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18 July 2011

Atkins Acoustics and Associates Pty Ltd.

Consulting Acoustical & Vibration Engineers

NOISE ASSESSMENT REVIEW
PROPOSED SHOOTING RANGE AND CLUBHOUSE
DEVELOPMENT APPLICATION: DA2011/0305

1.0 INTRODUCTION

The Peninsular Firearm Academy Inc submitted an application to Warringah Council (DA 2011/0305) seeking approval to construct a one hundred (100) metre shooting range, club house and associated car parking. The application was supported with reports prepared by Boston Blyth Fleming Town Planning and Wilkinson Murray (Sydney) Pty Ltd (Noise Impact Assessment).

Atkins Acoustics was commissioned by Mr Michael Temple to inspect the site, local environs and review information supporting the application with respect to the assessment of noise impacts.

Documentation reviewed by *Atkins Acoustics* included:

- Statement of Environmental Effects - Boston Blyth Fleming Town Planning
- Proposed New Shooting Club (Version C) - Wilkinson Murray
- Proposed New Shooting Club (Version D) - Wilkinson Murray
- Noise Impact Assessment St Ives Pistol Club - Robert Fitzell Acoustics Pty Ltd
- National Acoustics Laboratory Report No 84 *Community Reaction to Noise from Hornsby Rifle Range*
- Council Referral Response - Environmental Health dated 1 April 2011
- Council Referral Response - Environmental Health dated 8 July 2011
- Victorian Environmental Protection Authority Interim Gunshot Noise Guideline N6/91, dated 26 February 1991.
- St Ives Pistol Club (Web Site) - Match Information
- Independent Expert Panel Report - Southern Highlands Regional Shooting Complex - July 2008.

2.0 OVERVIEW

2.1 Gunshot Noise

Noise emitted from gunshots is dependent on a number of factors including the type of firearm and type of ammunition. It is not uncommon to find that noise levels from centre fire rifles can vary by upto 15dB. Noise measurements reported by (Dr Krammer) confirm that the most significant variation in gunshot noise is not from firearm type or caliber size, but rather in the barrel length and/or modification to barrel geometry. Bullet velocity also influence gunshot noise, measurements reported for a .308 rifles show a 50dB increase in noise as bullet velocity transitioned from subsonic to supersonic speeds. Considering these factors and to assist Council with understanding noise impacts from the proposal, the range and characteristics of noise from gunshots should have been documented by Wilkinson Murray.

2.2 Meteorological Affects

It is accepted as documented in *WM^D* that meteorological conditions influence noise impacts for distant receptors. As the Terrey Hills area is exposed sea breezes particularly afternoon winds from the northeast quadrant, the effects of these winds should be assessed. Referenced to Hilltop Inquiry the project noise assessment criteria apply to all prevailing weather conditions, which include source to receiver wind.

2.3 NSW SPCC Environmental Noise Control Manual

The SPCC (now known as OEH), ENCM Chapter 164 published guidelines for assessing noise from outdoor shooting ranges. The guidelines were developed from recommendations drafted by the Sporting Shooters Association of Australia. The approach of the guideline is to limit noise impacts and exposure for sensitive receptors based on noise level exposure and the number days ranges are used. The *ENCM* guideline states that "*A concession has been made in the case of existing ranges and is included in the table. Alterations to existing ranges should be incorporate a movement towards the "Future Range" figures when ever possible*". The Southern Highlands Regional Shooting Complex (July 2008) inquiry reported that the "*DECC in its submission supports the application of Chapter 164 of the ENCM, as does the Panel as the most relevant guidance document for NSW shooting ranges*".

Table 1. ENCM EPA (NSW) Operational Hours for Shooting Ranges

Description	Residential Level -dB Chapter 164 (Lin) Peak Hold										
	60	65	70	75	80	85	90	95	100	105	over 105
	Maximum Usage - Days (Nights) per week										
Existing -Daytime use only	7	7	7	7	7	7	5	4	3	2	1
Existing - Nighttime use	3	3	2	2	2	1	-	-	-	-	-
Future - Daytime only	7	5	5	4	3	2	1	-	-	-	-
Future - Nighttime use	3	2	1	-	-	-	-	-	-	-	-

2.4 NSW DECCW Noise Guide for Local Government

More recent (October 2010) guidelines (*NGLG*) published by the *DECCW* refer to "Outdoor shooting ranges" and recommend that Local Government as the Approving Authority refer to guidelines that restrict the number of days a range is used based on the level of noise exposure. The *NGLG* provides no criteria for assessing gunshot noise and refers to guidance from other States that may provide guidance for assessing noise from shooting ranges.

