

**BEFORE THE NEW PLYMOUTH DISTRICT COUNCIL
INDEPENDENT HEARINGS COMMISSIONER**

LUC24/48583

UNDER

the Resource Management Act 1991

IN THE MATTER

Application by the New Plymouth Pistol Club Inc for to operate a gun club being a sport and recreational activity within the General Industrial Zone under the Part Operative District Plan 2025 including construction of new facilities being a 2-storied shooting range and multiple acoustic barriers with all associated site mitigation works and earthworks and remediation of known soil contaminants.

STATEMENT OF EVIDENCE OF DAMIAN ELLERTON – ACOUSTICS

DATED: 21 APRIL 2026

Statement of evidence of Damian Ellerton

Introduction

- [1] My name is Damian Paul Ellerton.
- [2] I have been instructed by New Plymouth District Council (the **Council**), to give expert acoustics evidence on the land use consent for the continued operation of the New Plymouth Pistol Club including construction of new facilities with all associated site mitigation works and earthworks and remediation of known soil contaminants.
- [3] I have provided acoustic advice to the Council since 2022. At the time I was an Associate of Marshall Day Acoustics (MDA), an international acoustic consulting firm. As of 16 January 2026 I no longer work for Marshall Day Acoustics and am now self-employed as Director of Ellerton Acoustics Ltd. I am contracted by Council directly to complete this work.
- [4] I was employed by the Council between 1994 and 1998 and my duties included assessment of noise compliance as well as assisting with policy development. Since 1998 I have worked as an acoustic consultant in England (3.5 years) and since then in New Zealand (3.5 years in Christchurch and 1.5 years in Wellington). I established the New Plymouth office for MDA in 2007.
- [5] I have undertaken noise measurements and prepared written advice to the Council. I understand all of this data and advice has been provided to the applicant and their acoustic consultants Acoustic Engineering Services (AES). I have also attended meetings with Council in discussion with applicant and AES.

Code of Conduct

- [6] I have read the Environment Court Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023 and agree to comply with it. I confirm that the opinions expressed in this statement are within my area of expertise except where I state that I have relied on the evidence of other persons. I have not omitted to

consider materials or facts known to me that might alter or detract from the opinions I have expressed.

Scope of evidence

- [7] My evidence will address:
- (a) History of involvement
 - (b) Abatement notice
 - (c) Mr Philips
 - (d) Noise criteria
 - (e) Existing noise environment and cumulative noise
 - (f) Summary of noise measurements
 - (g) Application
 - (h) AES analysis
 - (i) Proposed noise management plan by AES
 - (j) Proposed conditions of consent by BTW
 - (k) Recommendations
 - (l) Conclusions

History of involvement

- [8] I was first contacted by the Council in March 2022 to undertake noise measurements of firearm usage at the New Plymouth Pistol Club (the Club). This was in response to complaints from Mr Bryan Philips at 1222 Devon Rd.
- [9] My involvement has included several site visits to the application site being 1222 Devon Rd and noise measurement at Mr Philips house and his second dwelling that was tenanted at the time.

- [10] I attended a pre-application site visit with applicant, Aaron Edwards (BTW), Jeremy Trevathan (AES), Campbell Robinson (Reporting Officer) on 12th December 2023.
- [11] I have provided copies of Council correspondence and raw data from noise measurements to Acoustic Engineering Service (AES), and feedback on pre-application documentation.
- [12] Attached as Appendix A are copies of all written documents I have provided, being Memo's 1-8. Memos 3, 6, 7 and 8.1 provide a good technical reflection of findings. These reviews cover my iterative findings through the pre-application process.
- [13] I did not undertake any work on this application from December 2024 until receipt of application documentation including the proposed noise management plan in December 2025 and January 2026.

Abatement notice

- [14] I understand an abatement notice was issued and was subsequently appealed by the applicant. I was not involved with the preparation of the abatement notice.
- [15] I understand the abatement notice has been withdrawn and the applicant also agreed to some limitations on the hours of operation¹, being:
- Wednesday: 9:00am – 4:00pm;
 - Thursday: 5:00pm – 8:00pm;
 - Friday: 9:00am – 4:00pm;
 - Saturday: 9:00am – 5:00pm; and
 - Sunday: 9:00am – 4:00pm.

¹ 20 November 2025.

Mr Philips

- [16] I have visited Mr Philips property on a small number of occasions to measure noise levels as noted previously.
- [17] Mr Philips primary and secondary dwellings are approximately 100-110m at closest distance from the notional boundaries to Range 1 of the application site. The use of firearms is clearly audible.
- [18] Current noise levels generally in excess of 70dB L_{AFmax} and CNR variable as total site usage for day not known².
- [19] I understand Mr Philips has a strong adverse response to firearm noise on the basis of current noise levels, and the absence of controls with respect to noise from site usage.
- [20] In my opinion, the implied noise limit of 65dB L_{AFmax} , without a limitation on the number of rounds fired, is unlikely to be enough of a reduction.

Noise criteria

- [21] Attached as Appendix B is a glossary of acoustic terms.
- [22] The Part Operative District Plan and the noise limits within it are based on guidance provided in NZS6802:2008 *Assessment of environmental noise*.
- [23] It is acknowledged the noise criteria for the discharge of firearms is not provided for in NZS6802 section 1.2.1 which states "This Standard does not apply to the assessment of sound ... subject to the application of other New Zealand acoustical Standards [i.e. NZS6803 1999 Construction Noise] ... and impulsive sound (such as gunfire and blasting), requires special techniques that generally are outside the scope of this Standard".
- [24] There is in fact an absence of clear guidance for noise limits that apply to firearm noise in particular. To suggest options, I looked at the criteria used by other consent authorities in decisions for

² Mm003.1 20220112 DE (New Plymouth Pistol Club) 7 June 2022

consents relating to use of firearms. Attached as Appendix C are copies of the documents referenced in my evidence.

[25] My review uncovered only a limited number of examples of directly relevant guidance through decisions made by the Environment Court.³ Council resource consent decisions, but I note the Waiuku Gun Club operates under limitation include days of the week, hours per day and total number of rounds permitted per day⁴.

[26] The noise criteria used in those cases are Composite Noise Rating (CNR) and L_{AFmax} and I will briefly describe each parameter.

CNR

[27] The CNR metric is primarily a function of the noise level of each shot, the number of shots per day and the proportion of days per year that shots are fired, (amongst other variables). Previous studies^{5, 6} concerning the investigation of gun fire noise recommend a limit of CNR 90.

[28] The Australian National Acoustics Laboratories⁷ (NAL) produced two relevant reports assisting the assessment of gunfire noise effects on communities. I have reviewed both NAL reports (upon which the proposed limit of CNR 90 is based) as part of this assessment as well as on other projects. It is my opinion that neither of the reports shows clear or robust reasoning for adopting the value of CNR 90. In fact, the Carter report² states throughout that many aspects of the equations are assumed only and have been included without evaluation against any dose / response evidence. Indeed, the element of the equation dealing with the number of days per annum when shooting may occur has been added as “In the absence of anything better...”. I consider

³ Decision No's. [2011] NZEnvC 48 Nelson City Council v Harvey, [2020] NZEnvC 074 Davis vs Gisborne District Council

⁴ <https://waiukupistolclub.org.nz/resourceconsent.php> (snapshot attached Appendix B)

⁵ Hede, A., Bullen, R. (1981). Community Reaction to Noise from the Hornsby Rifle Range. NAL Report No. 84.

⁶ Carter N.I., (1977). A Method for Evaluating Community Response to Noise from Military Firing Ranges. NAL Report No.67.

⁷ <http://www.nal.gov.au/>

that the CNR metric has some merit but there is a severe lack of information to support the value of 90 as being reasonable.

[29] The CNR level is calculated using the equation:

$$\text{CNR} = (Y - A) - 12 + 10\log N + 10\log R + 10\log T ; \text{ Where:}$$

- Y is the log average $L_{Z\text{Peak}}$ level for all shots over the day;
- A is the degree of community adaptation (set conservatively at 13 for no adaptation);
- N is the number of single shots a day;
- R is the number of rounds per burst (set at 1 in this case); and
- T is the proportion of days per annum that shooting occurs (set at 0.712 for instance if firearms discharged 5 days a week).

T may = zero given potential activity seven days per week

[30] While the CNR requires some calculation it does provide a potential tool for predetermining how compliance can be achieved with a potential mix of firearms being used. This was demonstrated in MDA Mm003 dated 7 June 2022⁸.

[31] The CNR criteria does attempt to quantify not only the level of noise experienced but the number of times this occurs and over what sort of duration to provide a single answer. As noted above, it does also mean a “pick’n’mix” approach to users of the club could be applied to future planning.

$L_{AF\text{max}}$

[32] The $L_{AF\text{max}}$ is defined in NZS6801 as “Ten times the logarithm, to the base 10, of the ratio of the square of the maximum sound pressure, obtained with a standardised A-frequency-weighting and F-time-weighting during a stated time period, to the square of the reference pressure (20 μ Pa). For the purposes of the Standard L_{max} derived from

⁸ Mm003.1 20220112 DE (New Plymouth Pistol Club) 7 June 2022

the measured short-LEQ values of 100-125 milliseconds duration shall be taken as equivalent to L_{max} derived from F-time-weighted measurements". What this means in lay terms is the highest measured sound pressure level during a measurement period.

[33] The L_{AFmax} approach is more simplistic and represents a singular threshold which cannot be exceeded – a hard limit. The numeric value put on this should include consideration of the number of events occurring because of the type of noise generated. Firearm noise is considered somewhat unique – being high energy and very short duration. Furthermore, the nature of firearms is the number of noise events created may be dozens, hundreds or thousands per day.

[34] I provided some initial guidance in Mm006⁹ where I suggested with the proviso that *"Whichever acoustic criteria is chosen, it must be appropriate for the receiver site use **and** consider the number of rounds discharged per hour/per day **and** the total hours of activity **and** the number of days of operation "broad noise limit options include:*

- 55dB LAFmax / Monday to Saturday 9am-8pm, Sunday noon-6pm / no limit on number of rounds
- 60dB LAFmax / Monday to Saturday 9am-8pm, Sunday noon-6pm / limit of 2,500 rounds per day
- 60dB LAFmax / 3 days per year/Monday to Saturday 9am-8pm, Sunday noon-6pm / no limits rounds per day – designed to allow competition event"

Existing noise environment and cumulative noise

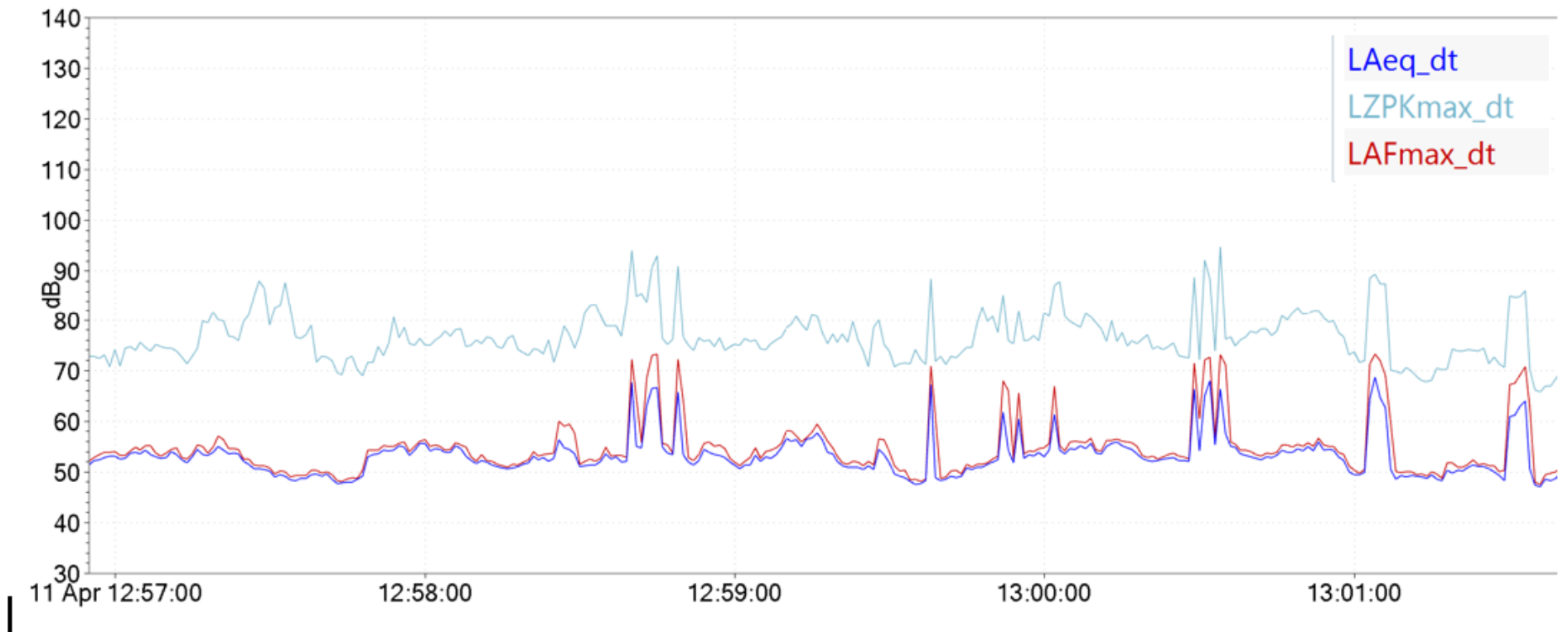
[35] The existing noise environment comprises road traffic noise from SH3 and some typical rural activity noise from time to time including light aircraft overhead.

⁹ Mm006 20220112 DE (New Plymouth Pistol Club__AES AEE dated 5 August 2024

- [36] The road traffic noise during the daytime is clearly audible and based on five previous measurements taken would typically be around 55-60dB L_{Aeq} at Mr Philips house as well as his tenant's property.
- [37] From my experience visiting Mr Philips house, and indeed the nearby Big Jims café, the sound of firearms is clearly and distinctly audible compared to the road traffic on SH3. I will discuss this further when considering advice provided by AES on behalf of the applicant.
- [38] I have not experienced or measured the ambient noise level at the Special Purpose Future Urban Zone (FUZ) land on the opposite side of SH3. Future development may include noise mitigation measures to reduce road traffic noise, and this may or may not inadvertently assist reduce the Applicants noise imission received at houses. Therefore, despite the undeveloped nature of this land, it is still prudent in my opinion to include appropriate noise limits for residential receivers within the FUZ, should consent be granted.
- [39] One of the reasons why the ambient noise environment is important is to consider the application noise within this context. The presence of an elevated ambient noise environment *may* allow for a noise limit that exceeds the District Plan limit to be acceptable. For instance, a new business close to a residential boundary may create noise which technically exceeds the permitted activity standards but *may* be judged as acceptable because the existing ambient noise environment already exceeds the District Plan noise limits i.e. both sites are subject to noise from motorway/road traffic.
- [40] In this case, AES have stated¹⁰ the presence of firearm noise at 65dB L_{AFmax} is acceptable in the context of road traffic noise at 55-60dB L_{Aeq} because the cumulative or additive effect is small. This statement is made in specific reference to Mr Philips property. I disagree with this conclusion because the nature of the two sounds is completely different in both character and receiver response. Figure 1 illustrates this.

¹⁰ AC23328 – 01 – R5: New Plymouth Pistol Club – Assessment of Environmental Noise Effects, page 6 penultimate paragraph

Figure 1: Example noise trace showing firearm vs ambient noise



[41] From Figure 1 it can be seen the ambient noise in the absence of firearms is approx 50-55dB L_{Aeq} (blue line). The L_{AFmax} (red line) is approx 70dB. The change in noise level during use of firearms can be clearly seen and is clearly audible when experienced during visit to Mr Phillips houses at 1222 Devon Rd.

[42] In my opinion, the consideration of cumulative noise, for the purposes of demonstrating minimal change in noise environment, is more appropriately applied when the same acoustic parameter is used. That is a change in (ambient) L_{Aeq} calculated from the difference between existing ambient noise and proposed activity + existing ambient noise level. Or in other words:

$$L_{Aeq} \text{ (new total)} = L_{Aeq} \text{ (existing)} + L_{Aeq} \text{ (new activity)}$$

And furthermore, the change in noise level is:

$$L_{Aeq} \text{ (new total)} - L_{Aeq} \text{ (existing)} = \text{Difference, dB.}$$

[43] Typically, this additive effect is acceptable where the change in noise level is limited to 2-3dB. After this the potential noise effect increases whereby a change in noise level of +10dB on existing is considered a significant increase or perceived as “twice as loud”.

[44] It can be seen from Figure 1 that the existing L_{AFmax} in the absence of firearms is negligible. When firearms are present the change in noise level is approx. 15-20dB in the example shown in Figure 1.

[45] The Part Operative New Plymouth District Plan includes an overlay for the State Highway Noise Control Boundary, see Figure 2. This boundary is used to prevent reverse sensitivity from noise sensitive activities (houses) being built close to the State Highway network.

Figure 2: State Highway Noise Control Boundary overlay



- [46] What this tells me is the ambient noise at Mr Philips house would be experienced at approximately 80m back from the State Highway within the FUZ. Houses closer to the State Highway will experience higher levels of ambient noise at a rate of $\sim+3\text{dB}$ at 40m and $\sim+6\text{dB}$ at 20m from road edge. This means that at 20m from road edge the ambient noise level may be around $60\text{dB } L_{\text{Aeq}}$ which should be considered with regard to the difference in the character of firearm discharge and ambient road traffic noise.

Summary of noise measurements

- [47] Copies of all memos provided to Council are attached in Appendix B and are numbered Mm001-008 with the last version of each document provided.
- [48] The results of all noise monitoring that I have conducted have been shared with the applicant and AES. Memo 003.1 includes a summary table of measured noise levels. I have measured a limited number of firearm types that were in use at those times. These do provide some guidance regarding potential noise levels and what those noise levels look like when compared to a range of different criteria.

Application

- [49] The application seeks land use resource consent for the operation of the New Plymouth Pistol Club (NPPC) on the site at 1206 Devon Road, Bell Block (legally described as: Lot 1 DP 19854).
- [50] The noise assessment has been prepared by AES and I discuss this separately.
- [51] The application is to allow shooting from 9am to 9pm seven days per week. The application seeks that no limitations be placed on the number of rounds fired between these hours including no limitation on number of rounds fired in association with Police/AOS usage.
- [52] Section 3.3 of the AEE by BTW repeats the AES guidance that a noise limit of 65dB L_{AFmax} and “the noise will be acceptable and effects minimal”. In addition, Table 3.2 is reproduced from AES guidance that predicts noise levels of 63-67dB L_{AFmax} at Mr Philips secondary dwelling once noise mitigation is completed.
- [53] My understanding is noise mitigation relies principally on physical barriers to lower noise levels and filling in any existing gaps in existing barriers.
- [54] In addition to the application document, I have reviewed the Draft noise management plan (NMP) dated 5 December 2025 provided to Council on 20th January 2026. I will discuss this document separately as it is central to the applicant demonstrating noise can be controlled to an appropriate level.
- [55] In summary, the application AEE suggests a noise limit of 65dB L_{AFmax} from 9am to 9pm daily at the notional boundary of all surrounding private dwellings including Mr Philips house is acceptable.
- [56] The application places considerable reliance on the physical noise mitigations proposed and NMP to ensure this occurs. As noted above, there appears to be no limit to the number of rounds that may be able to be fired.

