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Boston Blyth Fleming
Town Planners

2 June 2011

The General Manager
Warringah Council
725 Pittwater Road,
DEE WHY NSW 2099

Attention: Alexander Keller

Dear Alex

RE: Development Application 2011/0305 - Response to Request for Additional Information

I refer to your request for additional information dated 21 March 2011. The following information is provided in response to the issues raised in your correspondence.

1.0 Acoustic Report

In your email dated 21 March 2011 concerns were raised regarding the extent of noise data collection for the Acoustic Report prepared by Wilkinson Murray that accompanied the development application. The following information was requested:

- *Additional noise data collected and measured at:*
  - *i. the edge of the Belrose urban area (vicinity of Wyatt Ave)*
  - *ii. the St Ives showground, and*
  - *iii. the eastern edge of the St Ives urban area (vicinity of Richmond Avenue)*
- *Noise data measurements for the existing St Ives Gun Club.*
- *Noise contour data that completes the extent of predicted noise levels to the west of the facility.*
- *Information about the likely effects of prevailing wind patterns (and the effect on noise from the Range).*

An amended Acoustic Report (Version D) has been prepared by Wilkinson Murray which addresses the issues raised.

As requested the Noise Impact Assessment prepared by Robert Fitzell Acoustic Pty which was submitted as part of the documentation for the St Ives Pistol Club is enclosed.

2.0 Operational Plan of Management

An Operational Plan of Management has been prepared and is included as **Attachment 1**.

3.0 Visual and Scenic Impact

The proposed 3 metre high concrete walls will be painted in colours that will blend with the natural landscape. This issue can be conditioned.

Additional screen plantings can be provided to the north of the range wall to further screen views of the wall from the north. The extent of planting will be limited by the need to maintain this area as an inner

protection zone. The additional landscaping can be required via a condition of consent. The Landscape Plan can be amended prior to determination if necessary.

We are not aware that the proposed shooting range facility will be able to be viewed from any specific vantage points to the west in the National Park. It is considered that the provision of the use of a dark and earthy wall colour combined with the provision of additional plantings along the northern side of the facility will adequately minimise the potential visual impact of the clubhouse and northern range wall.

4.0 Multi Recreational Trail

The submission from the North Shore Horse and Pony Association requested that the existence of the multi-recreational trail be noted in the development process for DA2011/0305 and consideration made to avoid any inadvertent loss of trail access or the creation of any potential safety risks to trail uses.

The Warringah Regional Multiple Use Trail Strategy map shows a potential track to the south of the site and a potential urban link along Mona Vale Road. No existing tracks are shown in the vicinity of the site. If approval is granted by the landowner (the Crown) to a trail on land adjoining the subject site, then appropriate signage should be installed by the authority responsible for the trail before the track is opened to the public.

5.0 Conclusion

If you require any further information prior to the determination of the application, please do not hesitate to contact me on 9986 2535.

Yours faithfully

Amy Sutherland
Senior Associate
Boston Blyth Fleming Town Planners

OPERATIONAL PLAN OF MANAGEMENT

The shooting range facility and associated clubhouse at Lot 101 DP 1106750, Mona Vale Road, Terrey Hills will be managed and operated as detailed in this Plan of Management.

1.0 Use of the Facility

Shooting days will be held at the facility once a month. Training courses and the annual general meeting are also likely to be held at the facility on an infrequent basis, generally once every few months.

Up to 80 shooters can attend each shooting day and a maximum of 20 shooters will participate in each session or 'detail'.

2.0 Operation of Facility

The facility is to be operated in accordance with the relevant provisions of the *Firearms Act 1996* and the *Firearms Regulation 2006*.

3.0 Safety and Security of the Building

No weapons or ammunition will be stored on site. No cash will be stored on the site.

Club members will generally bring their own weapons and ammunition to the site. The Peninsular Firearm Academy will also bring weapons and ammunition to the site as required. The transporting of weapons and ammunition will be carried out in accordance with the relevant Act and its Regulations.

The standing orders for the club will detail the specific safety measures which are to be implemented at the facility. The standing orders are to be approved by the Firearm Registry prior to the issue of the licence. The standing orders of the club will prevail in the event of any inconsistency between the standing orders and this plan of management.

4.0 Noise and other complaint management

A complaints register will be kept by the Peninsular Firearm Academy. The register will record all complaints received in relation to the shooting range facility and the action taken to address the issue. The complaints register is to be available to Council officers at their request.

5.0 Traffic Management

The entrance gate to the shared driveway will be opened by range staff at the start of a shooting day and will close the gate after the shooting day finishes. No other specific traffic management measures are required.

6.0 Access Maintenance Routine

The waste water management system will recycle all waste water. In the event that rainfall has been insufficient to keep the water tanks full, water will be delivered.

7.0 Garbage collection

Normal commercial waste collection arrangements will apply. It is likely that the facility will engage the same waste collection service as the St Ives Pistol Club to collect garbage from the facility after a shooting day.

8.0 Review of Plan of Management

The Plan of Management is to be reviewed every 12 months.

ACOUSTICS AND AIR

PROPOSED NEW SHOOTING CLUB AT TERREY HILLS

PENINSULAR FIREARM ACADEMY INC.

REPORT NO. 10306
VERSION D

WILKINSON MURRAY

PROPOSED NEW SHOOTING CLUB AT TERREY HILLS

PENINSULAR FIREARM ACADEMY INC.

REPORT NO. 10306
VERSION D

APRIL 2011

PREPARED FOR

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GLOSSARY OF 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 overleaf, 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_{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.