2.5 Victorian EPA Interim Gunshot Noise Guideline (IGNG)

The Victorian *IGNG* specifies noise limits measured as *L_{Amax}* using impulse time weighting for assessing gunshot noise. *Table 2* provides a summary of maximum allowable noise levels for new ranges for the number of days per week on which shooting takes place. To protect the noise amenity of residents exposed the Victorian *IGNG* applies a 5dB penalty for ranges that operate Sunday's.

Table 2. EPA (Victoria) Noise Limits - Planned Ranges

Days of shooting per week	Days of shooting per week				
	<1	1	2	3-5	6-7
Monday - Saturday	60	55	50	45	45
Sunday	55	50	45	45	45

NOTES: 1. Measured as dB(A) Impulse
 2. The assessment of noise should be made when weather conditions favor the propagation of sound from the range to the measurement point.

2.6 Cumulative Noise Assessment

Local Government is responsible for assessing noise from pistol and gun ranges. With respect to the Peninsular Firearm Academy Inc proposal, Warringah Council is responsibility for assessing noise from the proposal and cumulative noise from the proposal with noise from the St Ives Pistol Club.

Referring to the *ENCM "Alterations to existing ranges should incorporate a movement towards the "Future Range" figures whenever possible"* and the advice from Council that the St Ives Pistol Club has approval to operate seven (7) days a week, the appropriate criteria recommended for assessing gunshot noise from the Peninsular Firearm Academy Inc and the St Ives Pistol range as perceived by the exposed residential receptors is 60dB(Lin) Peak hold.

3.0 THE PROPOSAL

The proposal comprises twenty (20) shooting bays, clubhouse, onsite car parking and a one hundred (100) metre range with a width of 26.8m. The design includes three (3) metre high masonry walls along the northern and southern sides of the range and a fourteen point five (14.5) metre high stop butt at the western end of the range. *WM^D* confirms that the noise predictions at Receiver 2 (Temple) assumed the stop butt (acoustic) mound would be extended in such a way to break the line of sight between any point within the bullet trajectory and Receiver 2 (Temple). Noise modelling reported in *WM^D* confirms that the acoustic mound would provide upto 20dB noise reduction for R2 (Temple residence). As the mound is required to attenuate gunshot noise for R2, the southern end of the mound would need to extend for at least the height of the mound to the south of the intersection of the line of sight and the mound.

3.1 Noise Receptors

WM^D (Table 4.2 and Figure 2.1) refer to four (4) referenced residential receptors for assessing predicted noise levels from the proposal. A review of the information in *WM^D* and the addresses of the objector responses recorded at Council shows that the acoustic assessment fails to address noise impacts at the residential areas to the north and northwest of the development site, the St Ives Showground caretakers residence and camp sites. From our discussions with Warringah Council it is understood that Ku-ring-gai Council has no issue with respect to noise impact at the St Ives Showground residence and campsites. Albeit, it is Warringah Council responsibility as Approving Authority for development in their LGA to ensure that noise emitted from development complies with relevant criteria for all receptor locations including areas outside the LGA.

Referenced to the Temple residence (*Photos 1 & 2*) and the Showground caretaker residences (*Photo 5*) the residences are elevated above the proposed range. The residences are located with similar bearings to the south and north of the proposed range. The distances to the residences from the proposed clubhouse building are approximately 680 metres and 1170 metres, respectively.

For the purpose of assessing noise in accordance with *OEH* guidelines, the subject noise is assessed at the most affected point on or within the residential property boundary or, if this is more than 30 m from the residence, at the most-affected point within 30m of the residence.

3.2 Local Meteorological Conditions

WM^D refers to *EPA*, *INP* procedures for evaluating the effects of meteorological condition and noise propagation. Where adverse meteorological conditions including wind are identified and occur for more than 30% of the assessment period, the *INP* requires the conditions to be assessed. During the summer months (December to February) the prominent winds reported by the Bureau of Meteorology from daily weather observations at Terrey Hills are from the northeast quadrant. For the month of December the reported wind from the northeast $\pm 45^\circ$ occurred for 35% of the time.

