	65	58	60	68
65	63	58	63	60	63	58	62	61	62
68	63	72	68	67	63	65	61	62	60
60	63	71	70	68	60	59	55	60	55
59	61	57	61	67	65	61	62	55	57
60	69	61	56	46	60	60	59	61	58
70	65	61	61	65	58	67	64	60	61
59	68	54	64	60	61	60	59	60	61
62	63	59	61	63	59	61	62	61	59
61	55	55	56	59	57	60	56	59	56
XR (67)	60	61							

- X = Audible but not measureable in ambient (background noise level or birds)  
 XW = Audible but not measureable due to wind at time of shot  
 XR = Not measureable due to extraneous noise from resident's observer, vehicle or plane  
 ( ) = Extraneous peak level  
 - = No measurement  
 NA = Not audible



### APPENDIX F: EPA Post-processing Method Example





Measurement	Pre-shot LZpeak	Shot LZpeak	Shot/pre-shot difference	Shot category
1	55.3	56.0	0.7	Not valid (inaudible)
2	52.8	68.1	15.3	Not valid (inaudible)
3	56.4	63.3	6.9	Not valid (inaudible)
4	58.2	67.2	9.0	A
5	64.9	64.7	-0.2	Not valid (inaudible)
6	72.5	98.2	25.7	Not valid (inaudible)
7	67.3	69.1	1.8	B
8	68.9	70.1	1.2	Not valid (extraneous noise)
9	71.6	79.1	7.5	Not valid (inaudible)
10	72.5	77.9	5.4	Not valid (extraneous noise)
11	66.5	66.8	0.3	Not valid (inaudible)
12	66.2	67.9	1.7	B
13	65.5	66.5	1.0	Not valid (plane)
14	65.0	69.4	4.4	Not valid (inaudible)
15	71.7	71.9	0.2	Not valid (inaudible)
16	67.5	68.0	0.5	Not valid (inaudible)
17	63.9	58.3	-5.6	Not valid (inaudible)
18	62.6	63.4	0.8	B