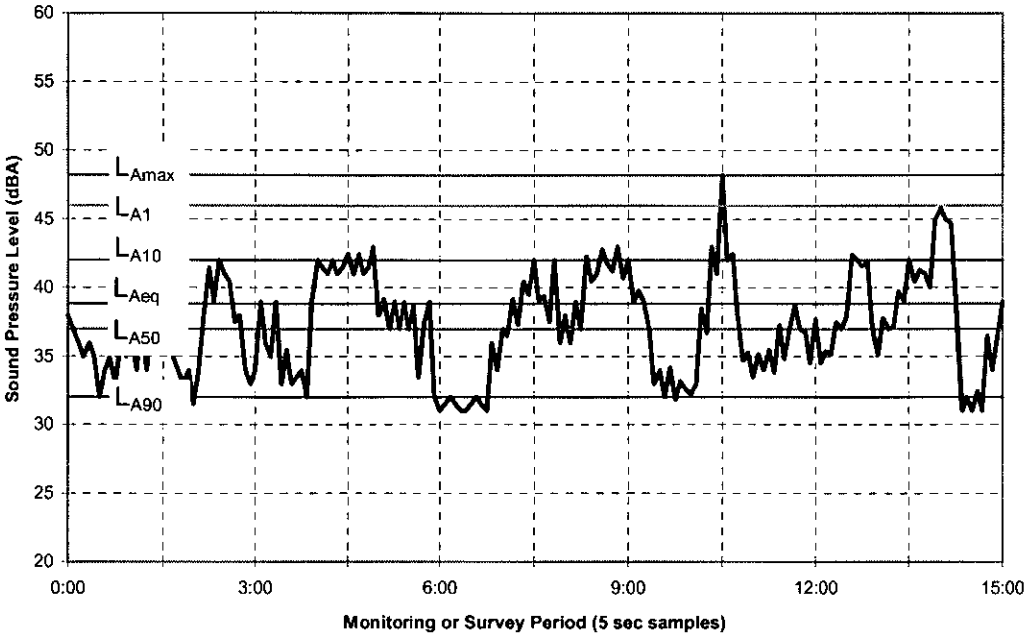
L_{A50} – The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.

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.

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 10^{th} percentile (lowest 10^{th} 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

The Peninsula Firearm Academy Incorporated proposes to construct a new shooting club at Mona Vale Road, Terrey Hills. The range will be 100m long and built to a "no exit" standard, meaning that the full length of the bullets' trajectory will be surrounded by walls and earth mounds to prevent bullets escaping from the range. This report presents a noise assessment of the proposed range.

This report addresses only noise from shooting at the club. The club is at 450m from the nearest residence and any other noise source from the club would be insignificant.

Noise from extra traffic generated by the proposal is also assessed.

2 DESCRIPTION OF THE PROPOSAL

2.1 Site Description

The location of the proposed range is shown on Figure 2-1. The nearest residences to the club are listed in Table 2-1. The nearest residence is 450m to the south-west of the club and located across Mona Vale Road. The buildings to the east of the club are industrial or commercial. To the west of the club is the St Ives Showground. The club is also surrounded by crown land and parts of Ku-ring-gai Chase National Park.

Table 2-1 Nearest Residences to Site

Receiver	Address	Distance to Range (m)
1	Mona Vale Road (south)	450
2	Mona Vale Road (west)	650
3	Myoora Road (Terrey Hills)	1580
4	Bundaleer Street (Belrose)	1500

2.2 Hours of Operation

One meeting per month is proposed. The meeting would be on Sunday between 12.30pm and 4.30pm.

2.3 Site Plan and Range Description

Figure 2-2 shows the site plan. The figure shows that the club is located off Mona Vale Road. The range is oriented from east to west. The range is surrounded by a 3m high masonry wall. To the west of the range is an earth mound 14.5m high intended to capture any bullets which ricochet out of the range. Also worth noting for acoustic reasons is that all shooting takes place from within the club house behind an "eyebrow" baffle. Whilst its purpose is for safety, the eyebrow baffle would serve to reduce noise from rifle shots as they exit the building.