Similar, winds observations are found for the winter month of August. Referenced to the *INP* the effects of prevailing wind from the northeast $\pm 45^\circ$ should be considered when assessing noise impacts down wind from the proposed range. Referenced to Hilltop Inquiry the assessment panel recommended that the noise assessment criteria apply to all prevailing weather conditions, which include source to receiver wind.

4.0 COUNCIL APPROVALS PROCESS

For the purpose of Council's review and assessment of the proposal two (2) Application Referral Comment Requests were forwarded to the Council's Assessment Officer dated 15 March and 7 June 2011.

4.1 Council Response Dated July 2011

Referenced to the Council's response dated 8 July 2011 it is assumed that the response was prepared to address *WM^D* dated April 2011 not the Wilkinson Murray (Version C), as referenced in the response.

4.2.1 Comments

The Council response repeats the findings of an earlier response, i.e., *"to ensure that noise generated from the development does not result in offensive noise to any other party compliance with the Protection of the Environmental Operations Act 1997"* and recommends that the development and activities undertaken on site must comply with the Acoustic Report prepared by Wilkinson Murray Report No. 10306 **Version C** dated February 2011 and the Industrial Noise Policy.

From our review of *WM^D* the assessment assumptions and recommendations have been amended and are significantly different to those reported in Wilkinson Murray Version C and in our opinion could give rise to secondary impacts that have not been addressed by Council. These include but are not limited to:

- the construction of the 14.5 m high butt mound to form an effective acoustic barrier,
- identification of noise receptors at St Ives Showground;
- predicted noise levels at the St Ives Showground;
- predicted noise levels with northeast $\pm 45^\circ$ winds;
- cumulative noise with the St Ives Pistol Club; and
- noise compliance testing at reference assessment locations that have not been identified or addressed in the material before Council *"to ensure noise compliance with the applicants noise performance standard and maintain amenity to adjacent neighbours"*.

From our review of the Council Referral Response dated 8 July 2011, the response in our opinion does not address the assessment requirements of the Referral Request dated 7 June 2011. In particular the response does not:

- refer to *WM^D*,
- confirm the adequacy of the revised noise report;
- identify or address all sensitive noise receptors;
- address secondary impacts arising from addition noise mitigation recommendations;
- adequately address the effects of source to receptor winds; or
- address cumulative noise from the proposal with noise from St Ives Pistol Club range.

Further the 90dB(A) compliance noise limit recommended in the Council response if applied would give rise to wide spread unacceptable noise impacts, generate substantiated complaints from the community and generate offensive noise. In preparing the draft noise condition of *"Noise from the rifle range during shooting activities shall not generate noise levels that exceed 90dB(A) measured at the property boundary measured in accordance with the Environmental Protection Authorities NSW Industrial Noise Policy"* shows that the author has no understanding of the Wilkinson Murray reports, the assessment of gunshot noise or the application of the *INP* or the assessment of noise impacts from gunshot noise. On the understanding that the *WM^D* has not identified or addressed noise impacts for the wider community we question if Council has clear understanding of the location of noise affected properties.

With respect to the noise compliance testing, Council has the responsibility to ensure that any noise compliance testing is undertaken by an independent person not associated with the club or the consultants who prepared the noise assessment report and have appropriate skills, qualification and instrumentation to undertake the measurements. All measurements should be undertaken without notification to club members and/or club management. Should any breach of the noise conditions be confirmed during the noise compliance audit, club management should be notified immediately by a Council authorised person and all site activities ceased until further notice. For transparency the findings and recommendations of any compliance testing should be published and made available to residents within 7 days or posted via a link to a *'compliance noise audit'* registrar provided on the Applicants Web site.

Additionally, if Council was to consider approving the proposal, the approval should be conditional with a twelve 12 month trial period and any extension being the subject of regular noise compliance testing during the period and certification that the gunshot noise during that period satisfied the noise conditions.

5.0 REVIEW OF WILKINSON MURRAY REPORT (VERSION D)

Two (2) noise reports prepared by Wilkinson Murray have been reviewed. The following comments are restricted to the second report identified Revision D, dated April 2011 (*WM^D*).

Section 2.1 - identifies four (4) residential properties as being nearest to the site. The referenced properties do not represent sensitive receptor locations at St Ives Showground (including a residence and camp sites), Duffys Forest or Terrey Hills (north).