[57] In regard to the land opposite State Highway 3 which is Future Urban Zone, the AES noise assessment (dated 1 August 2024) states that mitigation to achieve a noise limit of 70dB L_{AFmax} is all that is required in the event dwellings are constructed on those sites in future. I do not have any details on how this value was derived. If it was based on ambient noise levels, I am not sure of the location at which this data was obtained and any results that were gathered. This is something that the applicant team may wish to address and clarify.

[58] I note the proposed conditions of consent offered (should consent be granted), use the CNR criteria as a noise limit and no reference to the L_{AFmax} which has the knock-on effect of uncertainty with respect to AES analysis and the noise management plan to control firearm discharge to an appropriate level.

AES analysis¹¹

[59] As previously noted, there has been significant discussion regarding establishing a noise criteria. Attached to this evidence in Appendix D are MDA memo's 007¹² and 008.¹³ which illustrate the questions raised in response to information received.

[60] My summary findings of the AES analysis are as follows:

- (i) I disagree that the AEE noise criterion of 65dB L_{AFmax} at 1222 Devon Rd houses is appropriate, and likewise I do not agree the proposed 70dB L_{AFmax} at houses in Future Urban Zone is appropriate.
- (ii) There are examples in New Zealand of consents granted for firearm use that use L_{AFmax} in the range of 50-55dB. On the limited occasions I have experienced firearm noise at Mr Philips property, even at 65dB L_{AFmax} , combined with the number of rounds fired, I consider it to be too high.

¹¹ AC23328 – 01 – R5: New Plymouth Pistol Club – Assessment of Environmental Noise Effects

¹² Mm007 20220112 DE (New Plymouth Pistol Club)_AEEv2

¹³ Mm008.1 20220112 (New Plymouth Pistol Club)_AES AEE Dec 2024

- (iii) The AES advice predicts noise at 1222 Devon Rd houses at 67dB L_{AFmax} which is more than their own criteria of 65 dB L_{AFmax} and described as “typically inaudible”. While I accept it would be difficult to subjectively determine the difference between 65 and 67dB L_{AFmax} the critical point is it can be objectively measured and compared to a noise limit for determining compliance or otherwise.
- (iv) Reference to Chartered Institute of Environmental Health document¹⁴ commentary is of little or no relevance with respect to the application because it assumes a limitation on the hours of use (4 per day during week and 3 hours per day in weekends). Furthermore, the limitation on hours may be reduced where shooting occurs more than 28 days per year.
- (v) AES have made no consideration of the number of rounds fired, and the effect that this may have on surrounding properties. In my advice¹⁵ I have previously suggested broad noise limit options between 55-60dB L_{AFmax} which also have a reference to the number of rounds.
- (vi) The existing ambient road traffic does not provide the masking noise of firearm discharge that is being relied upon.

[61] As noted above, the proposed conditions of consent offered (should consent be granted), use the CNR criteria as a noise limit and no reference to the L_{AFmax} which means the AES analysis is redundant in this regard.

Proposed noise management plan by AES

[62] The draft NMP by AES is referenced by draft Condition 13 in the document submitted by Mr Edwards (undated).

¹⁴ CIEH (2003) Clay Target Shooting Guidance on the Control of Noise

¹⁵ Mm006 20220112 DE (New Plymouth Pistol Club__AES AEE dated 5 August 2024

- [63] The noise management (NMP)¹⁶ is relied upon as a critical document to demonstrating how an activity will be conducted to ensure noise will be controlled to the requested noise limit of 65dB L_{AFmax}.
- [64] In my view, best practice noise management plans should be written using plain English with a clarity of thought that can be readily understood (and fully implemented) by the reader, which in this case includes all club members and visitors as well as neighbours (existing and future), technical experts and Council staff.
- [65] The NMP lists in section 2.1 several noise mitigation measures that “were” implemented but later suggests “*the physical mitigation work is to be completed progressively As Club time and resources allow*”. I take from this that the applicant is requesting that the physical noise mitigation would not be complete prior to the consent being enacted. Therefore, the AES estimated noise reduction of 7-16dB would not occur immediately, and therefore the predicted noise levels relied upon for compliance would be exceeded.
- [66] The NMP section 2.3 references “seven continuous 4-hour periods of low to no noise per week” and provides example of firearm that can achieve this. The timing of when these low noise periods are to occur would be advised one week in advance, with the information disseminated via the club’s website and notice board. The mechanism for achieving compliance under this scenario, with the permitted standard, relies heavily on the club members knowing the firearm being used is or is not on the list. Furthermore, if this is ignored by the club member then noncompliance may occur and result in a complaint from neighbour(s) that requires investigation by Club and Council.
- [67] Section 2.5 of the NMP requires periodic noise measurement and assessment of a range of ammunition sizes to gather data. This should be mandatory after noise mitigation is installed to demonstrate the mitigation achieved is adequate to control noise from firearm use. The success of the NMP as a mitigation tool also relies on a system called “Hello Club”. This system requires a member to log how many shots

¹⁶ NPPC_DRAFT_NMP_05_12_2025: New Plymouth Pistol Club – DRAFT NOISE MANAGEMENT PLAN

are fired and type of ammunition over a 3-week period, and a system which alerts Club is the number of shots is greater than 2500. It is not clear what relevance the 2500 shots per day have in terms of controlling the noise effect.

[68] The success of the NMP as a mitigation tool also relies on a system called "Hello Club". This system requires a member to log how many shots are fired and type of ammunition over a 3-week period, and a system which alerts Club is the number of shots is greater than 2500. It is not clear what relevance the 2500 shots per day have in terms of controlling the noise effect.

[69] I also note the proposed installation of a Sensica XPT801 (or similar) noise meter (section 2.5 of NMP) which allows for cloud storage of data for analysis. I note this equipment also allows for real-time viewing of results and I would suggest this is preferable in the first instance to a retrospective analysis after shooting has finished.

[70] Interestingly the NMP section 2.5 references a trigger for checking compliance being "Apon receiving an alert triggered by the threshold number of members attending the club" ... "to determine if in fact there was any risk of the CNR 90 level being approached on that day".

[71] The control of noise must **proactively** occur in my opinion so that certainty of outcome occurs and compliance is achieved at all times. The proposed **retrospective** calculation of whether compliance was achieved does not provide confidence that noise from the activity can and will be controlled to an appropriate level.

[72] The NMP requires an appointed Club Noise Monitoring Officer to determine if noise criteria of CNR 90 was being approached by undertaking analysis, and where it is exceeded, advise club members not to use the range for the remainder of the day. It appears this would be done retrospectively (rather than in real-time) and therefore the proposed control of telling members not to visit the club may not occur in a timely manner and therefore be ineffectual. I do not consider this is a viable form of noise control and mitigation.

- [73] The Police and AOS usage is mentioned briefly in the NMP but has no specific control applied other than the default requirement to comply with the NMP. As I have discussed previously, the mechanism for ensuring compliance can and will be achieved is unclear. It is not known whether the Police and AOS will be permitted to use the Hello Club system on their work cell phone or whether they would change their scheduled use of the site if advice from Hello Club that they had, or may, exceed the self-imposed limits was received. This is an area that AES and BTW may wish to address.
- [74] Furthermore, given the activities of Police and AOS, particularly the use of 9mm Glock were demonstrably a significant source of firearm noise, I would have expected a fit for purpose section within the NMP, including for example that: “all Bushmaster rifles [and perhaps other models] shall be fired with a suppressor attached”. This comment is based on the knowledge that this form of mitigation did in fact reduce Bushmaster rifle noise emission.
- [75] In relation to draft condition 12, I agree that for a limited number of days per year a relaxation of the noise limits may be appropriate i.e. national championships, and it would appear this is to be offset by a period of no shooting for three days prior to the event. Again, this appears to take the form of a condition in a noise management format.
- [76] In summary, I consider the draft NMP is currently deficient because it does not provide the clarity required for users of the NMP to undertake their activity and ensure noise from that is controlled to an appropriate level.

Proposed conditions of consent by BTW

- [77] For the reasons given previously, there appears to be a disconnect between the proposed conditions of consent and the noise management plan that ensures noise is controlled to an appropriate level.
- [78] The proposed conditions of consent require a noise limit of CNR 90 to be complied with at all times, save for two exceptions. The first

exception is for two x three-day Club events which I understand may take the form of National Championships. I agree with this in concept but would suggest the hours of operation be constrained during those events and that a prohibition of use of the facilities occurs for a three-day period immediately prior to and after conclusion of the events.

[79] The second exception is during emergency management under the Policing Act 2008 which I consider appropriate.

[80] I disagree with the proposed definition of CNR in the conditions for three reasons. Firstly, the “Y” value should be the “log average L_{ZPeak} of all discharges” and not limited to the “25 loudest gunshots”.

[81] Secondly “T” is the proportion of days per week that firearms are discharged¹⁷. Because the application site is available for use seven days per week, the term $10\log_{10}(T) = 0$ in this case.

[82] Thirdly, referring to “T” as the proportion of time between 7am and 10pm whereas the application is for use between 9am to 9pm every day of the week.

[83] Because the level of noise emitted is critical, I recommend the activity should not be permitted to occur until:

- the definition of terms in calculating CNR are corrected; and
- a method of anticipating the CNR prior to use of the site on a daily basis to ensure compliance; and
- the noise mitigation measures be installed and tested prior to the application site being used; and
- the permanent noise meter is installed; and
- data from noise meter is made available to Council at all times including in real time displaying parameters including L_{AFmax} and L_{ZPeak} ; and

¹⁷ Evidence of Nevil Hegley, Waitemata Gun Club, Proposed AUP Topic 080.

- demonstration of how the use of the application site can comply with the conditions of consent (i.e. noise limit of CNR 90); and
- report by a suitably qualified and experienced acoustic consultant that noise can and will be controlled at all times to not exceed CNR 90 and confirmation of methods to ensure that occurs i.e. this may include update of NMP.

Recommendations

- [84] In my opinion the AEE must reflect the proposed conditions and noise management plan, and these documents must be fit for purpose, in order to reach a conclusion regarding the actual or potential noise effects.
- [85] Clarification of the proposed noise limit and rationale for it must be demonstrable against best industry practice and as it relates to the application site and surroundings.
- [86] The unique character of firearm noise, the number of rounds discharged and the hours/days this may occur has to be considered and quantified. A forward looking and proactive system should be developed to ensure compliance with the noise limit can and will be achieved on a daily basis.
- [87] The use of retrospective compliance determination should be avoided as the principle control mechanism and replaced with a proactive system.
- [88] The noise management plan is pivotal to demonstrate how noise from the activity can and will be controlled to an appropriate level. In its current form I do not consider the noise management plan will ensure the certainty of outcome required and should therefore be revised.

Conclusions

- [89] Because of the unique character of the noise source, the acoustic criteria and noise limit must be suitable to ensure noise is controlled to an appropriate level.
- [90] The noise criteria proposed to control noise to an appropriate level is inconsistent. The use of both the CNR and L_{AFmax} . This creates ambiguity as to the potential level of noise effects and if these effects can be adequately mitigated.
- [91] The application and proposed conditions appear to reference two different acoustic criteria. Furthermore, the noise management plan in its current form fails in my opinion to demonstrate how noise will be controlled to an appropriate level with any certainty of outcome.
- [92] Because of current noise levels, and limited controls on site usage, I am not surprised Mr Philips has an adverse response to firearm noise. As noted previously I do not agree that a noise level of 65dB L_{AFmax} is appropriate(my paras 20, 60(i)(ii)), but rather my general comment that 55dB L_{AFmax} would be more appropriate if that criteria had been proposed as a condition/adopted in NMP.
- [93] The loudness of firearm noise varies considerably depending on the ammunition, style of firearm and whether any mitigation affects occur.
- [94] It is not possible to comment with certainty on the likely effects on the FUZ land except the proposed noise limit of 70dB L_{AFmax} is not appropriate. Should consent be granted with appropriate noise limits established then I assume that risk can be minimised.

Dated: 21 April 2026



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Damian Ellerton

Appendix A: Memoes Mm001-008

MEMO

| | | | | | |
|-------------------|--------------------------|-------------------------|------------------|---------------------|----|
| Project: | Shooting Noise | Document No.: | Mm 001 | | |
| To: | NPDC | Date: | 22 February 2022 | | |
| Attention: | Ross Lilley | Cross Reference: | - | | |
| Email: | Ross.Lilley@npdc.govt.nz | Project No.: | 20220112 | | |
| From: | Damian Ellerton | No. Pages: | 1 | Attachments: | No |
| Subject: | New Plymouth Pistol Club | | | | |

Marshall Day Acoustics (MDA) has been commissioned to assist New Plymouth District Council (Council) determine the noise from the New Plymouth Pistol Club (NPPC).

Council has received a complaint from owner of 1226 SH3, New Plymouth. The NPPC has 8 or 9 shooting ranges that are 100-200m from the notional boundary of the house at 1226 SH3.

Preliminary noise measurements were undertaken on Sunday 20 February between 09:10 and 10:15 hours. During that time NPPC had previously advised .22, speed and black powder guns would be in use.

NOISE CRITERIA

The New Plymouth District Plan does not contain any specific noise rules that relate to shooting ranges. Furthermore the NPPC does not have a resource consent that we are aware of.

The absence of specific noise rules in the District Plan is not uncommon throughout New Zealand. The typical noise limits - L_{eq} , L_{10} and L_{max} do not adequately represent the sound of shooting because of the short impulse time and the intermittent nature of the activity.

There are several versions of noise rule(s) or criteria available through literature search and these occur on a case by case basis. One criteria that has been used with respect to the Waitemata Gun Club (WGC) is CNR – Composite Noise Rating includes consideration of the L_{peak} noise level, number of shots fired and has a simple community adaption correction factor to address degree of sensitivity.

The acoustic experts involved with WGC considered a CNR=90 to define what is reasonable. The expert working for the gun club suggested CNR=95. For the purposes of this exercise we suggest referencing CNR=90-95 in the absence of better noise criteria.

PRELIMINARY FINDINGS

During the noise measurements on 20 February we obtained L_{peak} values for ~800 shots. For the purpose of the calculation we assumed 5,000 rounds per day and have calculated CNR using two community adaptation values, highest and lowest.

Based on this data, and using the CNR calculation, we conclude the noise from NPPC for Sunday was CNR=100-111. This level of noise clearly exceed the CNR=90-95 basis for determining what a reasonable level of noise is.

From experience we know other guns generate a higher level of noise than those measured on Sunday. Glock 9mm and Bushmaster M4 as used by the NZ Police for instance as well as myriad of private gun owners equipment.

In our opinion the noise levels measured on Sunday 20 February are at the lower end of the range of noise levels and is unlikely to represent the worst case noise from the NPPC shooting range. Based on third party data we would expect the CNR to be 110+ depending on type of gun fired and ammunition used.

SUMMARY

The NPPC noise emission is very unlikely to be able to achieve the CNR=90-95 assumed threshold for reasonableness. We recommend additional noise testing I undertaken with other guns present – and ideally including NZ Police usage as well as private guns.

MEMO

| | | | | | |
|-------------------|--------------------------|-------------------------|---------------|---------------------|----|
| Project: | Shooting Noise | Document No.: | Mm 002 | | |
| To: | NPDC | Date: | 10 March 2022 | | |
| Attention: | Ross Lilley | Cross Reference: | Mm001 | | |
| Email: | Ross.Lilley@npdc.govt.nz | Project No.: | 20220112 | | |
| From: | Damian Ellerton | No. Pages: | 1 | Attachments: | No |
| Subject: | New Plymouth Pistol Club | | | | |

Marshall Day Acoustics (MDA) has been commissioned to assist New Plymouth District Council (Council) determine the noise from the New Plymouth Pistol Club (NPPC).

Council has received a complaint from owner of 1226 SH3, New Plymouth. The NPPC has 8 or 9 shooting ranges that are 100-200m from the notional boundary of the house at 1226 SH3.

Noise measurements were undertaken on Thursday 10 March between 19:00 and 20:00 hours. Thursday night is typically Club night but it seemed that only 3 or 4 shooters were present during our measurement period. We were not able to determine what firearms were in use during our measurement.

NOISE CRITERIA

The New Plymouth District Plan does not contain any specific noise rules that relate to shooting ranges. Furthermore the NPPC does not have a resource consent that we are aware of.

The absence of specific noise rules in the District Plan is not uncommon throughout New Zealand. The typical noise limits - L_{eq} , L_{10} and L_{max} do not adequately represent the sound of shooting because of the short impulse time and the intermittent nature of the activity.

There are several versions of noise rule(s) or criteria available through literature search and these occur on a case by case basis. One criteria that has been used with respect to the Waitemata Gun Club (WGC) is CNR – Composite Noise Rating includes consideration of the L_{peak} noise level, number of shots fired and has a simple community adaption correction factor to address degree of sensitivity.

The acoustic experts involved with WGC considered a CNR=90 to define what is reasonable. The expert working for the gun club suggested CNR=95. For the purposes of this exercise we suggest referencing CNR=90-95 in the absence of better noise criteria.

PRELIMINARY FINDINGS

During the noise measurements on 10 March we obtained L_{peak} values for ~500-600 shots. For the purpose of the calculation we assumed 600 rounds per day and have calculated CNR using two community adaptation values, highest and lowest.

Based on this data, and using the CNR calculation, we conclude the noise from NPPC for Thursday was CNR=86-97. This level of noise straddles the CNR=90-95 basis for determining what a reasonable level of noise is.

It is important to note the reasonableness test of CNR=90-95 was more or less achieved in a one hour period and around 600 rounds. If 5000 rounds of the same firearms were fired the CNR=95-106 and that would exceed the defined criteria.

SUMMARY

The NPPC noise emission is very unlikely to be able to achieve the CNR=90-95 assumed threshold for reasonableness unless the number of rounds fired per day is significantly limited and/or the type of firearms as well as ammunition used (subsonic/supersonic). We recommend additional noise testing is undertaken with other firearms present, and ammunition type known – and ideally including NZ Police usage as well as private firearms.

MEMO

| | | | | | |
|-------------------|--------------------------|-------------------------|-------------|---------------------|----|
| Project: | Shooting Noise | Document No.: | Mm 003.1 | | |
| To: | NPDC | Date: | 7 June 2022 | | |
| Attention: | Ross Lilley | Cross Reference: | - | | |
| Email: | Ross.Lilley@npdc.govt.nz | Project No.: | 20220112 | | |
| From: | Damian Ellerton | No. Pages: | 4 | Attachments: | No |
| Subject: | New Plymouth Pistol Club | | | | |

INTRODUCTION

Marshall Day Acoustics (MDA) has been commissioned to assist New Plymouth District Council (Council) determine the noise from the New Plymouth Pistol Club (NPPC).