Figure 2-1 Site Location and Sensitive Receivers

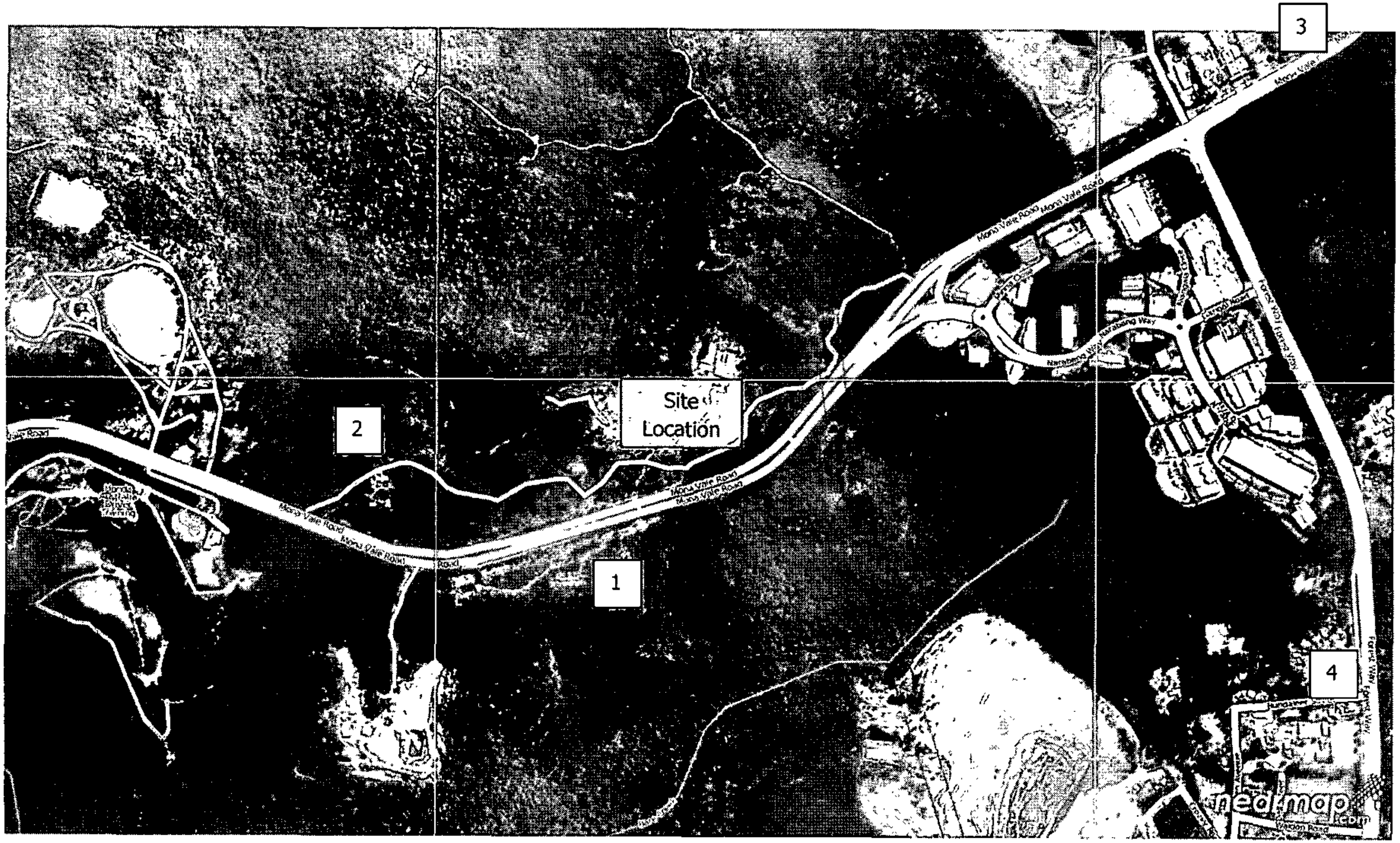
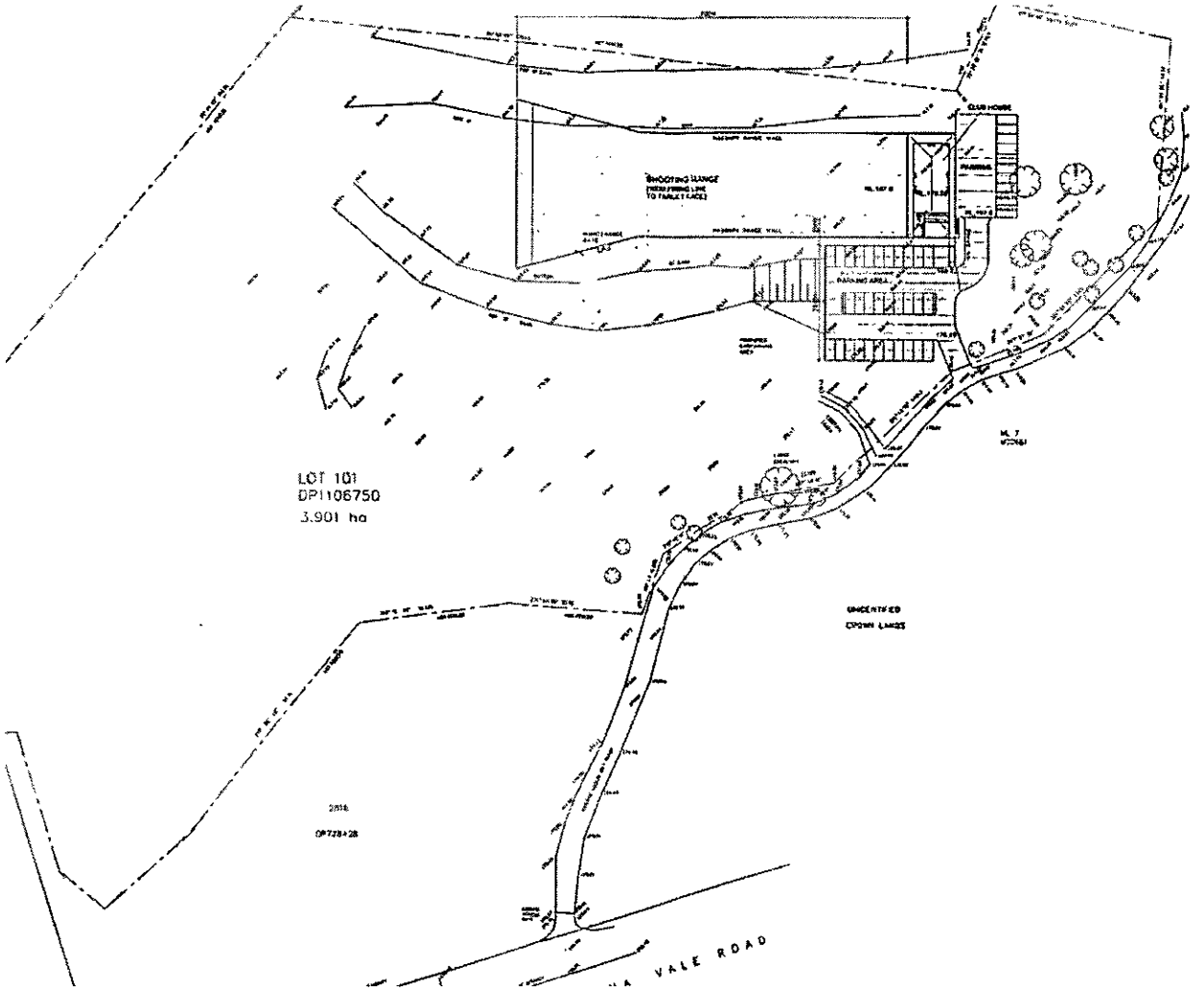