Section 3 - *WM^D* refers and recommends noise criteria published in the *ENCM*. The Southern Highlands Regional Shooting Complex (July 2008) inquiry reported that the "*DECC in its submission supports the application of Chapter 164 of the ENCM, as does the Panel as the most relevant guidance document for NSW shooting ranges*". The *ENCM* recommends that "*Alterations to existing ranges should incorporate a movement towards the "Future Range" figures whenever possible*". *WM^D* recommended a criterion for the 100m range without consideration of noise from the existing pistol range. For assessing future gunshot noise for seven (7) days exposure the *ENCM* recommends that the appropriate criterion would be 60dBA(Lin), *WM^D* adopted a level of 90dBA(Lin). In terms of assessing the gunshot noise, in addition to different characteristics from the introduction of the centre fire rifles, a level of 90dB would be perceived as eight (8) times louder than 60dB. As the consent authority Council has an obligation and responsibility to ensure that future noise from activities associated with outdoor shooting ranges including cumulative noise is assessed in accordance with recognised procedures and does not give rise to unacceptable impacts.

Section 4.4 - Noise modelling reported in *WM^D* for the validation of the NAL noise model without allowances for shielding confirms that the predicted level of 111dB(Lin) compared to a measured level of 111dB(Lin) and that the predictive model was suitable for assessing gunshot noise.

Section 4.5 - *WM^D* reports that source to receiver winds occur for less than 30% of the time, hence wind effect has not been considered in the modelling. Referring to Australian Government Bureau of Meteorology daily weather observation for Terrey Hills and the summer period (December to February) the prominent afternoon winds are from the northeast $\pm 45^\circ$. For the month of December 35% of the winds up to 3m/sec are from the northeast $\pm 45^\circ$. Similar, winds observations are found for the winter month of August. Accordingly referenced to the *INP*, wind effects need to be considered in the noise modelling. Referenced to the Southern Highlands Regional Shooting Complex (July 2008) inquiry the recommended noise limits apply under all prevailing weather conditions.

Section 4.6 - *WM^D* reports predicted gunshot noise levels for four (4) receptor locations with allowances for shielding with a 14.5m high acoustic mound. *WM^D* reports that the predicted noise levels at the Temple residence reduce by 20dB, from 111dB(Lin) to 91dB(Lin). For the acoustic mound to be effective for the Temple residence, it would need to extend past the intersection with line of sight to the range by at least the height of the mound (14.5m). No details have been provided or reviewed in the form of drawings with respect to the extent of acoustic mounding required to satisfy the *WM^D* 90dB(Lin) or the *ENCM* recommended 60dB(Lin) criteria.

Given the bearing and distance (1170m) of the Showground residence compared to the Temple residence (680m), the predicted gunshot noise level of 95dB(Lin) reported in *WM^D* (Section 4.4) for the Showground residence is not agreed. Utilising the *NAL* noise model, the predicted level for the Showground residence without excess attenuation is 107dB(Lin), 12dB higher than reported in *WM^D*. Considering the predicted level of 107dB(Lin) for the Showground residence the northern side of the 14.5 metre high acoustic mound would need to be extended in a similar form to the southern side extension.

WM^D fails to address gunshot noise for residential properties at Duffys Forest and Terry Hills (north). From our review of responses submitted to Council, it is understood that existing properties in the area are exposed to noise from the existing pistol range and as the proposed range is at a higher elevation would be exposed to greater noise levels than presently experienced.

Section 4.7 - *WM^D* fails to recognise that there is a residence and camp sites at the Showground that would be exposed to gunshot noise.

It is understood from discussions with Warringah Council that they understand that Kur-ring-gai Council has no issue with gunshot noise exposure and impacts for the caretakers residence or the campsites. As discussed earlier Warringah Council as Approving Authority has the responsibility to ensure that noise emitted from developments in its LGA complies with all relevant criteria for all sensitive receptor locations including receptors outside the LGA.

WM^D reports that with allowances from natural topography, range walls and acoustic mounding predicted noise levels of less than 90dBA(Lin). No supporting details are provided in *WM^D* to confirm the claim in the form of maps and drawings that show the extent of natural topography and acoustic mounding assumed and required to satisfy the *WM^D* 90dB(Lin) or the *ENCM* recommended 60dB(Lin) criteria. From a review of the natural topography features the caretaker's residence is located across a valley with a direct line of sight to the proposed range (*Photo 5*).