Council has received a complaint from owner of 1226 SH3, New Plymouth. NPPC has 8 shooting ranges that are 100-200m from the notional boundary of the house(s) at 1226 SH3.

Noise measurements have been undertaken on five separate occasions, and Table 1 summarises the results of these noise surveys.

On all but the 28 May survey, we knew which firearms were being used. On the 28 May an IPSC competition was underway - we were not able to determine from the Club what different firearms were being used during our noise survey.

The default noise monitoring position has been relative to the tenants house at 1226 SH3, however on 28 May we also undertook noise measurements near the site boundary – approximately 35m from NPPC bund, and also within the notional boundary of the main house.

We have listed below some key points to consider when reading Table 1.

- Separate analysis has been provided for activity noise in terms of L_{peak} , L_{max} , L_{10} and L_{eq} , (NPPC noise) and ambient noise, L_{10} and L_{eq} , (non NPPC noise).
- The data in Table 1 has been used for comparison with different noise limits and criteria as follows:
 - Resource and/ or land use consents that apply to the site.
 - Operative District Plan uses notional boundary noise limits.
 - Proposed District Plan has site boundary and notional boundary noise limits (not legally binding at the time of writing).
 - CNR criteria has been used in a number of Environment Court decisions using notional boundary assessment position.

Table 1: Summary of noise measurement analysis – all at gate position unless stated otherwise

| Date | Meas period, hours | Rounds | Ambient L_{A10}/L_{Aeq} (1hour) no NPPC | NPPC L_{A10} (1hour) | NPPC L_{Aeq} (1 hour) | L_{AFmax} , average | L_{peak} , Log Ave (used for CNR) | CNR | Comments/Firearms |
|------------------|--------------------|------------|---|------------------------|-------------------------|-----------------------|-------------------------------------|---------|------------------------------|
| 20/2/2022 | | | | | | | | | |
| Tenant | 1 | 874 | 58/56 | 68 | 65 | 70+/-5 | 93 | 89-100 | .22 and rapid, couple of |
| | - | 5000 | | | | | | 97-108 | - |
| 10/3/22 | | | | | | | | | |
| Tenant | 1 | 824 | 58/56 | 66 | 63 | 71+/-4 | 92 | 87-98 | .22 |
| | - | 5000 | | | | | | 95-106 | - |
| 31/3/22 | | | | | | | | | |
| Tenant | 0.3 | 191 | 58/56 | 66 | 63 | 63+/-3 | 81 | 71-82 | Club night .22 only on |
| | - | 5000 | | | | | | 86-97 | |
| 11/4/22 | | | | | | | | | |
| Tenant | 0.5 | .223/65 | 57/58 | 57 | 61 | 59 +/- 2 | 78 | 64-75 | Police training Range 6 only |
| | - | .223/5000 | | | | | | 83-94 | |
| Tenant | 0.3 | 9mmG/47 | | 66 | 71 | 70 +/- 2 | 89 | 73-84 | Police training Range 6 only |
| | - | 9mmG/5000 | | | | | | 94-105 | |
| 28/5/22 | | | | | | | | | |
| Tenant | 1 | IPSC, 800 | 59/58 | 70 | 66 | 69+/- 5 | 89 | 86-97 | IPSC various firearms |
| | - | IPSC, 5000 | | | | | | 94-105 | |
| Near site | 0.5 | IPSC, 749 | 68/67 | 80 | 75 | 72 +/- 8 | 100 | 96-107 | IPSC various firearms |
| | - | IPSC, 5000 | | | | | | 105-116 | |
| Main house | 0.5 | IPSC - 635 | 60/57 | 65 | 62 | 61 +/- 3 | 80 | 76-87 | IPSC various firearms |
| | - | IPSC, 5000 | | | | | | 85-96 | |

- Notes:**
1. Time averaging and SAC penalty not applied – in simple terms they can cancel each other out: -5dB for time averaging and +5dB for SAC.
 2. L_{max} arithmetic average with 1 std dev.
 3. CNR range includes community adaption range in calculation of 13-24 and calculated on # rounds measured during testing, and also if 5000 rounds were fired in one day.

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Mm 003.1 20220112 DE (New Plymouth Pistol Club) incl Lmax 7 June 2022

AMBIENT NOISE AND NOISE LIMITS

Because of the presence of SH3, the ambient noise level is elevated due to road traffic. The presence of this noise is not going to disappear and therefore we have suggested a “modified noise limit” that *may* be applicable when determining whether compliance with a noise limit is being achieved and/or an adverse noise effect is being created.

EXISTING CONSENTS

We are not aware of any consents that apply to the site with respect to noise either under the RMA or any preceding legal framework.

We understand from legal advice obtained by Council that NPPC has not demonstrated they have existing use rights as defined under the RMA.

OPERATIVE DISTRICT PLAN

The Operative New Plymouth District Plan requires the following:

| | | | |
|------|---|----------------------|---|
| 7.11 | Maximum noise levels, measured at the NOTIONAL BOUNDARY within the RURAL ENVIRONMENT AREA | on any day: 7am-10pm | L ₁₀ 50dBA L _{max} n/a |
| 7.12 | | 10pm-7am | L ₁₀ 45dBA L _{max} 70dBA |

From Table 1 we conclude:

- Ambient noise exceeds the District Plan noise limits of 50dB L_{A10}
- In this environment a more appropriate modified noise limit of 60dB L_{A10} could be applied
- Noise from NPPC when corrected for ambient noise is 66-68 dB L_{A10} during club night and use of .22 firearms as well as IPSC.
- Noise from club night and use of .22 firearms exceeds District Plan noise limit as written by 16-18dBA.
- Noise from club night and use of .22 firearms exceeds proposed modified noise limit by 6-8dBA.

PROPOSED DISTRICT PLAN

The Proposed District Plan noise limits may take the following form with respect to 1226 SH3:

Within the property boundary:

- At all times: 55dB L_{Aeq}

Within the notional boundary:

- 7am – 7pm: 50dB L_{Aeq}
- 7pm – 10pm: 45dB L_{Aeq}
- 10pm – 7am: 45dB L_{Aeq} and 70dB L_{Amax}

From Table 1 we conclude:

- Within site boundary the ambient noise exceeds Proposed District Plan noise limit of 55dB L_{Aeq}
- Within site boundary environment a more appropriate modified limit of 70dB L_{Aeq} could be applied

- Noise from NPPC when corrected for ambient noise is 80dB L_{Aeq} during IPSC, and our calculations indicate it would be similar for .22 use and club night, and approximately 90dB L_{Aeq} when Glock 9mm in use.
- Noise from NPPC may exceed Proposed District Plan boundary noise limit, as written by 25-35dBA.
- Noise from NPPC may exceed the Proposed District Plan boundary noise limit, when modified for ambient noise, by 10-20dBA.

CNR

The use of CNR as a tool for determining noise limits for firearms has been used in several Environment Court cases because that was agreed between parties. A CNR of 90 has been cited in other cases and could be used as a starting position for the purpose of this analysis. The CNR applies within notional boundary of rural properties was used in those cases because the calculation considers:

- The L_{peak} noise generated by firearms – logarithmic average of measured L_{peak} values for firearm discharges
- Number of rounds fired

In Table 1 we have calculated CNR on the basis of the rounds fired during our testing, and also if 5,000 rounds were fired in a single day.

- Community sensitivity expressed as a correction value range of 13-24

Given the complaint received by Council we anticipate the community response factor means the upper predicted CNR in Table 1 should be used.

For the purpose of this analysis we will comment on what the CNR from NPPC was for the testing period. From Table 1 we conclude:

- Use of black powder, .22 and .22 rapid (874 rounds) = CNR 100
- Club night and 20 mins use of .22 (191 rounds) on range 5 only = CNR 82
- Police and 30 mins use of .223 suppressed (65 rounds) on range 6 only = CNR 75
- Police and 30 mins use of Glock 9mm (47 rounds) on range 6 only = CNR 84
- IPSC and 60 mins (800 rounds) = CNR 97

When compared to a CNR 90 limit, it can be seen that the only activities that could comply are:

- Club night using .22 on range 5 – we calculate a limit of 1000 rounds per day would comply
- Police .223 suppressed on range 6 - we calculate a limit of 2000 rounds per day would comply
- Police Glock 9mm on range 6 - we calculate a limit of 175 rounds per day would comply

MEMO

| | | | |
|-------------------|---|-------------------------|--------------------------|
| Project: | Shooting Noise | Document No.: | Mm 004 |
| To: | NPDC | Date: | 16 June 2022 |
| Attention: | Ross Lilley | Cross Reference: | - |
| Email: | Ross.Lilley@npdc.govt.nz | Project No.: | 20220112 |
| From: | Damian Ellerton | No. Pages: | 2 Attachments: No |
| Subject: | New Plymouth Pistol Club – 28 May 2022 Ricochet | | |

MDA have been commissioned by New Plymouth District Council to measure noise from the New Plymouth Pistol Club.

During noise measurements on 28 May 2022 I heard what I believe to be the result of three ricochet events during shooting. I understand IPSC was underway at the time.

The time of the events were 10.50am, 10.53am and 11.09am. I have attached an audio file and the events occur at 2m.52, 5m.46 and 21.13 respectively.

Figure 1 illustrates the location where I experienced these events.

Figure 1: Location of audio recording



MEMO

| | | | |
|-------------------|---------------------|-------------------------|--------------------------|
| Project: | NPPC | Document No.: | Mm 005 |
| To: | AES/NPDC | Date: | 6 December 2023 |
| Attention: | Janathan Prins | Cross Reference: | - |
| Email: | jp@aeservices.co.nz | Project No.: | 20220112 |
| From: | Damian Ellerton | No. Pages: | 3 Attachments: No |
| Subject: | Information Share | | |

MDA have been commissioned by New Plymouth Pistol Club via New Plymouth District Council to provide noise data to their acoustic consultant.

We have copied the emailed questions and answered each one in italics for ease of reference.

- 1 In the memo page 1 and footnote of table 1 it refers to L_{max}, but L_{max} levels do not appear in the results table. Would you be able to provide us with L_{max} values for gunshots for each of the times measured? Or is there a reason that L_{max} data could not be used?

Attached to email is Mm003.1 – same document as Mm003 dated 7 June 2022 but with L_{max} data inserted into table and highlighted.

No text has been added – just the L_{max} data.

- 2 I see you have taken measurements both at “gate position” of the tenant’s house, site boundary, and main house. Would you be able to mark-up on a map the actual location of measurements?

See Figure 1 attached.

- 3 The ambient noise levels appear to be quite high in all locations – especially the ‘near site bdy’. Perhaps the figure of measurement locations mentioned above will help us to understand why ambient levels are so high at the ‘near site bdy’ location – as the closest point on the site boundary to a shooting range appears to be a similar distance from the State Highway as the logical notional boundary measurement points.

SH3 road traffic is clearly audible and reasonably consistent.

- 4 What is the typical range of L_{max} levels associated with ambient noise sources? Based on the rule of thumb that for gunshot L_{AFmax} = L_{peak} minus 30, it seems L_{AFmax} gunshot levels might often be at / below the ambient levels?

I would have to look at this in more detail but the road traffic isn’t a significant source of L_{max} events. Road traffic is free flowing 80km/hr past the site. Happy to discuss.

- 5 Have the ‘NPPC’ L_{A10} and L_{Aeq} levels in table 1 already had residual sound subtracted? Some of them seem very close to the ambient noise levels. Just trying to understand these numbers, and then the various summary statements on page 3.

The NPPC L10 and Leq values stated are just from noise events related to firearms noise only.

- 6 For the measurements on 11/4/22 the L_{Aeq} noise levels are greater than the L_{A10} noise levels (which are lower than the ambient noise levels in one case). Is this a typo?

We can discuss this further – perhaps because there was only 65 .223 rounds in 30 minutes results in an anomaly in calculation - I would need to check. Will discuss at meeting before I incur cost on NPPC delving into this.

- 7 I know there are a lot of variables, but sometimes pistol club L_{Aeq} levels would be 10 to 20 dB lower than L_{AFmax} (for example see table 1 of the attached MDA report). That would suggest L_{Aeq} levels more in the 40 – 50 dB range might be expected here? Again might be something with the ambient / adjustments which we are missing here.

I agree “rule of thumb” can be useful. In this case direct measurement is possible and analysis. Firearm discharge clearly audible.

- 8 If you could also provide us with any raw data that may also help us to understand about gunshot noise levels, frequency, and background noise levels for each event. Is there an easy way for you to do this? How did you keep track of and extract individual gunshots in the data?

We recorded a continuous audio file for post processing – highlighting only firearm discharge.

- 9 With reference to your page 3 - we were not able to find a rule in the Proposed District Plan that requires 55 dB L_{Aeq} at any point within the site boundary. Rule Noise-S1(4) does seem to impose a limit of 55 dB L_{Aeq} at the notional boundary. Have we missed something here?

At the time of this work the New Plymouth District Plan was being reviewed and at that time a two tier noise limit was proposed for rural properties: a notional boundary limit and a site boundary limit. The good news is the Commissioners saw sense and rejected the site boundary noise limit. This commentary is therefore redundant.

- 10 Had you considered the use of other metrics for gunshot noise? While not really wanting to rock the boat too much (and not quite understanding the situation enough yet to come to a final view), we do tend to agree with the summary which has been appended to various recent MDA reports (e.g. Appendix B of Lt 001 20220964) which concludes “while the CNR approach can serve as a proxy for annoyance, overall we do not consider it to be the current best metric for assessing noise from shooting ranges”.

You will see our memo acknowledges an absence of a specific firearm rule, hence we offered up analysis of L_{10} , L_{eq} and CNR. The purpose of this work at the time was to enable further discussion.

Without prejudicing the meeting next week – the resource consent process seems like an appropriate place for the pros and cons of different acoustic parameters to be discussed.

The June 2023 letter by my colleague serves as a useful starting point for consideration of different acoustic parameters and their appropriateness.

Figure 1: Location of noise measurements



MEMO

| | | | | | |
|-------------------|---------------------------|-------------------------|---------------|---------------------|----|
| Project: | NPPC | Document No.: | Mm 006 | | |
| To: | NPDC | Date: | 5 August 2024 | | |
| Attention: | Campbell Robinson | Cross Reference: | - | | |
| Email: | email | Project No.: | 20220112 | | |
| From: | Damian Ellerton | No. Pages: | 4 | Attachments: | No |
| Subject: | AES AEE dated 4 July 2024 | | | | |

MDA have been commissioned by New Plymouth District Council to review the AES document AC23328-01-R4 dated 4 July 2024 and provide peer review feedback.

By way of recap we have:

- Undertaken noise measurements on several different days at the neighbour property
- We have shared raw measurement data with AES
- Undertaken site visit with NPDC staff and AES, hosted by NPPC on a non-shooting day for familiarisation purposes
- Limited our comments with respect to 1222 Devon Rd houses and have not considered the Future Urban Growth areas. However, the same thought process will apply, albeit for Reporting Officer to determine any difference between actual (1222 Devon Rd) and potential Special Purpose – Future Urban Zone (FUZ) effects.

PROPOSED NEW PLYMOUTH DISTRICT PLAN (PLAN)

We note the Plan noise rules quoted in Table 2.1 are correct, but the matters of discretion appear to be incorrect. Whether the noise limits are applicable because of the limitations of the noise assessment standard they relate to – NZS6802:2008 is not addressed directly.

In our opinion, the noise limits per se are not appropriate for determining the acceptability of noise from firearms. AES correctly identify that NZS6802:2008 specifically notes noise from gunfire is outside the scope of the standard.

We understand from Council staff the activity is non-complying and there are no listed matters of discretion that are applicable.

In our opinion it is therefore incumbent on the applicant to demonstrate the actual or potential effects are avoided, remedied or mitigated.

With respect to noise, that includes a bespoke approach given the characteristic nature of the noise source and for the technical reasons identified by AES and Council.

AMBIENT NOISE

SH3 road traffic is clearly audible and forms part of the acoustic environment. We note the AES document relies on the ambient as a form of mitigation that is sufficient to disguise or mask the proposed activity. We disagree and suggest the character of the noise is significantly different.

The AES document does not explain how the L_{AFmax} and L_{Aeq} inter-relate with respect to either potential masking effect or whether the character of the sounds is comparable enough to provide useful masking at the respective levels.

The character of gunfire and road traffic are nothing like each other. It is our experience that the sound of gunfire at 65dB L_{AFmax} , being the noise limit promoted by AES, is clearly audible at the 1222 Devon Rd houses and is not masked or disguised by road traffic noise to such an extent it could be considered acceptable.



CRITERIA FOR GUNSHOT NOISE

This aspect is critical for determining what an acceptable level of noise is from the proposed activity, particularly in the absence of clear nationally applied guidelines. There are examples of resource consent and Environment Court decisions that use all of the acoustic criteria noted below, which does not assist.

We agree NZS6802:2008 and the Plan is deficient for assessment of noise from gunshot noise.

We also agree the L_{peak} and L_{AFmax} criteria have been used elsewhere. We note L_{Aeq} as an acoustic parameter has been used elsewhere, as well as CNR (based on L_{peak} noise levels).

We have reviewed the documents referenced, and note the following from the Chartered Institute of Environmental Health document¹ (CTS) that AES reference, states:

Where justified complaints of noise have been received or are anticipated by the local authority, or where noise levels are measured or predicted to exceed the levels given in Section 6 of this guidance, then restricting shooting to the following times may provide a suitable remedy:

- (i) Mondays to Fridays: 09.00 to 18.00 with a maximum cumulative duration of 4 hours
- (ii) Saturdays: 10.00 to 18.00 with a maximum cumulative duration of 3 hours
- (iii) Sundays: 10.00 to 14.00 with a maximum cumulative duration of 3 hours

On those sites where shooting occurs on more than 28 days within any calendar year it may, in some circumstances, be appropriate to further restrict the times of operation and/or the number of days per week and/or weeks per year that shooting may take place.

And

“For a given exposure level, community annoyance was found to vary significantly between shoots, but no particular shoot characteristics or socio-demographic variables were seen to be associated with the degree of annoyance. There is some suggestion in the data that different sensitivities exist in different communities and that this affects annoyance, but the causes of differing sensitivities are not clear.

At shooting noise levels below the mid 50's dB(A) there is little evidence of significant levels of annoyance at any site, whereas for levels in the mid to high 60's, significant annoyance is engendered in a majority of sites. For levels in between however, the extent of the annoyance varies considerably from site to site. Thus a level of, say, 60 dB(A) may be deemed acceptable at one site, but not at another.”

We note the noise criteria referred to in the CTS uses SNL – the logarithmic average of highest 25 L_{AFmax} shots in a 30-minute period corrected for residual noise level. Statistically using the highest 25 shots appears acceptable and reflects the comparatively low number of shots anticipated for clay bird shooting compared to the New Plymouth Pistol Club.