Figure 2-2 Site Plan and Relation to Mona Vale Road



3 NOISE CRITERIA

The Environment Protection Authority, now part of the DECCW, published the *Environmental Noise Control Manual (ENCM)*. Chapter 164 of the *ENCM* gave noise criteria for target shooting ranges based on the frequency of the use of the range. These are shown in Table 3-1. The *ENCM* states that "*Criteria may be used for guideline and less stringent figures could be used if site details and topography are very favourable.*"

Table 3-1 Residential Noise Level Criteria for Target Shooting Ranges

	Residential Level – dB(Lin) L_{peak}										
Shooting Range	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**Over 105**
	Maximum Usage – Days (Nights) Per Week										
Existing Range Daytime Use	7	7	7	7	7	7	5	4	3	2	1
Existing Range Night Time Use	3	3	2	2	2	1	-	-	-	-	-
Future Range Daytime Use	7	5	5	4	3	2	1	-	-	-	-
Future Range Night Time Use	3	2	1	-	-	-	-	-	-	-	-

While the *ENCM* is now generally superseded, no alternative guidelines for rifle range noise or similar sources have been put forward in subsequent documents. The DECCW *Noise Guide for Local Government, Part 3, Noise management Principles,* says

> *Outdoor shooting ranges – As this noise comprises a set of very short duration, high intensity events, noise measurements may need to be made using a specialised noise descriptor to adequately describe the noise impact. Sound level meters used to measure noise from shooting ranges should be set at 'peak hold' with a linear weighting, that is, no weighting at all. Councils could develop a policy that limits the number of days and nights that the range is used according to a measured typical maximum peak hold value so that when noise levels are high, fewer days are available for events than for venues where noise levels are lower. The policies from other states may provide guidance such as Audible Bird Scaring Devices – Environmental Noise Guidelines (EPA SA 2007)*

The guidelines in Table 3-1 are not inconsistent with this principle, and will be adopted in this report for assessment of shooting noise from the range.

4 PREDICTED NOISE LEVELS

4.1 Description of the Noise Source

Because the criteria are expressed in terms of unweighted or Linear, peak noise, accurate prediction is not possible using standard prediction procedures, which are designed to predict average or r.m.s. noise levels. However, it is possible to obtain a conservatively high prediction of the peak levels and this leads to a conservative assessment.

The National Acoustics Laboratory Report No. 84 (February 1981) *Community Reaction to Noise from Hornsby Rifle Range* by AJ Hede & RB Bullen, discusses noise levels for the firearms expected be used at this range.

For firearms such as pistols and shotguns, whose bullets travel at velocities below the speed of sound, the most significant noise is from the explosion at the gun. Peak noise levels from this source are attenuated by shielding and distance to the residences. At the proposed range, this noise will be further attenuated by the building and the eyebrow baffle.

For high power weapons, which in this report means those whose bullets travel at supersonic speeds, the noise has two components:

- noise from the explosion within the rifle; and
- noise from shockwave shedding from the bullet as it travels along it trajectory at supersonic speeds.

Although the second component is generally found to be lower in peak level than noise from the rifle, this component will not be attenuated by the building and eyebrow baffle.

4.2 Noise Source Levels

A range of weapons would be used at the range. In general there are two classes of weapon that would be used - rim fire and centre fire.

Rim fire weapons are the least powerful and generally fire bullets at speeds below the speed of sound.

Centre fire weapons are the most powerful and can fire bullets whose velocity is supersonic for the length of the range.

It is proposed to fire firearms of calibre up to 375 H&H at the range. Noise levels of several firearms were measured by Bassett Acoustics for their Report No. SA0026-GG-A1 of October 2003. That report was a noise assessment of a previous proposal for a shooting range at the same site. The results of those measurements are shown in Table 4-1. Note that all of these weapons are centre fire and in general would fire bullets at supersonic speeds. Noise from rim fire weapons is assumed to be at the lower end of the range. A level of L_{peak} 143 dB is assumed for rim fire weapons.

Table 4-1 Noise Levels Measured by Bassett Acoustics at 10m, 45 Degrees to Line of Firing

Type of Firearm	L_{peak}	ASEL
Winchester 308 (7.62 Nato)	148	125
Remington 223 (5.56 Nato)	143	119
45/70 (Ported)	144	125
243	142	121
444	149	127
Long Barrel 22/250	145	123

4.3 Prediction of Noise Levels

The NAL Report 84 gives a predictive equation for calculating noise at a distance from the range, but this does not allow for shielding provided by range walls, earth mounds or natural topography. The equation is:

$$L_{peak} = 94.0 + 5.49\ (1+\cos\theta)^{2.7} + 0.11\ V - 20\ \log\ (D/100)$$

where

- Θ is the angle between the trajectory of the bullet and the line from gun to receiver;
- D is the distance from gun to receiver in metres; and
- V is a vector wind component in m/sec.