Section 4.8 - *WM^D* states that the cumulative noise from both the existing St Ives Pistol range and the proposal does not need to be considered as cumulative peak levels are unrealistic. Referenced to the *ENCM*, cumulative noise from pistol and rifle ranges is assessed by reference to the level and number of day gunshot noise occurs. For example the *ENCM* recommends a level of 90dB(Lin) for one (1) day usage and 60dB(Lin) for seven (7) days.

Reference to the *ENCM* "*Alterations to existing ranges should incorporate a movement towards the "Future Range" figures whenever possible*" accordingly the criteria recommended by the *ENCM* for assessing gunshot noise from the Peninsular Firearm Academy Inc and the St Ives Pistol Club ranges is 60dB(Lin) Peak hold.

Section 6 - *WM^D* concludes that noise from rim fired weapons would be less than 80dB(Lin) peak hold at all residences. *WM^D* (Section 4.2) assumed a source noise level of 143dB for rim fire weapons and a range of noise levels from centre fire weapons between 142dB and 149dB. The difference between rim and centre fire being up to 6dB. Noise modelling for the Temple residence with allowance for acoustic mounding predicted a level of 91dB(Lin) for centre fire weapons. Considering the 6dB difference between centre and rim fired weapons the level for rim fired weapons based on the *WM^D* data is 85dBA(Lin) not 80dB(Lin) as reported.

WM^D concludes that *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*". For the acoustic mound to be acoustically effective for the Temple residence, it would need to extend past the intersection with line of sight to the trajectory path by at least the height of the mound (14.5m). No details have been provided in the form of drawings to confirm the extent of acoustic mounding required to satisfy the *WM^D* 90dB(Lin) or the *ENCM* recommended 60dB(Lin) criteria.

WM^D concludes that with the adoption of the 90dB(Lin) criteria the range could operate one day per week and the predicted 1dB exceedance is not significant. Referenced to the *ENCM* a criterion of 90dB(Lin) is not appropriate for assessing gunshot noise exposure that could occur for upto seven (7) days a week. The predicted 1dB exceedance when considering the additional effects from prevailing winds to represent a worst case scenario (as recommended in the Hilltop inquiry) in our opinion would result in non-compliance with the Applicant's own assessment criteria of 90dB(Lin).

The information presented in this review is not intended as a check list for Council to address, rather than a summary of issues that Council need to address and be satisfied that the proposal addresses:

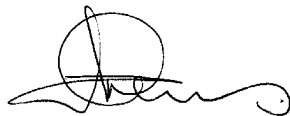
- the cumulative noise from the proposal with the St Ives Pistol Club range noise;
- satisfies relevant *ENCM* noise criteria;
- not add to noise impacts experienced at existing residential receptors, and
- is supported with adequate detail and technical information to enable Council to be confident that gunshot noise in the area satisfies all relevant assessment criteria.

From our review of the documentation referenced above, we are of the opinion that Council does not have adequate support information or understanding of the proposal in terms of assessing noise impacts as a consequence of the proposal and existing gunshot noise experienced in the area.

As the Approving Authority and prior to any determination of the proposal, Council has an obligation to affected property owners:

- to document and justify all facts relied upon;
- confirm acceptance of all technical support information submitted and relied upon in its determination;
- identify all noise affected properties, and
- report on the consequences of the proposal for noise affected properties in accordance with recognised assessment guidelines and assessment procedures.

ATKINS ACOUSTICS & ASSOCIATES PTY LTD



Graham Atkins

PHOTOS 1 & 2: TEMPLE RESIDENCE



Photo 1. Line of sight from eastern balcony Temple residence to site of proposed rifle range (circled).



Photo 2. Line of sight from proposed rifle range to Temple residence.
(house position circled- red pool wall is north and below house- see photos 3 & 4)

PHOTO 5: SHOWGROUND RESIDENCE



Photo 5. Caretaker cottage (circled) St Ives Showground, direct line of sight from proposed rifle range.



Photo 6. Ku-ring-gai National Park, the valley that extends from the proposed rifle range and links to the southern side of Terrey Hills and Duffys Forest and St Ives showground.