The CTS anticipates limited hours of operation and concludes in summary, SNL <50= good, 65=significant annoyance at majority of sites, and 50-55= generally OK.

The AES document suggests a criterion of 65dB L_{AFmax} – as defacto SNL- relying on the CTS upper limit. What is less clear is whether the CTS criteria is relevant when 1000+ rounds are fired in a 60 min period.

We have three comments regarding the AES statement (page 6 second to last paragraph) *“we consider that where noise levels during representative high noise periods from the pistol club of 65dB L_{AFmax} are received at the notional boundary of residential dwellings such as those located at 1222 Devon Rd, the noise will be acceptable and effects minimal, as the instantaneous noise would only be 5-10dB higher than the ambient*

¹ Chartered Institute of Environmental Health (2003) Clay Target Shooting Guidance on the Control of Noise

noise. Given the elevated ambient noise environment in this case, that approach is more conservative than what would often occur in a more 'typical' rural environment, with a shooting noise threshold of 55dB L_{AFmax} ".

1. We agree other consents have used 55dB L_{AFmax} as a noise limit. However, it is not clear what role the ambient (L_{Aeq}) noise plays in masking impulsive gunshot noise quantified by L_{AFmax} . In our experience at 1222 Devon Rd, gunfire can be clearly heard regardless of the road traffic noise.
2. What has not been considered is the number of rounds discharged in relation to the potential number of hours of operation.

Furthermore, the existence of a strong adverse reaction by the owner of 1222 Devon Rd must be factored into this situation and cannot be ignored.

3. We have previously suggested the CNR criteria which uses the L_{peak} rather than the L_{max} . The L_{peak} vs L_{max} are describing *similar* characteristics - in lay terms "the loudest instantaneous noise experienced". The CNR approach determines representative L_{peak} value for the type of firearm, the number of rounds fired and includes a community sensitivity component.

Whichever acoustic criteria is chosen, it must be appropriate for the receiver site use **and** the consider the number of rounds discharged per hour/per day **and** the total hours of activity **and** the number of days of operation.

In our opinion the *broad noise limit options* include:

- 55dB L_{AFmax} / Monday to Saturday 9am-8pm, Sunday noon-6pm / no limit on number of rounds
- 60dB L_{AFmax} / Monday to Saturday 9am-8pm, Sunday noon-6pm / limit of 2,500 rounds per day
- 60dB L_{AFmax} / 3 days per year/Monday to Saturday 9am-8pm, Sunday noon-6pm / no limit rounds per day – designed to allow competition event

NOISE MODELLING

We have not reviewed the AES noise model in any detail and take their predictions at face value as presented in their Tables 3.1 and 3.2. It appears the applicant proposes some specific noise mitigation in the form of solid fencing, bund height increase, shipping containers stacked two high and a new 2 storey clubroom.

It appears from Table 3.1 that compliance with the suggested noise criteria of 65dB L_{AFmax} may not be achieved. We do not agree with the suggestion that 1-2dB of the proposed limit will have a minimal effect and is therefore acceptable. As a non-complying activity it is essential that actual or potential noise effects are thoroughly addressed. Proposing a noise limit and then suggesting exceeding this would seem counter to this premise.

The reliance, and mitigating effect of, the ambient (L_{Aeq}) noise environment for masking, is also not explained satisfactorily as previously noted.

While we are not addressing the FUZ specifically, the rationale that a noise limit to future housing should be 70dB L_{AFmax} "to ensure effects are only minor" is not clearly explained.

SUMMARY

We are comfortable the L_{AFmax} acoustic parameter is appropriate for quantifying firearm noise provided the frequency of occurrence and hours/days are also considered in determining an appropriate noise limit.

The proposed noise limits to control noise from the New Plymouth Pistol Club is considered too high.

Council has received a number of complaints from 1222 Devon Rd and undertaken a number of measurements. During the measurement and analysis of noise from the New Plymouth Pistol Club it was noted the discharge of firearms was clearly audible even at the noise limit level suggested by AES as being appropriate.

The proposed limits do not appear to include any consideration of the number of rounds discharged nor the potentially extensive hours that are applied for.

Assuming the noise modelling is correct for the proposed mitigation, we do not agree with the approach the 1-2dB over the proposed noise limit is acceptable.

In our opinion, and for the reasons given above, we consider the proposed noise limit to be too high and will not appropriately control noise to an appropriate level.

MEMO

| | | | | | |
|-------------------|-------------------------------|-------------------------|------------------|---------------------|----|
| Project: | NPPC | Document No.: | Mm 007 | | |
| To: | NPDC | Date: | 11 December 2024 | | |
| Attention: | Campbell Robinson | Cross Reference: | Mm 006 | | |
| Email: | email | Project No.: | 20220112 | | |
| From: | Damian Ellerton | No. Pages: | 4 | Attachments: | No |
| Subject: | AES AEE dated 6 December 2024 | | | | |

MDA have been commissioned by New Plymouth District Council to review the AES document AC23328-02-R3 dated 6 December 2024 and provide peer review feedback.

Much of our commentary from our memo Mm 006 (5 August 2024) remains relevant and we have retained that where appropriate. Changes made have been highlighted grey for ease of comparison.

By way of recap we have previously:

- Undertaken noise measurements on several different days at the neighbour property
- We have shared raw measurement data with AES
- Undertaken site visit with NPDC staff and AES, hosted by NPPC on a non-shooting day for familiarisation purposes
- Limited our comments with respect to 1222 Devon Rd houses and have not considered the Future Urban Growth areas. However, the same thought process will apply to these, albeit for the Reporting Officer to determine any difference between actual (1222 Devon Rd) and potential Special Purpose – Future Urban Zone (FUZ) effects.
- Prepared Mm 006 in response to AES document AC23328-01-R4 dated 4 July 2024.

PROPOSED NEW PLYMOUTH DISTRICT PLAN (PLAN)

We note the Plan noise rules quoted in AES Table 2.1 are correct, but the matters of discretion appear to be incorrect. Whether the noise limits are applicable because of the limitations of the noise assessment standard they relate to – NZS6802:2008 is not addressed directly.

In our opinion, the noise limits per se are not appropriate for determining the acceptability of noise from firearms. AES correctly identify that NZS6802:2008 specifically notes noise from gunfire is outside the scope of the standard.

We understand from Council staff the activity is non-complying and there are no listed matters of discretion that are applicable.

In our opinion it is therefore incumbent on the applicant to demonstrate the actual or potential effects are avoided, remedied or mitigated to an acceptable level.

With respect to noise, that includes a bespoke approach given the characteristic nature of the noise source and for the technical reasons identified by AES and Council.

AMBIENT NOISE

SH3 road traffic is clearly audible and forms part of the acoustic environment. We note the AES document relies on the ambient noise as a form of mitigation that is sufficient to disguise or mask the proposed activity. We disagree because the character of the noise is significantly different.

The AES document does not explain how the L_{AFmax} and L_{Aeq} inter-relate with respect to either potential masking effect or whether the character of the sounds is comparable enough to provide useful masking at the respective levels.

The character of gunfire and road traffic are very dissimilar. It is our experience that the sound of gunfire at 65dB L_{AFmax} , being the noise limit promoted by AES, is clearly audible at the 1222 Devon Rd houses and is not masked or disguised by road traffic noise to such an extent it could be considered acceptable.

AES para 2.3 does not appear to address how the ambient/background noise is relevant to the activity sound which has a very different character – either at 1222 Devon Rd or Future Urban Zone. We do not have any details of the noise logging undertaken by AES and it may be necessary to review this in the future.

CRITERIA FOR GUNSHOT NOISE

This aspect is critical for determining what an acceptable level of noise is from the proposed activity, particularly in the absence of clear nationally applied guidelines. There are examples of resource consent and Environment Court decisions that use all of the acoustic criteria noted below, which does not assist.

We agree NZS6802:2008 and the Plan is deficient for assessment of noise from gunshot noise.

We also agree the L_{peak} and L_{AFmax} criteria have been used elsewhere. We note L_{Aeq} as an acoustic parameter has been used elsewhere, as well as CNR (based on L_{peak} noise levels).

We have reviewed the documents referenced, and note the following from the Chartered Institute of Environmental Health document¹ (CTS) that AES reference, states:

Where justified complaints of noise have been received or are anticipated by the local authority, or where noise levels are measured or predicted to exceed the levels given in Section 6 of this guidance, then restricting shooting to the following times may provide a suitable remedy:

- (i) Mondays to Fridays: 09.00 to 18.00 with a maximum cumulative duration of 4 hours
- (ii) Saturdays: 10.00 to 18.00 with a maximum cumulative duration of 3 hours
- (iii) Sundays: 10.00 to 14.00 with a maximum cumulative duration of 3 hours

On those sites where shooting occurs on more than 28 days within any calendar year it may, in some circumstances, be appropriate to further restrict the times of operation and/or the number of days per week and/or weeks per year that shooting may take place.

And

“For a given exposure level, community annoyance was found to vary significantly between shoots, but no particular shoot characteristics or socio-demographic variables were seen to be associated with the degree of annoyance. There is some suggestion in the data that different sensitivities exist in different communities and that this affects annoyance, but the causes of differing sensitivities are not clear.

At shooting noise levels below the mid 50's dB(A) there is little evidence of significant levels of annoyance at any site, whereas for levels in the mid to high 60's, significant annoyance is engendered in a majority of sites. For levels in between however, the extent of the annoyance varies considerably from site to site. Thus a level of, say, 60 dB(A) may be deemed acceptable at one site, but not at another.”

We note the noise criteria referred to in the CTS uses SNL – the logarithmic average of highest 25 L_{AFmax} shots in a 30-minute period corrected for residual noise level. Statistically using the highest 25 shots appears acceptable and reflects the comparatively low number of shots anticipated for clay bird shooting compared to the New Plymouth Pistol Club.

¹ Chartered Institute of Environmental Health (2003) Clay Target Shooting Guidance on the Control of Noise

The CTS anticipates limited hours of operation and concludes in summary, SNL <50= good, 65=significant annoyance at majority of sites, and 50-55= generally OK.

The AES document suggests a criterion of 65dB L_{AFmax} – as defacto SNL- relying on the CTS upper limit. What is less clear is whether the CTS criteria is relevant when 1000+ rounds are fired in a 60 min period.

We have three comments regarding the AES statement (page 6 second to last paragraph) “we consider that where noise levels during representative high noise periods from the pistol club of 65dB L_{AFmax} are received at the notional boundary of residential dwellings such as those located at 1222 Devon Rd, the noise will be acceptable and effects minimal, as the instantaneous noise would only be 5-10dB higher than the ambient noise. Given the elevated ambient noise environment in this case, that approach is more conservative than what would often occur in a more ‘typical’ rural environment, with a shooting noise threshold of 55dB L_{AFmax} ”.

1. We agree other consents have used 55dB L_{AFmax} as a noise limit. However, it is not clear what role the ambient (L_{Aeq}) noise plays in masking impulsive gunshot noise quantified by L_{AFmax} . In our experience at 1222 Devon Rd, gunfire can be clearly heard regardless of the road traffic noise.
2. What has not been considered is the number of rounds discharged in relation to the potential number of hours of operation.

Furthermore, the existence of a strong adverse reaction by the owner of 1222 Devon Rd must be factored into this situation and cannot be ignored.
3. We have previously suggested the CNR criteria which uses the L_{peak} rather than the L_{max} . The L_{peak} vs L_{max} are describing *similar* characteristics - in lay terms “the loudest instantaneous noise experienced”. The CNR approach determines representative L_{peak} value for the type of firearm, the number of rounds fired and includes a community sensitivity component.

Whichever acoustic criteria is chosen, it must be appropriate for the receiver site use **and** the consider the number of rounds discharged per hour/per day **and** the total hours of activity **and** the number of days of operation.

In our opinion the *broad noise limit options* include:

- 55dB L_{AFmax} / Monday to Saturday 9am-8pm, Sunday noon-6pm / no limit on number of rounds
- 60dB L_{AFmax} / Monday to Saturday 9am-8pm, Sunday noon-6pm / limit of 2,500 rounds per day
- 60dB L_{AFmax} / 3 days per year/Monday to Saturday 9am-8pm, Sunday noon-6pm / no limit rounds per day – designed to allow competition event

It is not clear what noise criteria is being proposed. We recommend the suggested noise criteria written in the form of a condition, should consent be granted, be provided. The CNR 90 has been discussed, but we also note reliance on L_{AFmax} in the AES document.

The CTS document is of interest, but we do not consider this to provide any meaningful utility with respect to this application. The averaging of 25 shots is not considered particularly relevant in this case because of the wide range of firearms that may be used at the application site.

We agree a noise management plan is an appropriate tool for addressing noise and allows for changes to be incorporated as required. However, any noise management plan should be practicable, reasonable and enforceable and be written with these principles in mind.

The suggestion that as part of noise management that “seven contiguous 4-hour periods ... each week, within the overall 9am to 9pm hours ... low or no noise ... display these periods on their website calendar, 1 week in advance...” on the face of it seems convoluted and fraught with practical limitations. It also requires third parties to review the applicant website and in effect organise themselves around the calendar. It may be easier to simply suggest instead of 9am to 9pm that these hours are reduced to 6-7 hours per day as shown in Table 7.1 for instance.

The eight annual Club events each being three days long are not guaranteed to comply with the criteria sought (to be confirmed by applicant) and therefore we cannot comment whether this is acceptable. The exemption for two three-day events may be acceptable, depending on the degree of respite offered before or after the event.

We do not agree with the suggestion that Police or AOS firearm training should be exempt from consideration of noise emissions.

The Future Urban Zone and Table 8.1 suggests high L_{AFmax} values from range 6 and 7 usage. Should CNR 90 be used we don't agree that the community adaption factor can be automatically relaxed – it is after all the community response and not solely an engineering assessment.

NOISE MODELLING

We have not reviewed the AES noise model in any detail and have taken their predictions at face value as presented in their Tables 3.1 and 3.2. It appears the applicant proposes some specific noise mitigation in the form of solid fencing, bund height increase, shipping containers stacked two high and a new 2 storey clubroom.

It appears from Table 3.1 that compliance with the suggested noise criteria of 65dB L_{AFmax} may not be achieved. We do not agree with the suggestion that 1-2dB of the proposed limit will have a minimal effect and is therefore acceptable. As a non-complying activity, it is essential that actual or potential noise effects are thoroughly addressed. Proposing a noise limit and then suggesting exceeding this would seem counter to this premise.

The reliance, and mitigating effect of, the ambient (L_{Aeq}) noise environment for masking, is also not explained satisfactorily as previously noted.

While we are not addressing the FUZ specifically, the rationale that a noise limit to future housing should be 70dB L_{AFmax} “to ensure effects are only minor” is not clearly explained.

SUMMARY

We are comfortable the L_{AFmax} acoustic parameter is appropriate for quantifying firearm noise provided the frequency of occurrence and hours/days are also considered in determining an appropriate noise limit.

The proposed noise limits to control noise from the New Plymouth Pistol Club is considered too high.

Council has received a number of complaints from 1222 Devon Rd and undertaken a number of measurements. During the measurement and analysis of noise from the New Plymouth Pistol Club it was noted the discharge of firearms was clearly audible even at the noise limit level suggested by AES as being appropriate.

The proposed limits do not appear to include any consideration of the number of rounds discharged nor the potentially extensive hours that are applied for.

Assuming the noise modelling is correct for the proposed mitigation, we do not agree with the approach the 1-2dB over the proposed noise limit is acceptable.

In our opinion, and for the reasons given above, we consider the proposed noise limit to be too high and will not appropriately control noise to an appropriate level.

MEMO

| | | | | | |
|-------------------|-------------------------------|-------------------------|-----------------|---------------------|----|
| Project: | NPPC | Document No.: | Mm 008.1 | | |
| To: | NPDC | Date: | 30 January 2025 | | |
| Attention: | Campbell Robinson | Cross Reference: | Mm 006 | | |
| Email: | email | Project No.: | 20220112 | | |
| From: | Damian Ellerton | No. Pages: | 5 | Attachments: | No |
| Subject: | AES AEE dated 6 December 2024 | | | | |

This memo is an updated version of Mm008 in response to comments raised by consultant planner in email dated 27 January 2025. New text is shown as **bold** to make it easier to follow from original text.

By way of summary we have distilled our outstanding questions as follows:

- **Where was the ambient noise obtained via noise logger during May 2024?**

Please send a copy of the details regarding the equipment used and the personnel responsible as well as the raw and filtered noise logging data.

- **We consider the character of firearm noise is significantly different to the noise of road traffic noise. We do not agree with the suggestion that the sound of gunfire would “emerge over the ambient noise to a modest degree”.**
- **The use of CNR as a criteria used in determining potential noise levels which we agree with. There is also reference compliance with District Plan noise limits that we consider redundant.**

We recommend the applicant draft a proposed noise condition for Council to review.

In addition to a draft noise condition, a draft noise management plan would be prudent to illustrate how noise may be managed on a day to day basis.

- **We understand the reference to L_{AFmax} has been used in some instances to determine what effect noise mitigation may have in comparison to the noise model. It should be noted if the CNR noise limit is adopted it utilises the L_{peak} acoustic parameter and therefore the potential variation in L_{AFmax} / L_{peak} values for different firearms should be factored into this.**

Should consent be granted, it would be anticipated that a noise monitoring condition be included to determine the actual noise mitigation provided by the proposed barriers and building structures.

- **The exemption of Police/AOS activities has not been previously discussed or agreed to and is not appropriate in our opinion.**

MDA have been commissioned by New Plymouth District Council to review the AES document AC23328-02-R3 dated 6 December 2024 and provide peer review feedback.

Much of our commentary from our memo Mm 006 (5 August 2024) and Mm007 (11 December 2024) remains relevant, and we have retained that where appropriate and provided commentary on degree of public notification.

By way of recap we have previously:

- Undertaken noise measurements on several different days at the neighbour property
- We have shared raw measurement data with AES
- Undertaken site visit with NPDC staff and AES, hosted by NPPC on a non-shooting day for familiarisation purposes
- Limited our comments with respect to 1222 Devon Rd houses and have not considered the Future Urban Growth areas. However, the same thought process will apply to these, albeit for the Reporting Officer to determine any difference between actual (1222 Devon Rd) and potential Special Purpose – Future Urban Zone (FUZ) effects.
- Prepared Mm 006 in response to AES document AC23328-01-R4 dated 4 July 2024.
- Prepared Mm 007 in response to AES document AC23328-01-R4 dated 6 December 2024.

PROPOSED NEW PLYMOUTH DISTRICT PLAN (PLAN)

We note the Plan noise rules quoted in AES Table 2.1 are correct, but the matters of discretion appear to be incorrect. Whether the noise limits are applicable because of the limitations of the noise assessment standard they relate to – NZS6802:2008 is not addressed directly.