4.4 Testing of Live Fire Noise Levels at the Range Location

To validate the formula proposed in Section 4.3 permission was obtained to test noise levels at the site of the proposed range on two different occasions and compare those levels with the formula predictions.

A rifle using .308 Winchester (7.62 Nato) calibre bullets was fired along a 100m trajectory as close as possible to the location of the proposed range.

Noise levels were measured at the following locations:

- near the shooting (83m from the firearm);
- 20m from the second closest residence (Receiver 2);
- on Mona Vale Road near the entrance gate to the closest residence (Receiver 1);
- at the St Ives showground (near Conway Avenue on the eastern side of the showground);
- at the eastern edge of the St Ives urban area on Richmond Avenue; and
- at the northern edge of the Belrose urban area on Wyatt Avenue.

The noise measured near the shooting and at the second closest residence was measured and analysed using the sAmurai sound analysis system. The analysis showed that close to the firing location the rifle noise and bullet noise are both of significant level. However, analysis of the noise at the residence showed that the rifle noise had been significantly attenuated, but the bullet noise was similar to the predicted level.

Three shots were measured at the second closest residence and the L_{peak} levels were 105, 105 and 111dBL. It is important to note that those results correspond to levels without any shielding from the proposed safety bund which is expected to considerably reduce noise

generated by supersonic bullets. The predicted level at the measurement location using only the formula, atmospheric absorption and shielding from natural topography (i.e. no artificial shielding from side walls and earth mounds is considered) is L_{peak} 111dBL.

Six shots were measured on Mona Vale Road near the entrance gate to the closest residence and the measureable L_{peak} levels were 75 and 80dBL. Four out of the six shots were not measureable due to the high volume of traffic on Mona Vale road which made it very hard to make accurate readings. The predicted level at the measurement location using only the formula, atmospheric absorption and shielding from natural topography (i.e. no artificial shielding from side walls and earth mounds is considered) is L_{peak} 84dBL.

Two shots were measured at the St Ives showground and the L_{peak} levels were 81 and 85dBL. The predicted level at the measurement location is L_{peak} 95dBL. The difference between measured and predicted levels is due to the fact that the predictive equation of Bullen and Hede is conservative and the topographic shielding of L_{peak} levels is not well understood.

It is noted that even with the same rifle firing shots at close intervals, there is a spread of 4-6dB in L_{peak} noise levels, due presumably to short-term meteorological fluctuations. While the predictive equation predicts the highest measured noise level, many shots would be expected to have lower levels.

Attempts were made to measure shots at the eastern edge of the St Ives urban area on Richmond Avenue and at the northern edge of the Belrose urban area on Wyatt Avenue but all of the shots were inaudible.

4.5 Effects of Wind Conditions

Meteorological data was used to understand whether wind in the direction of the identified receivers is a feature of the area. Daily wind speed and wind direction observations were obtained from the Bureau of Meteorology for the Terrey Hills station between 1 March 2010 and 1 April 2011.

Daytime wind was found to blow in the direction of Receiver 1 and 4 only 3% and 10% of the time respectively. Receiver 2 and 3 are both exposed to winds blowing in their direction for only 7% of the time.

Since daytime source-to-receiver winds occur less than 30% of the time at any of the identified receivers, wind is not considered a feature of the area and therefore wind effects do not need to be considered.

The Terrey Hills meteorological data shows wind speeds typically less that 3m/s and therefore effects associated with wind is generally expected to be less than 1dB according to the predictive equation of Bullen and Hede.

4.6 Noise to Residences

Noise from weapons that do not fire supersonic bullets will be reduced by the shielding provided by the building. This noise is shielded significantly more to the east than to the west. All rim fire weapons fall into this category.

Prediction of noise from high power centre fire rifles is complicated by noise from shockwave shed by the bullet along its supersonic trajectory. Peak levels from this source are typically lower than from the gun, but in the direction of the bullet trajectory they may be higher. This noise is not attenuated by the building.

The predictive equation of Bullen and Hede refers to unshielded noise, and the measurements reported above indicate it gives a conservatively high estimate of unshielded peak noise levels at this site. To provide a conservative estimate of final noise levels, this equation was used as the starting point for calculation of noise from both the gun (shielded by the building) and the bullet (shielded by external mounding). In both cases, the calculation included:

- the predictive equation by Hede and Bullen;
- shielding by local topography, range walls and safety bund, and the building in the case of the gun; and
- atmospheric absorption.

It is important to understand that noise predictions at Receiver 2 assumed the safety bund would extend in such a way that it breaks the line of sight between any point within the bullet trajectory and Receiver 2.

Predicted noise levels are given in Table 4-2. The predicted noise level of the rifle within the building would apply to the rifle noise component of noise from centre fire weapons, and to all noise from rim fire weapons.

Table 4-2 Noise, L_{peak}, to Residences

Receiver Number	Address	Distance to Range (m)	Predicted Noise Level (dBL)	
			Rim Fire Rifle Noise from Within building	Supersonic Bullet of Centre fire rifle
1	Mona Vale Road (south)	450	68	81
2	Mona Vale Road (west)	650	64	91
3	Myoora Road (Terrey Hills)	1580	30	46
4	Bundaleer Street (Belrose)	1500	38	41

For noise from within the building, the maximum predicted level is at Location 1 as it is closest to the firing position. The maximum predicted level is 68dBL at Location 1. The levels are shown in Table 4-2 for other residential locations. With reference to Table 2-1, the range would be considered suitable for use for five days or one night per week for levels less than 70dBL.

For noise from supersonic bullets, the maximum predicted level in Table 4-2 is 91dBL. With reference to Table 2-1, the range would be considered suitable for use for one day per week and no night for levels just under 90dBL. Given the conservative assumptions made for the calculation, this minor exceedance is considered negligible. Also, it is noted that it is proposed to use the range only once per month, not once per week.

4.7 Noise to Parks and St Ives Showground

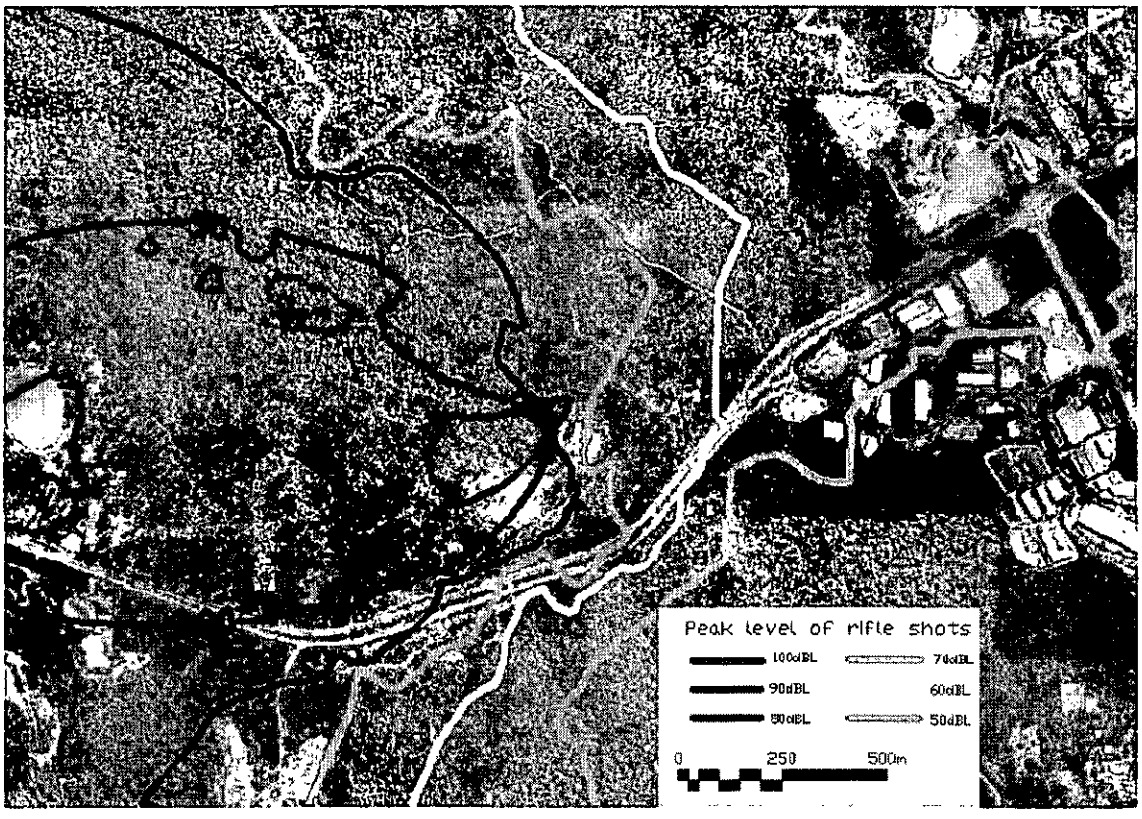
Ku-ring-gai Chase National Park is located to the north of the shooting range. Approximately 1km west is St Ives showground.

There are no target shooting noise criteria for recreational areas. Typically, for other types of noise, the criteria for recreation areas are higher than those for residential locations.

Figure 4-1 shows an aerial view of the area. The figure shows a noise contours for noise from supersonic bullets, predicted using the NAL Report 48 technique, and allowing for shielding provided by natural topography, range walls and earth mounds. These predictions should be considered approximate as the topographic shielding of L_{peak} levels is not well understood. The predicted levels at the showground are less than 90dB L_{peak}. The 90dB contour extends north and south of the showground, corresponding to areas less protected acoustically by the earth bund at the western end of the firing range.

Trails can be seen north and east of the range location, and most of the large trails appear to be outside the 90dB contour. As this level would be considered suitable for residential locations for 1 meeting per week, it is reasonable to consider that there would be minimal noise impact at recreational areas outside this contour. Noise levels would be suitable for active recreation except very near the range. There appear to be no dedicated areas for passive recreation, for example picnic grounds, within the 90dB contour.

Figure 4-1 L_{peak} Noise Contours



4.8 Noise from Existing St Ives Pistol Club

It should be noted that directly east of the proposed shooting range is the St Ives Pistol Club which has been in operation since 1989.

The cumulative effect of both the existing St Ives Pistol Club and the proposed rifle range does not need to be addressed since the notion of cumulative peak levels is unrealistic in the context of shooting ranges. This is due to the fact that peak levels generated by firearms occur so quickly (i.e. within one msec) it is almost impossible to have several shots fired at exactly the same time such that they would generate simultaneous peak levels.

5 TRAFFIC NOISE

5.1 Road Traffic Noise Goals

The DECCW's *Environmental Criteria for Road Traffic Noise (ECRTN)* sets out criteria for assessment of noise from vehicles on public roads.

The *ECRTN* sets out noise criteria for 'arterial', 'sub-arterial', 'local roads' and 'collector roads'.

Mona Vale Road would be considered an arterial road. Criteria for "land use developments with potential to create additional traffic" are as follows:

- Arterial Roads
  - Daytime (7.00am-10.00pm) $L_{Aeq,15hr}$ = 60dBA
  - Night Time (10.00pm-7.00am) $L_{Aeq,9hr}$ = 55dBA

In cases where the criteria are already exceeded, consideration should be given to reasonable and feasible means of reducing traffic noise to the criteria. In all cases, traffic from the development should not lead to an increase in existing levels of more than 2dBA.