In our opinion, the noise limits per se are not appropriate for determining the acceptability of noise from firearms. AES correctly identify that NZS6802:2008 specifically notes noise from gunfire is outside the scope of the standard.

We understand from Council staff the activity is non-complying and there are no listed matters of discretion that are applicable.

In our opinion it is therefore incumbent on the applicant to demonstrate the actual or potential effects are avoided, remedied or mitigated to an acceptable level.

With respect to noise, that includes a bespoke approach given the characteristic nature of the noise source and for the technical reasons identified by AES and Council.

It is not clear how the conclusion (page 14 final paragraph) is reached that “full compliance will be achieved with the District Plan noise limits ...”.

AMBIENT NOISE

SH3 road traffic is clearly audible and forms part of the acoustic environment. We note the AES document relies on the ambient noise as a form of mitigation ***in section 2.4, page 6 last paragraph, but fails to offer any explanation as to what extent. In our opinion*** the character of the noise ***of the activity*** is significantly different ***that even at elevated ambient noise levels gunfire can be clearly heard.***

The character of gunfire and road traffic are very dissimilar. It is our experience that the sound of gunfire at 65dB L_{AFmax} , being the noise limit ***recommended*** by AES (***section 2.4, page 6 last paragraph***), ***is clearly audible at 1222 Devon Rd second house and further afield and we disagree that the sound of gunfire would “emerge over the ambient noise to a modest degree”.***

AES para 2.3 does not appear to address how the ambient/background noise is relevant to the activity sound which has a very different character – either at 1222 Devon Rd or Future Urban Zone. In section 2.4, page 7 first paragraph, we do not have any details of the noise logging undertaken by AES and it may be necessary to review this in the future.

CRITERIA FOR GUNSHOT NOISE

This aspect is critical for determining what an acceptable level of noise is from the proposed activity, particularly in the absence of clear nationally applied guidelines. There are examples of resource consent and Environment Court decisions that use all of the acoustic criteria noted below, which does not assist.

We agree NZS6802:2008 and the Plan is deficient for assessment of noise from gunshot noise.

We also agree the L_{peak} and L_{AFmax} criteria have been used elsewhere. We note L_{Aeq} as an acoustic parameter has been used elsewhere, as well as CNR (based on L_{peak} noise levels).

CTS Document

We have reviewed the documents referenced, and note the following from the Chartered Institute of Environmental Health document¹ (CTS) that AES references. *This document* states:

Where justified complaints of noise have been received or are anticipated by the local authority, or where noise levels are measured or predicted to exceed the levels given in Section 6 of this guidance, then restricting shooting to the following times may provide a suitable remedy:

- (i) Mondays to Fridays: 09.00 to 18.00 with a maximum cumulative duration of 4 hours
- (ii) Saturdays: 10.00 to 18.00 with a maximum cumulative duration of 3 hours
- (iii) Sundays: 10.00 to 14.00 with a maximum cumulative duration of 3 hours

On those sites where shooting occurs on more than 28 days within any calendar year it may, in some circumstances, be appropriate to further restrict the times of operation and/or the number of days per week and/or weeks per year that shooting may take place.

And

"For a given exposure level, community annoyance was found to vary significantly between shoots, but no particular shoot characteristics or socio-demographic variables were seen to be associated with the degree of annoyance. There is some suggestion in the data that different sensitivities exist in different communities and that this affects annoyance, but the causes of differing sensitivities are not clear.

At shooting noise levels below the mid 50's dB(A) there is little evidence of significant levels of annoyance at any site, whereas for levels in the mid to high 60's, significant annoyance is engendered in a majority of sites. For levels in between however, the extent of the annoyance varies considerably from site to site. Thus a level of, say, 60 dB(A) may be deemed acceptable at one site, but not at another."

We note the noise criteria referred to in the CTS uses SNL – the logarithmic average of highest 25 L_{AFmax} shots in a 30-minute period corrected for residual noise level. Statistically using the highest 25 shots appears acceptable and reflects the comparatively low number of shots anticipated for clay bird shooting compared to the New Plymouth Pistol Club.

The CTS document is of interest, but we do not consider this to provide any meaningful utility with respect to this application. The averaging of 25 shots is not considered particularly relevant in this case because of the wide range of firearms that may be used at the application site.

¹ Chartered Institute of Environmental Health (2003) Clay Target Shooting Guidance on the Control of Noise

Proposed criteria

We agree other consents have used 55dB L_{AFmax} as a noise limit. However, it is not clear what role the ambient (L_{Aeq}) noise plays in **mitigating the emergence of** impulsive **firearm discharge** noise quantified by L_{AFmax} . In our experience at 1222 Devon Rd, gunfire can be clearly heard regardless of the road traffic noise.

What has not been considered is the number of rounds discharged in relation to the potential number of hours of operation.

Furthermore, the existence of a strong adverse reaction by the owner of 1222 Devon Rd must be factored into this situation and cannot be ignored, given the history of complaint.

We have previously suggested the CNR criteria which uses the L_{peak} rather than the L_{max} . The L_{peak} vs L_{max} are describing *similar* characteristics - in lay terms “the loudest instantaneous noise experienced”. The CNR approach determines representative L_{peak} value for the type of firearm, the number of rounds fired and includes a community sensitivity component.

Whichever acoustic criteria is chosen, it must be appropriate for the receiver site use **and** the consider the number of rounds discharged per hour/per day **and** the total hours of activity **and** the number of days of operation.

We recommend the applicant prepares for comment the noise criteria proposed and written in the form of a condition, should consent be granted. The CNR 90 has been discussed, but we also note reliance on the assumption in AES document that Future Urban Zone residents will be less sensitive to firearm discharge noise – which affected the calculation of CNR.

We do not agree with the suggestion that Police or AOS firearm training should be exempt. It has not been discussed previously and excluding a potentially significant source of noise is not considered to be avoiding, remedying or mitigating the [noise] effect. Furthermore, it appears from the predicted noise levels that compliance with CNR 90 can be achieved including use of 9mm service firearms – in which case, why do they need to be exempt?

Noise management

We agree a noise management plan is an appropriate tool for addressing noise and allows for changes to be incorporated as required. However, any noise management plan should be practicable, reasonable and enforceable and be written with these principles in mind.

The suggestion that as part of noise management that “seven contiguous 4-hour periods ... each week, within the overall 9am to 9pm hours ... low or no noise ... display these periods on their website calendar, 1 week in advance...” on the face of it seems convoluted and fraught with practical limitations. It also requires third parties to review the applicant website and in effect organise themselves around the calendar. It may be easier to simply suggest instead of 9am to 9pm daily that these hours are reduced to 6-7 hours per day as shown in Table 7.1 of the AES document for instance.

The eight annual Club events each being three days long are not guaranteed to comply with the criteria sought (to be confirmed by applicant) and therefore we cannot comment whether this is acceptable. The exemption for two three-day events **may** be acceptable, depending on the degree of respite offered before or after the event.

With respect to the Future Urban Zone, should CNR 90 be used we do not agree that the community adaption factor can be automatically relaxed – it is after all the community response and not solely an engineering assessment.

The reliance, and mitigating effect of, the ambient (L_{Aeq}) noise environment **in minimising the emergence of firearm discharge noise**, is also not explained satisfactorily as previously noted.

NOISE MODELLING

We have not reviewed the AES noise model in any detail and have taken their predictions at face value as presented in their Table 3.1. It appears the applicant proposes some specific noise mitigation in the form of solid fencing, bund height increase, shipping containers stacked two high and a new 2 storey clubroom.

Should consent be granted it is likely a condition requiring noise monitoring would be imposed. The results of this noise monitoring and calculation of CNR, if that criteria is used, will determine the accuracy of the noise modelling particularly with respect to mitigation of noise from proposed barriers/structures.

PUBLIC NOTIFICATION

We have been asked to provide an indicative radius around the application where the potential noise effects may be reduced to an appropriate extent site.

Should Council decide to limit the public notification process for the application, we recommend this include all properties within a 500m radius of the site.

The distance of 500m was considered to represent a radius where noise from firearm discharge is reduced to a level whereby still audible, but not to an extent Council would consider immediate enforcement action.

SUMMARY

Council has received a number of complaints from 1222 Devon Rd and undertaken a number of measurements. During the measurement and analysis of noise from the New Plymouth Pistol Club it was noted the discharge of firearms was clearly audible, albeit to different degree depending on factors such as the firearm, ammunition type and range in use.

We acknowledge firearm noise criteria varies throughout New Zealand and AES on behalf of the applicant suggest CNR criteria. The CNR calculation includes a Community Adaption Factor and it is suggested that new home owners will be less sensitive to firearm noise due to SH3 road traffic noise. This may be too simplistic an approach given the character difference between road traffic noise and firearm discharge means that masking of the proposed activity [noise] effect will be minimal if at all.

It is not clear from the AES document what form the proposed noise rule would take. We recommend a draft noise rule is provided for comment with the application.

The fundamental considerations for any noise criteria/rule must be appropriate for the receiver site use **and** the consider the number of rounds discharged per hour/per day **and** the total hours of activity **and** the number of days of operation.

The requirement for a noise management plan has been discussed and we agree this would be a fundamental requirement. It is not clear why the L_{AFmax} criteria is discussed with respect to the noise management plan – but as noted previously a draft noise rule may clarify this. There has also been suggested an online diary is available ahead of usage – we are not sure how effective this would be in mitigating any potential noise effects.

A noise management plan has not been provided for us to review and we recommend one is drafted for comment with the application.

It has been suggested that Police/AOS training noise be exempted and we disagree with this suggestion.

There may be some limited exemption afforded to a small number of 2-3 day events such as hosting national events, but this may only be tempered by a respite period either prior or post event. Submitter feedback on such a proposal will help inform what form any exemption may take.

Should the application be subject to limited public notification we recommend properties within a radius of 500m around the application site be included.

Appendix B: Glossary of terms

GLOSSARY OF ACOUSTIC TERMS

- A-weighting** The process by which measured noise levels are corrected to account for the non-linear frequency response of the human ear.
- Z-weighting** Represents zero or flat linear response to the noise measured.
- Ambient** The ambient noise level is the noise level measured in the absence of intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
- dB, decibel** The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of $P_r=20 \text{ x Pa}$ i.e. $\text{dB} = 20 \times \log(P/P_r)$
- dBA** The unit of sound level which has its frequency characteristics modified by a filter (A- weighted) so as to more closely approximate the frequency bias of the human ear. A-weighting is used in airborne acoustics.
- $L_{Aeq}(t)$** The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.
- The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
- L_{AFmax}** The A-weighted maximum noise level. The highest single noise level occurs during the measurement period. Derived from the short L_{eq} values of 100-125 milliseconds from fast time weighted measurements.

L_{Zpeak} The peak instantaneous pressure level recorded during the measurement period being absolute value of the instantaneous sound pressure. The Peak level should not be confused with L_{max} and is captured by a faster rise time than L_{max}.

L_{A90 (t)} The A-weighted noise level equaled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level.

The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.

Noise A sound that is unwanted by, or distracting to, the receiver.

Notional boundary A line 20m from any side of a residential unit or other building used for a noise sensitive activity, or the legal boundary where this is closer to such a building. This definition is from Part Operative New Plymouth District Plan which in turn references National Planning Standards.

NZS6801:2008 Acoustics – Measurement of environmental sound

NZS6802:2008 Acoustics – Environmental noise

NZS 6803:1999 Acoustics – Construction Noise

APPENDIX C: Referenced documents

BEFORE THE ENVIRONMENT COURT
I MUA I TE KOOTI TAIAO O AOTEAROA

Decision No. [2020] NZEnvC 074

IN THE MATTER of the Resource Management Act 1991
AND of an appeal pursuant to s 120 of the Act

BETWEEN **RICHARD JAMES DAVIS**

(ENV-2018 -WLG-000130)

Appellant

AND **GISBORNE DISTRICT COUNCIL**

Respondent

AND **GISBORNE PISTOL CLUB
INCORPORATED**

Consent Holder

AND **DAVID DUNBAR**

BRUNO HAAG

ROB KARAITIANA

Section 274 Parties



DAVIS v GISBORNE DISTRICT COUNCIL

Court: Environment Judge MJL Dickey
Environment Commissioner D Bunting
Environment Commissioner JA Hodges

Hearing: At Gisborne on 21 and 22 October 2019
Final submissions received and Minute issued 10 December 2019

Appearances: GR Webb for the Consent Holder
M Williams for the Appellant
D Randal and F Wedde for the Gisborne District Council

Date of Decision: 9 June 2020
Date of Issue: 9 June 2020

INTERIM DECISION OF THE ENVIRONMENT COURT

- A. The appeal is allowed.**
- B. The resource consent PD 201041 shall be amended by the substitution of the conditions set out in Appendix 1 (Draft Conditions).**
- C. The Draft Conditions shall apply from 11.59 p.m. on Monday 28 July 2020, subject to (D) below.**
- D. Parties may suggest alternative days and times to those set out for Club activities in Draft Conditions 4, 5 and 7 by way of a joint memorandum no later than 5pm on Monday 14 July 2020, provided there is no increase in total days or hours of operation. The Club is to seek the views of NZ Police and should they wish to comment, their views shall be provided in the joint memorandum.**
- E. Having considered the parties' memorandum, the Court will then issue its final decision.**
- F. Costs are reserved. Any application for costs must be made within 10 working days of receipt of this decision and the party against whom costs are sought**



must respond within a further five working days.

By way of a summary, the conditions require:

- (a) there shall be no shooting on Mondays, Thursdays, Fridays or Sundays, all Public Holidays and the period between, and including, from midnight on 23 December to midnight on 2 January;
- (b) shooting at the Site may only occur on Tuesdays from 0900 to 1700 hours, Saturdays from 0900 to 1600 hours and on every second Wednesday from 0900 to 1700 hours for the period to midnight on 30 June 2022 and on every fourth Wednesday after that date;
- (c) that the Police may undertake shooting up to 2100 hours on a maximum of two of the permitted weekdays in any calendar year;
- (d) a noise limit of 65 dB L_{AFmax} shall apply to all activities at the Site for the period to midnight on 30 June 2022, save for the use by Police of Glock pistols, which may be used for no more than three hours a day on any of the days a year of Police use. Thereafter, a noise limit of 55 dB L_{AFmax} shall apply to all activities at the Site.



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REASONS

A. Introduction

[1] This Appeal relates to a review of the conditions of the 2001 land use consent PD 201041 (**the 2001 Consent**), which authorises the operation of the Gisborne Pistol Club Incorporated (**the Club**) at 150 Gaddums Hill Road, Kaiti (**the Site**). The review is in accordance with the provisions of s 128 of the Resource Management Act 1991 (**Act**) to deal with adverse effects on adjacent residents (**Review**). The relief sought by the Appellant is to set aside the decision made on the Review (**Review Decision**) or that appropriate conditions are set that “both constrain noise generated from the Club to a reasonable level as experienced by adjacent and surrounding residential land owners and occupiers, and better constrain the hours of operation within which such noise can be generated”.¹

[2] The Review Decision substituted a revised set of conditions that, among others, limited the days and hours of operation, and made specific provision for training times for the NZ Police. The Club was also required to provide a report to the Council detailing the best practicable option for sound insulation and for reducing the noise created from the metal targets.² No noise limits were imposed

[3] As Mr Randal, counsel for the Gisborne District Council (**the Council**) submitted:³ “This is a difficult case, and there are no easy answers”. The issues are complex legally, technically, environmentally, socially and practically, and the way they are resolved will have major implications for the Club, the owners and occupiers of land in the locality of the Site and the New Zealand Police (**the Police**), who use Club facilities for training purposes. For these reasons, it has been necessary to consider the many aspects of the case in some detail, and our decision reflects that.

[4] The Appellant at the commencement of the hearing sought to amend the Review Decision conditions to require that the Club's activities not exceed a limit of 50-55 DB_{LAF max}, and to delete the conditions providing for competitions. That position was somewhat modified at the conclusion of the hearing. We summarise the changes towards the end of our decision.



¹ Notice of Appeal dated 6 December 2016, paragraph 11.

² Decision report dated 30 October 2018, and Erratum to the Decision dated 1 November 2018, Common Bundle (CB) pages 865-884.

³ Council's closing submissions at paragraph 3.

[5] The Council's response to the appeal was essentially to support the Review Decision, but with the conditions amended so as to provide for the prohibition of competitions, prohibition of firing positions on Range 1 other than the 50 metre position in the covered shed, and transfer of shooting activity to Range 4 where practicable. It opposed the imposition of the noise limits sought by the Appellant.

[6] The Club said that it would accept the conditions in the Review Decision. It noted, however, that they would significantly curtail its activities and that any further restrictions would endanger the viability of the Club. In that regard, counsel for the Club stated that a 50-55 dB_{LAF max} level cannot be met and "will mean there is no regard to whether the activity allowed by the consent will continue to be viable".⁴

[7] We were tasked with determining what effects noise from the Gun Club is having on the environment, and what conditions would most properly address those effects. In doing that, we must comply with the requirements of the Act directed at review of resource consents. We also need to consider what the 2001 Consent authorised, because the parties had differing views on that. And in determining the appropriate conditions, we need to consider the extent to which the Club 'having been there first' should influence those conditions, if at all.

Structure of our decision

[8] We address our fact finding associated with the above matters under the following topic headings before setting out our evaluation and findings and our decision:

- (a) the evidence;
- (b) background to the Appeal;
- (c) the Site and description of the activity;
- (d) site environs and land uses in the general locality of the Site;
- (e) relevant Plan provisions;
- (f) the Review process;
- (g) community concerns relating to noise;



⁴ The Club's opening submissions at paragraph 12.5.

- (h) expert opinions on noise issues and effects; and
- (i) what activities are authorised by the 2001 Consent.

[9] To assist in understanding the location of dwellings in the immediate vicinity of the Site, we include the following copy of an aerial photograph of the wider locality.⁵

Figure 2 – Aerial photograph of the wider area



⁵ Dr Chiles Supplementary evidence: Figure 2– Aerial photograph of the wider locality.

B. The evidence

[10] We received expert evidence on noise from Dr SG Chiles, who was engaged by the Council, and Mr JR Styles, who was engaged by the Appellant. We received expert planning evidence from Mr H van Kregten, who was engaged by the Club, and Mr RF Proffit, who was engaged by the Council.

[11] In addition, we received evidence in support of the Club from:

- (a) Ms NR Hawes, President of the Club;
- (b) Inspector AC Sloan of the New Zealand Police;
- (c) Mr D Dunbar, a director of 9 Gaddums Hill Road (also on behalf of Ms J Baynes).

[12] For the Appellant and s 274 Parties we received evidence from:

- (a) Mr RJ Davis, a resident living at 157 Gaddums Hill Road;
- (b) Ms KJ Morris, a resident living at 160 Gaddums Hill Road;
- (c) Mr B Haag, a resident living at 180 Gaddums Hill Road;
- (d) Mr TA O'Neill, a resident living at 171 Gaddums Hill Road; and
- (e) Mr NM Jacobs, a resident living at 173 Gaddums Hill Road.

[13] We reviewed the evidence in detail, together with the supporting information attached to it. For the avoidance of doubt, we included consideration of the evidence given by Mr NI Hegley to the Council hearing, to the extent relevant.⁶

[14] We record that the Council's case relied in places on the s 42A Report for the Council hearing relating to the Review, which is attached to the evidence of the Council's planner, Mr RF Proffit. We found that document contained information directly relevant to the outcome of the case. We have taken that information into account.



⁶ RJ Davis Statement of Evidence (SOE), Appendix B, CB page 923.

C. Background to the Appeal

[15] The Club commenced activities at the Site between 1987 and 1990. Following an application for retrospective consent for its operations (**2001 consent application**) the Club was granted a retrospective consent on 27 July 2001 (**the 2001 Consent**) to operate a pistol range at the Site.

[16] At the time the 2001 Consent was granted, the land surrounding the Site was zoned Rural Residential, meaning that residential development and subdivision were contemplated under the applicable district plan. However, the first application for subdivision consent was not made until September 2006.⁷ From around 2010 onwards, private residences were established on land immediately adjacent to and/or in the vicinity of the Site.⁸

[17] Subsequently, the Council started to receive complaints from residents regarding noise from the Site. This led to the Council inviting and receiving on 11 July 2012 a letter from the Kauri Park Residents Association requesting that the Council review the conditions of the 2001 Consent.⁹

[18] The Council notified the Club of its intention to review the Consent in February 2014.¹⁰ In 2015/16, Club members met with the Council's Chief Executive and other managers to find a new site. The Club looked for and identified an alternative site on the Waerenga-o-Kuri Conservation Area. An application for resource consent, supported by the Council, was granted in 2016. We were advised that two neighbours who had not been notified of the application challenged the decision by way of judicial review. The Club then surrendered its consent in December 2017.¹¹ For the Club, Ms Hawes explained the reason the consent was surrendered was that Club did not have the funding to go through the Court case.¹²

[19] For the period during which an alternative site was being pursued, the Review was put on hold. When the consent for the alternative site was surrendered, the Council re-notified the Review because of the time that had elapsed since the original notification.

⁷ Wainui Park Limited, CB page 178.

⁸ RG Karaitiana SOE at paragraph 2, CB page 991.

⁹ Notification Report dated 14 May 2014 at section 1.4, CB page 517.

¹⁰ Commissioner's Decision at paragraph 4, CB page 866.

¹¹ NR Hawes SOE at paragraph 12, CB page 98.

¹² Transcript page 18, line 33.



An Independent Commissioner was appointed to decide the Review and he issued his decision (**the Commissioner's Decision**) on 30 October 2018. This was some four and a half years after the original notification of the Review, and some eight and a half years after the Council initiated discussions with residents about noise effects.

[20] The Commissioner's Decision was appealed by Mr Davis. It was also appealed by the Club, but that appeal was withdrawn. Mr D Dunbar, Mr B Haag and Mr RG Karaitiana joined the appeal as Section 274 Parties.

D. The site and description of the activity

The Site

[21] The Site is located in a disused quarry with some walls of the former quarry being up to 30 m high. It is accessed from Gaddums Hill Road via a metalled driveway.¹³ In elevation, the Site is below the road and nearby houses and, broadly speaking, the noise generated can travel in a direct line from firing positions to a number of houses. There would appear to be limited, if any, potential to mitigate the noise using noise barriers because of the topography.

The activity

[22] Ms Hawes advised that the Club mainly shoots three disciplines – International Practical Shooting Confederation (**IPSC**), Cowboy Action Shooting (**CAS**), and Speed Steel. Periodically they also shoot other disciplines such as Service Pistol. IPSC is described as “power, speed and accuracy”, with courses usually requiring between 12 and 32 shots and a running course anything from 20 m wide to 50 m long.

[23] Ms Hawes explained that CAS is shooting with pistols, rifles and shotguns, with a typical course of fire of between 20 m wide and roughly 40 m long. Speed Steel involves eight stages with five steel plates at different distances. She stated in written evidence that the IPSC discipline has been shot at the Club since 2004.¹⁴ In response to questions, she said she had been told that three members had been shooting IPSC since 1999.¹⁵



¹³ Section 42A Report at paragraph 39, CB page 546. Mr Webb, counsel for the Club, inferred in cross-examination that the site was also an old landfill, but we were provided with no details of such a landfill, meaning we have no basis for determining its relevance, if any, to our decision.

¹⁴ NR Hawes Evidence in Rebuttal (EIR) at paragraph 9, CB page 1026.

¹⁵ Transcript page 9, line 28.

She said CAS had been shot since the early 2000s.¹⁶ This timing evidence is at best indicative and certainly not definitive, as it was based primarily on hearsay.

[24] Competition shooting is an important part of the Club's activities, and Ms Hawes advised that club members have had considerable success with their Competition shooting. One member is the IPSC North Island, South Island and New Zealand Champion and another is the IPSC New Zealand Ladies Open Champion. Club members also hold numerous National titles and represent New Zealand overseas.¹⁷ Ms Hawes said that if the Club was prevented from shooting certain disciplines, "it would make the Club unviable".¹⁸

[25] Facilities at the Site include a simple wooden club house and four shooting ranges demarcated by earth bunds. Ranges 3 and 4 post-date the 2001 Consent and were built in 2005.¹⁹ The layout of the facilities is shown on the following Image 2, reproduced from page 12 of the s 42A Report. The Site is surrounded by a high deer fence.



*Image 2 – Close up aerial photograph of Club Facilities.
Ranges are numbered as described below*



¹⁶ Transcript page 10, line 26.

¹⁷ NR Hawes SOE at paragraphs 19 and 20, CB page 98.

¹⁸ NR Hawes SOE at paragraph 14, CB page 98.

¹⁹ NR Hawes EIR at paragraph 8, CB page 1026.

[26] Range 1 has targets at 25 and 50 m and shooting can take place from a covered but open front shelter or from the grass in front. Range 2 has targets at 25 and 50 m and a range of other targets and obstacles, which are used for CAS and Police simulation activities. Range 3 is fully enclosed by earth bunds and is 18 to 20 m long, with a number of steel targets, three of which have been backed with rubber to reduce shot noise. Range 4 is 18 m long and is used for CAS and by the Police for “room scenario” simulations. CAS is described in the s 42A Report as having various target set-ups and two single action revolvers, a lever action or pump action rifle in pistol call and a side-by-side shotgun.²⁰

Site Safety

[27] Ms Hawes outlined the safety requirements of Pistol New Zealand and the Commissioner of Police that the Club is required to meet. We received no expert evidence on the subject and as safety is not the subject of an appeal before the Court, it is not a matter we can address as part of the appeal.

[28] However, we note that one of the neighbours, Ms Morris, raised concerns about the adequacy of the deer fence to prevent access to the Site by young children, as she lives next door to the Site and has two young and adventurous children. Having seen a small length of the deer fence on our site visit, we indicated our view at the hearing that it would be prudent for the Club to ensure the fence is effective at preventing unauthorised access to the Site and, in particular, is small child proof. Mr Webb said in his closing submissions that the fence has now been repaired and is secure.

Land tenure

[29] The Club leases the Site from the Council. The lease was renewed on 25 November 2009²¹ for a 10-year term, with two 10-year rights of renewal.

[30] Mr Karaitiana bought his section at 155 Gaddums Hill Road in 2009 and built his house in 2010. We note that the lease extension for the Club's land was granted after the Council granted the subdivision consents referred to above and possibly after Mr Karaitiana purchased his section.



²⁰ Section 42A Report at paragraphs 42 to 45, CB pages 547 to 549.

²¹ CB page 971, Report to Council dated 28 July 2011 recommending rescinding its agreement to the lease extension and re-advertising it.

[31] The existence of the subdivision consents, which were known to both the Council and the Club at the time the lease was renewed, means that both parties knew that residential development was legally authorised in the immediate vicinity of the Site and could occur at any time. This is of relevance to the issue of reverse sensitivity discussed later in our decision.

[32] We note from the Officer's Report of 28 July 2011 (relating to the lease) that the Council passed a resolution to enter into an agreement with the Club to renew the lease and it was intended to restrict the operating hours as a condition of the lease. This resolution was made before the notified date for the closing of public submissions. On the closing date, an adjoining landowner phoned the Council wanting to put in a submission. The Council decided to proceed on the basis that it had not received a written submission and that the landowner "would be involved in negotiations regarding the Club's operating hours." We discuss this further below in the section on days and hours of use of the Site.

The Club's financial position

[33] Mr Webb submitted that "In terms of the Best Practicable Option GPC's position is ... its financial position would prevent it from establishing the necessary infrastructure".²²

[34] Ms Hawes outlined the Club's financial position,²³ noting its overall financial position is a debt of \$23,173.

Club membership

[35] Ms Hawes stated that current Club membership is 36, and prior to the dispute with neighbours over noise the Club had just under 60 members. Mr van Kregten stated that membership has never exceeded 50.²⁴

Days and hours of site use

[36] We were provided with no definitive evidence on how many days and hours the Club facilities were historically used, are currently used or can be used. Having



²² The Club's opening submissions at paragraph 17(b).

²³ NR Hawes SOE at paragraphs 21 to 25, CB page 99.

²⁴ H van Kregten SOE at paragraph 14, CB page 77.

considered the evidence, our understanding is as follows:

- (a) the Club stated by letter dated 15 November 2000, in relation to lease negotiations with the Council (addressed to a legal administrator and not associated with the 2001 consent application), the building is in use by the Club two days a week and is open to other users at any other time by arrangement;
- (b) the 2001 consent application was for "club members shooting on Saturdays and Sundays and occasional week days for members, Police and other groups";²⁵
- (c) Ms Hawes advised that some competition shooters practice every day the Club is open, without saying which days those were. She also indicated that Sunday is a very popular practice day, and in accepting that there will be no shooting on a Sunday, the Club has made a significant concession;²⁶
- (d) the Club is used by the Police on some Tuesdays, Wednesdays and Thursdays, including an indication this could continue until 11pm some nights (see below);
- (e) in a Council report on noise monitoring of the Site in January 2010²⁷ the reporting officer said that: "The actual operation of the club varies from day to day, but generally club activities are permitted during weekdays from 8am to 8pm and on weekends from 7.30am to 9.30pm. Prior to this the club had been unrestricted in its hours of operation;"
- (f) Ms Hawes said that the Club had been operating on at least two weekdays since 2011.²⁸

[37] Ms Hawes stated in her written evidence that "the Club's hours of operation have been significantly reduced and are now of (*sic*) 17 hours per week."²⁹ In response to questions from Mr Williams, Ms Hawes said the Club had been operating 22 hours a week since 2011 but had reduced them to 20 in November 2018.³⁰ This is one of a



²⁵ First page of application, CB pages 157 and following.

²⁶ NR Hawes SOE at paragraphs 19 and 30, CB pages 98 and 99.

²⁷ RJ Davies SOE, Appendix A, CB page 919.

²⁸ Transcript page 6.

²⁹ NR Hawes EIR at paragraph 39, CB page 1026, responding to Nicholas Jacobs.

³⁰ Transcript page 6.

number of examples of unclear evidence we received, and in this case, it is material.

[38] In response to questions from Mr Williams, Dr Chiles said that the hours of operation stated by Ms Hawes were not the Club's hours of operation prior to the Review. He based that statement on information provided by Mr Bengé, the Vice President of the Club, during an earlier tour around the range and a description of the operation of the Club. He said that when he was first asked to look at the Gun Club, they were operating Tuesdays and Thursdays and for longer hours.

[39] As noted in paragraph [32] of our decision, a negotiation on future hours of use was undertaken in relation to renewal of the Club's lease. The Officer's Report referred to earlier sets out the following proposed future hours of operation:

- Hours proposed by the Club - Mondays to Fridays 3pm to 7pm, 9am to 7pm on Saturdays and from 9am to 3pm for Club days on Sundays – that is every day and for a total of 36 hours a week, including some public holidays.
- Prior to competition, the Club sought the extension of hours from 9am to 7pm each weekday, a total of 60 hours a week.
- Hours proposed by land owners were 4pm to 6pm on Tuesdays and Thursdays, 2pm to 4pm on Saturdays and 9am to 3pm on Sundays, a total of 12 hours a week.

[40] We received no evidence on whether or not this matter was resolved. In any event, we note that it is outside the scope of the current hearing. However, it gives weight to the residents' stated frustration at the way the Council has responded to their concerns relating to noise generated by Club activities.

[41] Following the initiation of the Review, the Club offered different days and times of operation in May 2014. These totalled 29 hours a week on Saturdays, Sundays, Tuesdays and Thursdays, and on 12 Wednesdays a year for Police use. Some extension of hours was proposed for Police use and competitions.³¹

[42] We received evidence from some of the neighbours as to the hours of operation. Mr Davis said that the Club generally shoots about 15 hours a week and that has been

³¹ Review notification report dated 14 May 2014, CB pages 510 and 543.



relatively constant since he has been there, which is three years. He also said that, while the evidence from the Club is that they had been shooting 22 hours a week for the past seven or eight years, that 22 hours is not continuous gunfire.³² Mr O'Neill said that the Club generally does not operate more than 17 hours a week.³³

[43] The variability of the above information illustrates part of the difficulty we found in trying to understand the extent of use of the Site. In the absence of anything more definitive, our conclusion on actual shooting hours is that they are currently likely to be somewhere between 15 and 20 hours a week as an average, and that those hours could be at any time within a wider but uncertain envelope of time. The extent of that wider envelope is likely to have been different on different days and may have reduced in recent times, but there is no reliable way of determining how wide it has been at different times in the past, or by how much it has reduced.

[44] Despite the uncertainties, we are satisfied that the Site has operated on at least five days some weeks and at any time from 9am onwards on any of those days and until late in the evening on some days.

Police use of the Site

[45] The 2001 consent application stated that Police use would be on "occasional week days". It is clear that Police use is currently substantially more than provided for in the 2001 Consent based on the information summarised below.

[46] The s 42A Report referred to advice from the Club in 2014 and 2018 that the maximum number of days needed by the Police was 12, and "that typically, there was less use per annum."³⁴

[47] In a letter to the Club dated 6 March 2014,³⁵ the Police advised the Club that they would use the Club on Tuesdays, Wednesdays and Thursdays between 0900 hours and 1600 hours. In addition, the Armed Offenders Squad may use the facilities for a "low light" shoot on a Wednesday and Thursday between 1600 hours and 2030 hours. The letter stated that the Police would use the facilities for a maximum of three days a month,



³² Transcript page 199, line 14.

³³ Mr O'Neill SOE at paragraph 58, CB page 955.

³⁴ Section 42A Report at paragraph 94, CB page 565.

³⁵ Letter to the Club from NZ Police dated 6 March 2014, CB page 719.

or a maximum of 36 days a year. We note this is three times the number of days the Club advised the Council was required for Police use, and substantially more than the "occasional weekdays" applied for in the 2001 consent application.

[48] In his evidence, Inspector Sloan said:

- (a) A minimum of 12 sessions per year is required for Tairāwhiti staff training, and more to allow for some staff who may be unavailable on some of the scheduled days;
- (b) 10 monthly sessions for the Armed Offenders Squad, between 9.30am and 3.30pm, and until 9am³⁶ one or two days a year.
- (c) The condition relating to Police use in the Commissioner's decision provides for 26 days a year on Tuesdays and Wednesdays between 9am and 6pm, with two night sessions also on Tuesdays and Wednesdays to 10pm. Inspector Stone said the conditions allow "... some flexibility, however, with the staffing increases in the near future, we would have liked some reserve days".³⁷

[49] The above information demonstrates that there has been a very large increase in Police use compared to the "occasional weekdays" sought in the 2001 consent application, and the indication is that the Police would like to see that use increasing further.

Use of the Site by other groups

[50] Ms Hawes said that three groups a month use the Club.³⁸

Types of firearms used at the Site

[51] Documentation accompanying the 2001 consent application stated "Firearms to be used" as "Revolvers, Pistols and Police 223 Rifles".

[52] The author of the s 42A Report requested information as to the types and calibres



³⁶ We presume this should be 9pm.

³⁷ AC Sloan SOE at paragraph 23, CB page 103.

³⁸ Transcript page 22, line 31.

of firearms used at the Site. The Club, through Mr Bengé, responded by email dated 5 September 2018.³⁹ He advised that the Gisborne Pistol Club has been approved by Pistol New Zealand and the New Zealand Police to fire all pistol calibres, all rifles that fire a pistol calibre, rifles up to and including .223 and shotguns up to and including 12 gauge. A range of calibres is used, and a list was provided of common calibres used, including different types of pistols, rifles and shotguns. The list included “all pistol calibre rifles” followed by a list of seven rifle calibres in addition and three competition shotgun types. Mr Bengé stated that the list is not definitive and a new rule change or shooting discipline can be made at any time. He said that is why the Club cannot operate with anything less than what is approved by Pistol New Zealand, the Police and the Resource Consent.

[53] Mr van Kregten’s evidence is that “the Club is reluctant to restrict the use of noisier firearm types as these are considered essential in training for competitions that the Club’s members engage in”.⁴⁰

[54] For clarity, we record that while we accept that the use of different firearms may be approved for use at the Site by Pistol New Zealand and the Police, those processes are different from and do not over-ride what is authorised by the 2001 Consent.

Intensity of use of the site

[55] We received conflicting evidence on the intensity of use of the Site. The Notification Report on the Review (**Review Notification Report**) set out very general information on intensity of use and said that, on an average day, between 12 and 15 people will be on the Site at any one time and approximately 10 of these people are serious shooters. An average serious shooter will generally discharge 10 rounds during one visit to the Site. It said that the maximum number of people on site at any one time is during Police training, with up to 15 to 20 people present. The Report said that “during the site visit, approximately 15 shooters were present on the site and each discharged 34 rounds (with multiple officers shooting at once)”.⁴¹

[56] The Club responded to the Review Notification Report, recording that:⁴²

³⁹ CB pages 854 to 856.

⁴⁰ H van Kregten SOE at paragraph 47, CB page 82.

⁴¹ Notification Report on Review (**Review Notification Report**) dated 14 May 2014, CB page 507 at page 515.

⁴² CB page 683.



- (a) serious shooters may fire far more than 10 rounds, with 300 being more likely;
- (b) ten rounds was more likely the number fired by a club member doing target shooting, who may only attend 12 times a year;
- (c) the total number of rounds at present would not exceed 5000 a day;
- (d) the Police would use approximately 1200 rounds over three days. This may increase, particularly if the Police were to carry arms more regularly.

Complaints

[57] There is no practical or reliable way that we can determine how many noise complaints have been made by residents, what responses they received from the Council or whether residents considered they had reached the point where further complaints would not achieve any different outcomes. From the evidence before us, it is our understanding that:

- (a) there were few, if any, complaints prior to subdivision occurring in the vicinity of the Site;
- (b) at least 26 complaints were received about the Club's operations in the four years to May 2014 and complaints were received from a variety of locations around the Site;⁴³
- (c) Mr Karaitiana's evidence is that, as he is the closest resident, most of the complaints are likely to have come from him, which at last count were about 40. However, he thought Mr O'Neill might consider he complained the most.