5.2 Traffic Flows

A traffic report *Proposed Shooting Range Facility, Lot 101, DP 1106750 Mona Vale Road, Terrey Hills, Traffic and Parking Impact Assessment, 3 February 2011* was prepared by Ray Dowsett Traffic and Transport Planning Pty Ltd. According to that report the peak traffic generation expected would be 31 two way vehicle movements between 2.45pm and 3.45pm. Further, *as the Academy would be transferring its events from the St Ives Pistol Club's facility the proposal will not result in any substantial change to the number of vehicle movements to and from the site.*

The total movements over the day would be approximately twice the maximum hourly flow, or 62 vehicles per day. These movements would take place during the daytime assessment period.

The traffic report discusses to RTA traffic counts. The Annual Average Daily Traffic (AADT) on Mona Vale Road at Forest Way was 48,819 in 2005. The traffic flow details for the Sunday daytime periods are not available, however it is reasonable to assume that it would be at least 30,000 vehicles per day.

5.3 Assessment of Traffic Noise Levels

The addition of 84 movements to the existing traffic flow during the Sunday daytime period would not increase existing noise significantly. The increase would be less than 0.1dBA and is considered negligible.

6 CONCLUSION

A noise assessment of the proposed target shooting range at Terrey Hills was conducted.

The noise was assessed using criteria published in the *Environmental Noise Control Manual*. The criteria determine the number of times the range could be used per week based on the L_{peak} noise level at residences.

The prediction of noise from high powered rifles is described in the body of the report. The uncertainty of predicting propagation of noise for L_{peak} levels is described. To allow for this uncertainty, measurements of live fire at the range were performed, and conservative assumptions were made in predicting worst case noise levels at residences.

The noise from rim fire weapons is predicted to be less than L_{peak} 80dB at all residences. Under the adopted criteria, the range would be suitable for up to 5 meetings per week for rim fire weapons.

At residences west of the range, the noise from the supersonic bullets is predicted to be at most 91dB (Receiver 2).

It is important to understand that noise predictions at Receiver 2 assumed the safety bund would extend in such a way that it breaks the line of sight between any point within the bullet trajectory and Receiver 2.

Under the adopted criteria, levels of 90dB would be suitable for a proposed range that operates one day per week. While the predicted maximum level is 91dB, the 1dB exceedance is not considered significant for two reasons:

- the range will only operate one afternoon per month; and
- due to the conservative assumptions made, the noise levels of most rifle shots is likely to be less than 90dB.

The impact of increased traffic noise due to the proposal was assessed. The proposal could increase the number of movements on Mona Vale Road by 80 vehicles per day. As Mona Vale Road is a busy arterial road, the traffic noise increase would be insignificant and no noise impact is predicted.

Note

All materials specified by Wilkinson Murray (Sydney) Pty Limited have been selected solely on the basis of acoustic performance. Any other properties of these materials, such as fire rating, chemical properties etc. should be checked with the suppliers or other specialised bodies for fitness for a given purpose. The information contained in this document produced by Wilkinson Murray is solely for the use of the client identified on front page of this report. Our client becomes the owner of this document upon full payment of our **Tax Invoice** for its provision. This document must not be used for any purposes other than those of the document's owner. Wilkinson Murray undertakes no duty to or accepts any responsibility to any third party who may rely upon this document.

Quality Assurance

We are committed to and have implemented AS/NZS ISO 9001:2008 "Quality Management Systems – Requirements". This management system has been externally certified and Licence No. QEC 13457 has been issued.

AAAC

This firm is a member firm of the Association of Australian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.

Version	Status	Date	Prepared by	Checked by
C	Final	8 February 2011	George Jenner	Rob Bullen
D	Final	23 May 2011	Roman Haverkamp	Barry Murray

ROBERT FITZELL ACOUSTICS PTY. LTD.

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Directors: Robert Fitzell
Valerie Bray
Associate: Don Craig

NOISE IMPACT ASSESSMENT

NEW SHOOTING RANGE

ST IVES PISTOL CLUB

Report Number: I120
Date: July, 1989

Prepared for:

St Ives Pistol Club
PO Box 46
St Ives NSW 2075

This Firm is a member of AAAC and the work here reported has been performed in accordance with the Terms of Membership

Table of Contents

1. INTRODUCTION

This report presents the results of an assessment of the noise impact of a new shooting range (known as Range E) at the St Ives Pistol Club premises which are located adjacent to the quarry on the northern side of Mona Vale Road, approximately mid-way between St Ives Showground and the intersection with Forest Way.

The existing range has been in use by the club for at least 20 years and the new range is intended primarily for the larger bore pistols, typically up to 45 calibre.

2. LOCATION

The site is adjacent to the southern boundary of Ku-ring-gai Chase National Park and the nearest residential areas are: the northern extremities of Belrose, approximately 1.6 km to the south-east; the southern extremities of Terrey Hills, approximately 1.2 km to the east; Duffys Forest, approximately 2.5 km to the north; and North St Ives, approximately 2.5 km to the west. The intervening land is predominantly National Park and State Recreation Area.

The pistol range is at an elevation of 160 metres and is shielded from each of the above areas by natural ridges with elevations of 180 metres or higher. The closest residence is that of the caretaker of St Ives Showground which is at a distance of approximately 1.2 km to the east and has a clear line of sight across the intervening valley to the new shooting range.

3. CRITERIA

The State Pollution Control Commission (SPCC) in its Environmental Noise Control Manual, sets a noise control guideline for "Target Shooting Ranges" in terms of allowable usage time for a range, in relation to the measured noise levels at the worst affected residences (See Appendix A).

In contrast to the usual criteria for industrial and commercial noise sources, which are expressed in terms of A-weighted sound pressure level excesses over background noise, the Target Shooting Range criteria are expressed in terms of peak levels of noise, measured without weighting and are assessed as absolute values; i.e. there is no reference to ambient noise levels at the receiver. Typically, the criteria allow existing ranges to operate seven days per week if the peak sound pressure levels do not exceed 85 dB (unweighted) but require peak levels of 60 dB (unweighted) or less for unrestricted daytime use of new ranges.

4. MEASUREMENT PROCEDURE AND INSTRUMENTATION

Noise measurements were carried out on the afternoon of 15th July at the residence of the caretaker of St Ives Showground using a Modular Precision Sound Level Meter, Bruel & Kjaer type 2231, fitted with a Statistical Analysis Module type BZ7101 and 12 mm microphone, Bruel & Kjaer type 4155. A professional cassette recorder was used to record the meter output for subsequent laboratory analysis. The system reference level was checked before and after the measurements using a reference level calibrator, Bruel & Kjaer type 4230 and the drift was less than 0.5 dB.

Several series of shots were fired from the back position on the new range and the maximum peak sound pressure levels were read directly on the meter. The series of shots comprised a single shooter firing four rounds; synchronised shooting with four shooters and ultimately six shooters firing in synchronisation. The pistols were 38 and 45 calibre.

As well as recording the maximum peak sound pressure levels read on the meter, the tape recording was subsequently analysed using a Hewlett Packard 3561A Signal Analyser in transient capture mode to produce waveform data. This was considered necessary to provide confirmation that the field readings did in fact relate to the shots. This was difficult to assess in the field because the typical levels of transient peaks of background noise were of the same order of magnitude as those of the pistol shots.

5. RESULTS OF MEASUREMENTS

The measured peak sound pressure levels varied considerably from sample to sample and from shot to shot, within a sample. The highest level recorded was 87.5 dB peak (unweighted), however typical levels ranged from 73 to 80 dB. These levels were confirmed and positively identified as being related to the shots by subsequent laboratory analysis of the tape recording.

The most probable cause of the variation was wind, although by observation, the conditions were almost calm at the time of the measurements. This did not preclude the possibility that a breeze could have occurred at some point across the valley, causing random increases and decreases in sound levels at the receiver.

6. COMMENTS ON RESULTS

On the basis of the highest level recorded, the SPCC criteria would strictly permit use of the new range on only one day per week and no night time use. It is noted however that, at the same noise level, the "existing range" concession would allow use for 5 days per week but no nights.

Such a strict interpretation of the guideline does appear to be somewhat over protective, given that the typical noise level was closer to the 75 to 80 dB range and also that this affects only a single residence. The closest residential areas would be expected to receive significantly lower noise levels because of the additional barrier attenuations expected due to the intervening ridges, as well as the generally greater distances involved.

7. CONCLUSION

The strictest interpretation of the SPCC Guideline would indicate an allowable usage of the new shooting range on 1 to 2 days per week but no night time use. Given the particular situation of the range and the small number of residents likely to be affected, it would appear to be reasonable to allow somewhat greater usage up to 7 days and 1 or 2 nights per week.

It is further noted that the Guideline includes a statement that "to cater for special events such as state or national championships or charity shoots, the Commission may consider an extension of the times on both nights in one weekend provided such events occur no more than two or three times a year".

Appendix A. SPCC NOISE CONTROL GUIDELINE FOR TARGET SHOOTING RANGES

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Air rifle and air pistol competitions are not scheduled since the projectile is not propelled by an explosion.

Such competitions are usually held indoors and seldom present a noise problem. They are lawful sporting activities and the Commission is the responsible authority for any noise investigation.

This guideline specifies criteria for assessing the effect on nearby residences of pistol, rifle or gun club shooting ranges when the propellant is explosive. Criteria may be used for guidance and less stringent figures could be used if site details and topography are very favourable.

Measurement should be made at the worst affected location and consideration should be given to any neighbouring vacant land zoned as residential.

Note that any premises used for competitive shooting where the propellant is explosive are scheduled premises under the Act.

Times of Day Restrictions

Daytime operation is considered as being from 10 a.m. to 5 p.m. Night operation normally extends from 5 p.m. to 10 p.m. To cater for special events such as state or national championships or charity shoots, the Commission may consider an extension of the times on both nights in one weekend provided such events occur no more than two or three times a year.

Restricted Number of Days

Peak Hold (Linear) readings are taken at the most affected residential boundary. The number of days and nights usage of the range should be limited to correspond with the measured level as shown in the table on page 164-2.

A concession has been made in the case of existing ranges and is included in the table. This may be subject to future review by the Commission.

Alterations to existing ranges should incorporate a movement towards the "Future Range" figures whenever possible.

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Shooting Range	Residential Level - dB(Lin) Peak Hold										
	60	65	70	75	80	85	90	95	100	105	Over 105
	Maximum Usage - Days (Nights) Per Week										
Existing Range Daytime Use	7	7	7	7	7	7	5	4	3	2	1
Existing Range Nighttime Use	3	3	2	2	2	1	–	–	–	–	–
Future Range Daytime Use	7	5	5	4	3	2	1	–	–	–	–
Future Range Nighttime Use	3	2	1	–	–	–	–	–	–	–	–