E. Site environs and land uses in the general locality of the Site

[58] The topography of the area is undulating and affords expansive views across the valley and out to the ocean from various locations along Gaddums Hill Road. Ms Morris' house is at 160 Gaddums Hill Road, approximately 176m from the main range.⁴⁴ Mr Karaitiana's house at 155 Gaddums Hill Road is some 185m from the enclosures of Range 1. There are several houses and vacant building platforms located just over 200m



⁴³ Review Notification Report dated 14 May 2019, CB at pages 521 and 523.

⁴⁴ KJ Morris SOE, paragraph 6, CB page 984.

from Ranges 1 and 2 and there are 21 rural residential sites located in the valley within 600m of the Site. Most of the building sites have a direct line of sight to the Site due to the valley nature of the area.⁴⁵

[59] A paint ball facility is located to the south of the Site.⁴⁶ A lease for the new activity was approved by the Council at the same time as the Club's lease was renewed in 2009.

Past Resource Consents

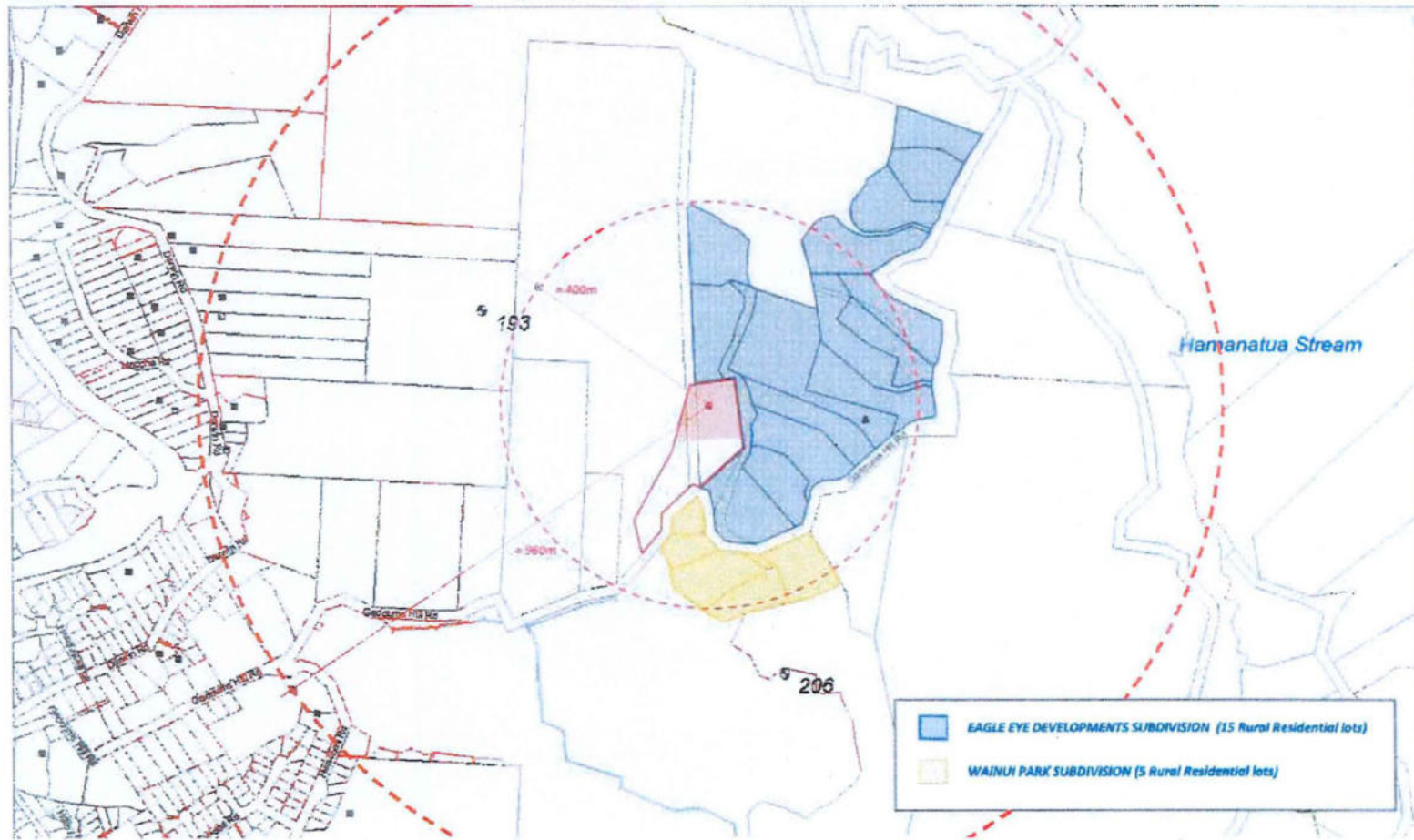
[60] At the time the 2001 Consent was granted, the land in the vicinity of the Site was zoned Rural Residential. It would be reasonable to assume that both the Council and the Club could have anticipated that reverse sensitivity would be an issue at some time in the future. In fact, this was pointed out by the Council's Environmental Health Officer at the time and recorded in the Council's decision on the 2001 consent application.

[61] In the intervening period, the Council has approved three subdivision consents for land immediately adjacent to the Site. The locations are shown on the following plan reproduced from Figure 2 attached to a submission dated 13 June 2014 from a group of Kauri Park Residents in relation to the review of consent conditions.



⁴⁵ Section 42A Report at paragraphs 49 and 50, CB page 550.

⁴⁶ Section 42A at paragraph 47, CB page 549.



This plan has been adapted from Quickmap data and has been produced for resource consent review purposes only.

GISBORNE PISTOL CLUB: GADDUMS HILL ROAD
LOCATION RELATIVE TO RECENT RURAL RESIDENTIAL SUBDIVISIONS

June 2012 | Revision: 1 |
Insight (Gisborne) Limited |

FIGURE
2

[62] In October 2006, Eagle Eye Developments Limited applied for subdivision consent to provide 10 residential lots (Stage 1). The application was processed as a restricted discretionary activity. Matters of discretion did not include noise. A decision to grant consent was made without notification, with the Decision Report signed by Mr van Kregten, who at the time was the Council Manager of Environment and Planning.⁴⁷ By way of a conclusion, the report considered that "... the proposed subdivision will create an appropriate development in this area, which is allocated for rural residential development by the zoning of the District Plan."⁴⁸ Neither the application nor the decision mentioned the Club or reverse sensitivity.

[63] In February 2008, Eagle Eye Developments Limited applied for subdivision consent to provide a further four residential lots as Stage 2 of the Kauri Park Development under the same District Plan rules as Stage 1. All four lots are located immediately alongside, or in close proximity to, the eastern boundary of the Club's Site. The application identified the Club as an affected party. The President of the Club provided a letter of support stating that "The Gisborne gun club supports the consent application by Eagle Eye Developments for a site to the north of the gun club on the ridge".⁴⁹ This was on the proviso that Eagle Eye Developments Limited build a wooden ricochet wall "to the specification of the NZ pistol club and the safety of the proposed site" (*sic*).

[64] We note that the proviso made no mention of the wall being for noise mitigation purposes as claimed by Ms Hawes.⁵⁰ Despite the Club providing a letter of support, the Decision Report made no reference to the Club or the potential for reverse sensitivity effects. The Decision Report granting consent was again signed by Mr van Kregten, as the Council Manager of Environment and Planning.⁵¹ The Report's conclusion was the same as noted above for the Stage 1 development.

[65] In September 2006, Wainui Park Limited applied for discretionary activity subdivision consent for 40 rural residential lots and land use consent to erect a dwelling on each lot.⁵² The Council's Report to the Hearings Committee records (with paragraph numbers in brackets in each case):

⁴⁷ Refer Attachments E and F to RF Proffit's SOE.

⁴⁸ CB at page 252.

⁴⁹ CB at page 478.

⁵⁰ NR Hawes SOE at paragraph 8, CB page 97.

⁵¹ Refer Attachments I and J to RF Proffit's SOE.

⁵² Refer Attachments D, G and H to RF Proffit's SOE.



- (a) the Gisborne Pistol Club occupies land to the north of the site (1.2);
- (b) reverse sensitivity is one of the main resource management issues and that: "... conditions have been recommended to address any significant, potential adverse effects that might arise due to reverse sensitivity ..." (1.17 and 1.19);
- (c) "... the site does not abut any Rural Productive land where it is considered reverse sensitivity issues are more likely to arise" (4.46);
- (d) one dwelling and one self-contained unit are permitted activities on a site not less than one hectare in size (3.4); and
- (e) the application was publicly notified on 2 March 2007 and in addition the Council directly notified 247 potentially affected parties about the proposal (3.4 and 3.5);

[66] It is clear that the reporting officer recognised the presence of the Club and that reverse sensitivity was a main resource management issue. However, he did not address reverse sensitivity in terms of the subdivision being near to the Club. More particularly, there are no conditions which address reverse sensitivity in relation to the Club. The Report does not list those directly notified, and while we do not know if the Club was one of the 247 parties notified as a potentially affected party, the application was publicly notified.

[67] Mr van Kregten was again the Council Manager of Environment and Planning at the time who authorised distribution of the report.

F. Relevant Plan provisions

[68] At the time of the 2001 consent application the site was zoned Recreation Reserve under the Transitional Plan and Neighbourhood Reserve under the then proposed District Plan.⁵³ The surrounding area was zoned Rural Residential. Mr Proffit's evidence⁵⁴ is that under the Operative Tairāwhiti Resource Management Plan (**TRMP**), the Site is zoned Neighbourhood Reserve and the surrounding land is zoned Rural Residential. He said that there had been no changes to the regulatory framework of the District Plan

⁵³ 27 July 2001 Report of the District Planner in relation to the 2001 consent application at section 3.0, CB page 174.

⁵⁴ RF Proffit SOE at paragraphs 55 and 56, CB page 132.



through the adoption of the TRMP.

[69] The relevant objectives and policies were not set out in evidence, but Mr Proffit referred to them as being set out in the s 42A Report. That Report stated that the TRMP is the primary planning instrument for the Review and set out the relevant objectives and policies.

[70] Mr Randal submitted⁵⁵ that Mr Proffit's evidence provided factual background to the appeal, rather than an analysis of the Club's activities against the relevant planning provisions "because these proceedings do not turn on different interpretations of those planning provisions".

[71] Mr Randal did refer to the analysis contained in the s 42A Report, where the author concluded that in the current environment the GPC's club operations would clearly be contrary to various objectives and policies in the TRMP. The s 42A Report set out objectives and policies relevant to the review⁵⁶ and concluded:

Had the applications for resource consents been sought to establish the pistol club in the current environment, operations would clearly be contrary to the above objectives and policies

[72] Mr van Kregten agreed that the noise generated by the Club is above a reasonable level given the District Plan objectives and policies.⁵⁷

[73] Taking into account the planning evidence, including that set out in the s 42A Report, we are satisfied that the current activities are contrary to the following objectives and policies, which we were told have not changed from the date of the 2001 consent application:

Reserve Zones

Objective DD5.3.2

Development and use of reserve land that does not create adverse effects on the reserve or surrounding environment.



⁵⁵ Council's opening submissions at paragraph 50.

⁵⁶ s 42A Report at paragraph 104, CB page 567.

⁵⁷ Transcript page 74, line 11.

Policy DD5.4 1

To enable community well-being by making reserve land available in order to maintain and enhance:

- (a) residential and district amenity...

Region-wide provisions

Objective C11.2.4 1

To enable noise and vibration at levels which do not have an adverse effect on human health.

Objective C11.2.4.2

An acoustic environment within each zone that is compatible with the character of the area.

Policy C11.2.5 1

To ensure that noise emissions are contained at levels or in locations in a manner which provides for the health and safety of individuals and the community.

Policy C11.2.5 2

To maintain noise at limits that reflect the amenity values and character associated with the locality in which the noise is having an effect.

[74] Mr Randal submitted⁵⁸ that the above provisions are not directive “avoid” policies, do not have binding effect and do not require or direct a particular outcome in this case. In our view, the provisions are directed at ensuring protection of the surrounding environment from adverse effects, including from noise; ensuring an acoustic environment which is compatible with amenity values and the character of the area, and ensuring that noise emissions are contained at levels that protect the health and safety of individuals. The provisions are relevant matters to be taken into account in determining this appeal.

[75] For completeness, we record that there is an existing Gaddums Hill Recreation Reserve Management Plan dated 24 November 1983. This does not include reference to the Club and has not been updated since the Club came into being.

The permitted baseline

[76] For the Club, it was argued that the permitted baseline can apply. Mr van Kregten referred to passive and outdoor recreation being a permitted activity in the Neighbourhood Reserve Zone and to the Club being able to meet the permitted activity noise standards on Mondays to Saturdays. Levels are set with reference to average

⁵⁸ Council’s closing submissions at paragraphs 50 and 54.



maximum noise levels (L_{10}) dBA. The L_{max} standard only applies after 10pm.⁵⁹ As part of his evidence on the permitted baseline he cited farming activities and bird scarers as reasons why in rural zones “full serenity cannot be expected in that environment”.⁶⁰

[77] For the Appellant, Mr Williams submitted that any argument that the Club is compliant with the L_{10} noise limit “would be flawed in the extreme”. Mr Randal took a broadly similar view, and noted that the purpose of the Review is to deal with an adverse effect that arises from the exercise of the consent. He submitted that “It would be a perverse outcome if a permitted baseline comparison could be applied to somehow “discount” the adverse effects provided for through the earlier set of conditions”.

[78] The Hearings Commissioner did not consider the permitted baseline approach to the assessment of adverse noise effects provided much assistance to his consideration of the case.

[79] Our view is that the permitted baseline cannot be applied for the reasons stated by Mr Williams and Mr Randal. The reference to bird scarers was of no assistance as they can be activated up to 18 times an hour, compared to possibly 1000 times an hour for Club activities, based on the Club’s estimate of no more than 5000 shots a day, and a typical five-hour day.

G. The Review process

[80] The process for reviewing resource consent conditions is prescribed under the Act. The review process followed by the Council is set out in various documents attached to Mr Proffit’s statement of evidence.⁶¹

[81] Sections 128-133 of the Act govern the review of consent conditions. Section 128(1) sets out the circumstances when consent conditions can be reviewed and provides that:

- (1) A consent authority may, in accordance with section 129, serve notice on a consent holder of its intention to review the conditions of a resource consent -
 - (a) at any time or times specified for that purpose in the consent for any of the following purposes:

⁵⁹ H van Kregten SOE at paragraph 69, CB page 84.

⁶⁰ H van Kregten SOE at paragraph 73, CB page 85.

⁶¹ RF Proffit SOE, Attachments K to N, CB starting at page 501.



- (i) to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage;
or
...
- (ii) for any other purpose specified in the consent.
...

[82] In this case, s 128(1)(a) is relevant.⁶²

[83] Sections 129 and 130 are machinery provisions relating to initiation of a review, public notification, submissions and hearing of the review. For the purpose of notification, the review is to be treated as if it were an application for a discretionary activity resource consent.⁶³

[84] Section 131 sets out the matters to be considered in a review. For convenience, we record that when reviewing the conditions, we:

- (a) *shall* have regard to the matters in s 104; and
- (b) *shall* have regard to whether the activity allowed by the consent will continue to be viable after the change; and
- (c) *may* have regard to the manner in which the consent has been used.

[85] Section 132 sets out the requirements for decisions on review. Relevantly s 132(1) provides that a consent authority may change the conditions of a consent, other than any condition as to the duration of the consent only if one or more of the circumstances in s 128 applies.

Foundation for the Review

[86] Condition 3 of the 2001 Consent provides that:

The Consent Authority may, subject to Section 128 of the Resource Management Act 1991, serve notice in writing on the consent holder of its intention to review the conditions of this

⁶² We record that the Notice of Review also relied on s128(1)(c) - material inaccuracies in the application but the Council later formed the view that the application did not contain such inaccuracies; that view was accepted by the Commissioner in the Decision. This matter was not advanced by the Appellant in this hearing.

⁶³ Section 130(3) RMA.



resource consent annually commencing from the date the consent is granted, for any of the following purposes:

- (a) To review the effectiveness of the conditions of this resource consent in avoiding or mitigating any adverse effects on the environment from the consent holder's activity and if considered appropriate by the Consent Authority, to deal with such effects by way of further or amended conditions.
- (b) To impose additional, or modify existing conditions of consent relating, but not necessarily limited to the matters specified hereunder if the Consent Authority considers it necessary to deal with any adverse effect on the environment which may arise from the exercise of this consent and which it is appropriate to deal with at a later date:
 - Hours of operation;
 - Noise levels;
 - Vehicle parking; and
 - Location within the site.

[87] The Council's Notice of Review, initiated on 21 February 2014, stated that the conditions subject to review were:

Conditions 1 and 2 stated above of resource consent PD201041

[88] Condition 1 of the 2001 Consent requires that "The development be carried out in general accordance with the details submitted with the application."

[89] Condition 2 of the 2001 Consent requires that:

- 2. The site shall be laid out and the use shall be conducted so as to ensure that the average maximum (L_{10}) and maximum noise levels (L_{max}) specified below are not exceeded at or within the notional boundary of any dwelling.

| Average Maximum Noise Level (L_{10}) dBA | | (L_{max}) dBA |
|--|--|-------------------|
| Day 0600 – 2100 hrs | Night 2100 – 0600 hrs Night 2100 – 0600 hrs | |
| 55 | 45 | 70 |

The noise levels shall be measured and assessed in accordance with the requirements of NZS6801:1991 Assessment of Environmental Sound.

[90] Subsequently, the Council decided that the maximum should apply only between 2100 and 0600 hours to be consistent with the relevant District Plan noise limits.⁶⁴



⁶⁴ Section 42A Report at paragraph 74, CB page 561.

[91] The Council's Notice of Review set out the reasons for the review, and invited the Club to propose new conditions:

The reasons for the review are as follows:

- The exercise of the resource consent is resulting in levels of noise that are considered unacceptable to residents in the surrounding environment. The resource consent condition imposed in relation to noise makes it difficult to undertake effective enforcement and monitoring, and it is therefore considered likely that there is an adverse effect on the environment (section 128(1)(a)(i)).
- The hours of operation specified in the application for resource consent are *Saturdays, Sundays and occasional week days*. Concerns have been raised by surrounding residents about these days in terms of frequency of use during the week, and also in terms of the duration of use on Saturdays and Sundays. Concerns have also been raised by surrounding residents that the application is silent in relation to use on public holidays. The lack of clarity around opening hours and the associated effects the hours of operation introduces to the surrounding environment is considered to create a potential adverse effect on the environment (section 128(1)(a)(i) and section 128(1)(c)).
- There is a lack of details contained in the application in relation to the club facilities, and concerns have been raised by neighbouring residents that the nature of these facilities (i.e. a lack of noise attenuation in particular) is contributing to the generation of an adverse effect on the environment (section 128(1)(a)(i)).
- The types of firearms to be used at the facility are not well defined in the application. Concerns have been raised by neighbouring residents that the types of firearms used contribute to the level of adverse effect on the environment (in particular noise) (section 128(1)(a)(i)).

In accordance with section 129(1)(d), the consent holder is invited to propose new conditions of consent. These new conditions must be proposed to the consent authority within 20 Working Days of the service of this notice.

[92] The Club responded to the invitation to propose new conditions. Its proposed conditions are summarised in paragraph [41] of this decision and were set out in a letter dated 13 May 2014 from Kaha Consultancy Limited, signed by Mr van Kregten. We understand that the hours were noted as the maximum number of hours, with actual hours being less. Nevertheless, it is of interest and concern to us that the days to which the Club wished the facility to be restricted were substantially in excess of those sought in the 2001 consent application, and the hours are in excess of the number Ms Hawes has stated that the Club now operates each week. In broad terms, the proposed hours amounted to approximately 40 a week when the Police were using the site, more than twice what Ms Hawes has said is the case now.



[93] By way of an initial comment, the purpose of the Review is to review the effectiveness of the conditions in avoiding or mitigating adverse effects of the activity on the environment. Not only did the Club's proposed conditions fail to address this purpose, they sought to increase the days and hours activities that could occur on the Site, with a consequent increase in adverse effects and no proposals for mitigation.

[94] In considering the scope of a review, we were referred to two High Court decisions, being *Minister of Conservation v Tasman District Council (Minister of Conservation)*⁶⁵ and *Genesis Power Ltd v Manawatu-Wanganui Regional Council (Genesis)*.⁶⁶

[95] In *Minister of Conservation*, the High Court upheld the Environment Court's conclusions on the scope of review of some resource consents.⁶⁷

[43] It is worth noting that the Court's conclusion was based on more than just s 128 of the Resource Management Act. In summary the Court concluded:

- (1) Section 128 does not allow consents to be terminated.
- (2) Section 128 amendments to conditions are only limited by the proposition that such amendments cannot have the "effect of preventing the activity for which resource consent has been granted".
- (3) In changing conditions, the Council would need to consider whether, as a result of the change, the consent remained "viable" although this did not imply a limit on the power to amend.
- (4) Reducing the extent of the marine farm still meant the applicants would "have an overall permit to marine farm".
- (5) Section 132(4) of the Act entitles review of resource consents where the application contained "material inaccuracies".
- (6) The terms of the consent itself could be framed in such a way as to achieve the necessary protection should the ecological assessments turn out unexpectedly poorly, for example the term of consent.



⁶⁵ *Minister of Conservation v Tasman District Council* HC Nelson CIV-2003-485-1072, 9 December 2003.

⁶⁶ *Genesis Power Ltd v Manawatu-Wanganui Regional Council* (2006) 12 ELRNZ 241 (HC)

⁶⁷ *Minister of Conservation v Tasman District Council* above n 65 at paragraph [43]. The Court added an additional matter to the list: "Section 17 and s 314 of the Act gives power to local authorities to control adverse environmental effects through enforcement orders or abatement notices" at paragraph [44].

[96] We were also referred to *Genesis*, where the High Court commented on the *Minister of Conservation* decision as follows:⁶⁸

[81] There is perhaps a lack of precision in what Young J said about the power to cancel a resource consent. Under a combination of either ss 128(1)(c) and 132(4), or ss 17 and 314(1)(e), of the RMA, a resource consent can only be cancelled if there were both material inaccuracies in the application and adverse effects on the environment resulting from the exercise of the consent...

...

[83] Thus, I think the Environment Court understated the powers of the Manawatu Wanganui Regional Council and of the Court upon a review of the consent conditions. Subject to the restriction on the power to cancel a consent, I think the process does provide for "wholesale review". To that extent, I accept *Genesis*' submission that the Court misconstrued the consent review process.

...

[87] Obviously, reviewing the conditions of existing consents is more limiting than a fresh consents process. But, subject only to the limit on the power to cancel [a resource consent], I do not agree that, in practical terms, the consent conditions review process is more limiting than the process for fresh resource consents...

[97] The High Court decisions to which we were referred guide our approach. We were also referred to *Medical Officer of Health v Canterbury Regional Council*,⁶⁹ where the Planning Tribunal held that when reviewing the efficacy of conditions, the consent authority is not entitled to amend the conditions or impose new conditions which have the effect of preventing the activity for which resource consent was granted. Further, and picking up on the concept of 'wholesale review' referred to in *Genesis*, we were referred to *Feltex Carpets Ltd v Canterbury Regional Council*,⁷⁰ where the Environment Court held that the power to change conditions on a s 128 review is "wide and flexible" and has "no obvious limit".

[98] In our review of the consent conditions, the following matters assumed particular significance:

- (a) the scope of the 2001 Consent;
- (b) the requirements of s 16; and



⁶⁸ *Genesis Power Ltd v Manawatu-Wanganui Regional Council* (2006) 12 ELRNZ 241 (HC) at paragraphs [81], [83], [87].

⁶⁹ *Medical Officer of Health v Canterbury Regional Council* [1995] NZRMA 49 (PT) at 62 – 63.

⁷⁰ *Feltex Carpets Ltd v Canterbury Regional Council* (2000) 6 ELRNZ 275.

- (c) the relevance of residents moving to the area after the establishment of the Gun Club, in the setting of noise levels.

H. Community concerns relating to noise

[99] Without trying to address everything raised by residents, we have set out below our understanding of their primary concerns arising from activities at the Club and we have taken them into account in our decision. We have also considered Mr Dunbar's submission in support of the Club and comment on some aspects below.

[100] Mr Davis is retired, meaning he is at home through the week. His view is that the Club can create as much noise as it likes as the current controls are ineffective and "to make matters worse" the Council has known this "for nearly a decade now but done nothing about it". He said, "Time and again the residents were told nothing could be done because the noise was within consent limits". He is sure that: "... the amount of noise and use of the Pistol Club which has clearly grown over the years wouldn't be happening if effective noise limits were in place from the beginning...".

[101] He said that at louder levels the noise gives rise to a visceral effect, which we interpret to mean a deep emotional response that he "... can only describe as anxiety producing and unpleasant". He says sudden loud gunfire often interrupts his time in the garden and forces him indoors with closed windows and doors, "hiding inside my own home". He described what for him was a particularly frightening experience at dusk one evening during Police training.⁷¹

[102] Mr O'Neill said he has noticed increased activity at the Club, with high powered rifles and pistols and no attempt to control noise. "This has resulted in intolerable noise levels". He has a very stressful job and works long hours. He said he is unable to enjoy the peace and quiet of his surroundings and relax. "On the weekends, and two to three evenings during the week I'm subject to the unsettling and disturbing sound of gunfire." He can hear the noise above the sound of his lawn mower and when inside with doors and double-glazed windows closed, needs a radio to drown out the gunfire noise. This is very stressful, and he is concerned about effects on health.



⁷¹ RJ Davis SOE, CB pages 911-916.

[103] Mr O'Neill advised that his wife is in ill health and has recently had to give up work. Staying at home has "resulted in her being more exposed to the Police and club's gunfire during the weekdays, when she should be resting and relaxing". His wife is unable to handle the startling noise levels of the loudest pistols, getting stressed and having to retreat inside. The gunfire causes her to become agitated, stressed and even angry. At times, they "... feel like prisoners in our own home" and are forced to leave the property most Saturdays. The gun noise affects their grandchildren.⁷²

[104] Ms Morris said that when the shooting is happening on the weekends, when the children should be free to roam their section, "they can't play in the bottom portion because the noise is just too intense." Her four-year old stays inside "because the shots/loud bangs scare her". She said it's not fair they have to live like that and that the family generally tend to stay inside while the shooting is taking place. Ms Morris said the safety aspect of the Club really bothers her. Safety issues are outside the scope of the appeal, but we have addressed them to a limited extent earlier in our decision.⁷³

[105] Mr Haag is a retired engineer who likes to spend a lot of time outside at his home. His evidence is that over the years it seems like louder guns are being used and the noise level has increased. He dreads going outside when the red flag is being flown at the entrance to the Site and often postpones outside jobs and stays indoors. "It feels like I am prisoner in my own home. Even inside with the windows closed, shots are clearly audible and disturbing." He said that to enjoy the outside living space whilst shooting is in progress is out of the question.

[106] He said they cannot put up with unlimited noise that may in the future increase even further. "Some of the pistols are incredibly loud" and when the wind is from a westerly direction, the sound is even louder, "so loud that they cause a startle reflex that gives you a fright and causes your heart to race. The only way to avoid this is to leave the house for a period of time".

[107] When his wife was unwell and she had to spend two weeks "Lying in bed and having to listen to gun shots was agonising and prevented her getting the sleep she needed to recover". Mr Haag expressed concern about Police shooting and that "they have chosen to ignore the pledges (*sic*) of the community and see fit to continue to create

⁷² TA O'Neill SOE, CB pages 945-958.

⁷³ K Morris SOE, CB pages 983-986.



excessive noise at the Club".⁷⁴

[108] Mr Karaitiana's house is situated about 150 m from the Club as the crow flies. He said that when the Club is operating "the noise from the relentless gunfire is simply incredible especially on competition days". He cannot sit outside on a standard shooting day and during competition days he has to exit his home and drive away altogether. As he sees it: "... no human can be expected to endure that gunfire noise, that often, at that level".

[109] In moving to his house, he did not expect uncontrolled noise with basically no noise limit at all. He said that the gunfire noise has also increased exponentially in frequency and levels over the last few years since he bought into the area. He said the Police fire what sound to him like pistols, automatic assault rifles and shotguns and can begin shooting in the morning and continue shooting to around 10pm. at night. He said that they are absolutely immune to the disturbance they are causing to residents and young children who need to go to bed early.⁷⁵

[110] Mr Jacobs said he is not bothered by some activities at the Club, such as the firing of small calibre pistols. "It is the use of the larger caliber (*sic*) pistols fired in rapid succession that really disturbs us. On some weekend days, the noise levels from the Club, even from inside the house, is (*sic*) totally unacceptable." He said that when his children were very young "these periods of intense loud shooting were enough to wake them with windows closed. The sudden impact of these loud shots gets our hearts racing and the kids have to cover their ears".

[111] At weekends, from 9am onwards, they cannot have any confidence that they will enjoy any peace and quality family time. He says people turn up at the Club "whenever they feel like it. Usually after a mornings (*sic*) barrage of war zone gunfire, it all goes quiet, the car(s) leave, and we think we may be able to get on with our day. Often though, another car turns up soon after and we prepare ourselves for yet another onslaught".

[112] Mr Jacobs said, "We are being subjected to prolonged, repeated, damaging noise levels where we fear for the health impact it is having on our kids." The frequency and nature of the shooting on the weekends makes him angry.⁷⁶



⁷⁴ B Haag SOE, CB pages 987-990).

⁷⁵ RG Karaitiana SOE, CB pages 991-995.

⁷⁶ NM Jacobs SOE, CB pages 997-1005.

[113] Most residents participating in the hearing acknowledged in different words that they knew of the Club's existence before they bought their properties in the locality. However, while the way they described it was different, few if any of them anticipated the actual noise effects would be subject to no controls and could occur at very loud levels without prior warning and at random times.

Submissions in support of the Club from Jan Baynes and David Dunbar

[114] Ms Baynes and Mr Dunbar provided comprehensive submissions in support of the Club. The submissions are critical of the way in which the Council processed the Eagle Eye subdivision discussed below. We note this matter is outside the scope of the Court's jurisdiction in this case. Restricted covenants were addressed in some detail, but these are not before the Court.

[115] The submissions also addressed in some detail reverse sensitivity, the permitted baseline, the evidence of other witnesses and various aspects of case law. We address all of these matters in our decision and, having carefully read the submissions, take them into account in our decision as appropriate.

I. Expert opinions on noise issues and effects

[116] For the purpose of our decision we have adopted the term "shooting noise" to include any form of gunfire noise arising from the Club's activities.

The noise condition included in the 2001 Consent (Condition 2)

[117] The condition was imposed on the recommendation of the Council's then Environmental Health Officer. It is based on L_{10} noise limits during the day and night and a maximum noise limit at night.⁷⁷ It imposes noise limits identical to those for the Residential and Neighbourhood Reserve Zones in the Operative District Plan, which we were told are the same as those in the District Plan at the time the 2001 Consent was granted.⁷⁸ As noted in paragraph [90] the Council amended part of the condition to be consistent with the relevant District Plan noise limits.



⁷⁷ RF Proffit SOE, Attachment B, CB page 171.

⁷⁸ Transcript, page 77, line 30.

[118] The evidence from three experienced noise experts, including Mr Hegley who advised the Club at the Review Hearing, is that L_{10} is not appropriate as a metric or criterion for measuring shooting noise. L_{10} is the noise level exceeded for 10% of the time, which does not capture shooting noise. The reasons for this are set out in their evidence, which we refer to below. We accept that evidence.⁷⁹

[119] The 2001 Consent's noise condition requires that the Club meet an L_{10} noise limit of 55 decibels (**dB**) at the notional boundary of any dwelling. For clarity, we note that "notional boundary" is recorded in the TRMP as "a line 20m from the wall of any rural dwelling, or the legal boundary where this is closer to the dwelling".⁸⁰

[120] It appears from the evidence that the Club is compliant with the noise condition, but it is clear to us that the noise condition is inappropriate and does not prevent unreasonable noise from occurring.

What is the most appropriate criterion or metric for shooting noise?

[121] This is addressed in the Joint Statement of Noise Experts dated 25 June 2019 (**the JWS**). The experts say there are no standard metrics or criteria for shooting noise in New Zealand. For the impulsive characteristics of shooting noise, Dr Chiles and Mr Styles agree that L_{AFmax} should be used as it provides a pragmatic measure consistent with other recent cases in New Zealand. We accept their evidence that L_{AFmax} should be used.

[122] We sought clarification of the definition of L_{AFmax} from Dr Chiles. He advised that L_{AFmax} is, in effect, the maximum allowable sound level from any individual shot.⁸¹ As noted above, this level must be achieved at the notional boundary of any dwelling.

If L_{AFmax} is to be used in conditions, what should the level be?

[123] This is addressed in paragraphs 3.2 to 3.5 of the JWS. The experts agreed that, if there are limited days and hours of shooting each week, then a limit of 55 dB L_{AFmax} would be appropriate, but for more frequent or prolonged shooting the limit should be 50 dB L_{AFmax} . They stated that these have been used as limits of acceptability in other cases in

⁷⁹ Dr Chiles SOE at paragraphs 19 to 22, CB page 110 and JR Styles SOE at paragraph 3.2, CB page 900.

⁸⁰ Section 42A Report at paragraph 73, CB page 561.

⁸¹ Transcript page 125, line 21.



New Zealand.

[124] While they consider the above limits to be reasonable, they advised that shooting noise at these levels would still be clearly audible over the background noise level on most days, and would usually be the dominant sound in the environment.

If L_{AFmax} is to be used in conditions, what hours per week would be acceptable at different L_{AFmax} levels?

[125] Mr Styles and Dr Chiles differed as to what hours per week would be acceptable at different L_{AFmax} levels. Dr Chiles considered that current noise levels would be reasonable if the number of hours of shooting is 17 hours a week.

[126] Mr Styles considered that, if the limit is 55 dB L_{AFmax} then the 17 hours a week as proposed by Dr Chiles would be appropriate. He considered that, if the limit is 63 dB L_{AFmax} , a level recommended by Mr Hegley, then the hours a week should be reduced to nine, with less than 50% of them on a Saturday.⁸²

[127] Mr Styles considered that current levels of noise would only be reasonable if they were limited to, say, six to 10 times a year for around six hours on each occasion.⁸³

What are background noise levels in the locality?

[128] Mr Styles' evidence was that background noise levels range from approximately 30 to 45 dB L_{A90} . He explained that the background noise level is exceeded 90% of the time and is the noise level present in between the transient noises in the environment, such as shooting, bird calls, occasional cars or intermittent residential noise.⁸⁴ This was not challenged by Dr Chiles.

What noise levels result from Club activities?

[129] Noise measurements have been taken on a number of different occasions over a number of years. The Council undertook noise monitoring of Club activities on



⁸² NI Hegley, SOE at the Council hearing at paragraph 3.4, CB page 927.

⁸³ JR Styles SOE at paragraph 5.5, CB page 904.

⁸⁴ JR Styles SOE at paragraph 4.7, CB page 901.

17 January 2010.⁸⁵ It is clear from the report that the Council knew at that time that L_{10} was inappropriate for measuring shooting noise. The monitoring report made reference to further monitoring being carried out if enforcement action was planned. Noise measurements were taken using L_{Cpeak} values, which the report said are the absolute peak values. Monitored levels were typically 140 L_{Cpeak} at source, between 84 and 93 L_{Cpeak} at 157 Gaddums Hill Road and between 96 and 99 L_{Cpeak} at a Kauri Lane property, the location of which is not clear from the information available to the Court.

[130] We received no evidence of the relationship between L_{AFmax} and L_{Cpeak} but based on evidence relied on by the Court in *Nelson City Council v Harvey (Harvey)*⁸⁶ L_{Cpeak} is typically 30 dB higher than L_{AFmax} .⁸⁷ This means that indicative L_{AFmax} levels at the two properties could have been between 55 and 70 dB. For clarity, we note that the shooting being undertaken at the time of the monitoring is not stated, so we cannot rely on the monitoring results as we cannot relate them back to a specific type of shooting activity. What is clear is that while the levels recorded indicate relatively high noise levels were being generated in 2010, they appear to be significantly lower than the most recent levels measured by Dr Chiles.

[131] Mr O'Neill referred to Council monitoring of his property (171 Gaddums Hill Road) on 15 and 29 July and 1 August 2018. Measured values were 73.5, 79.2 and 98.3 dB L_{AFmax} respectively. Dr Chiles has questioned the last result,⁸⁸ and we have not relied on it, or the other results for the reasons set out in the preceding paragraph. It is nevertheless interesting to note that Mr O'Neill's property is at least 50% further away from the Site than other properties where later monitoring took place, yet noise levels still approached 80 dB L_{AFmax} on one occasion.

[132] The JWS referred to noise monitoring undertaken by the Styles Group in May and June 2019 at 155, 157 and 180 Gaddums Hill Road, when the Club was unaware of the monitoring. The JWS stated that "it appears that most shooting noise at the nearest neighbours is in the order of 60 to 80 dB L_{AFmax} , with occasional shots between 80 and 90 L_{AFmax} ." Mr Styles confirmed the above noise levels after further evaluation of the data. He also stated that his measurements show that noise levels over 80 dB L_{AFmax} occur



⁸⁵ RJ Davis SOE, Appendix A, CB pages 919 and 929.

⁸⁶ *Nelson City Council v Harvey*, [2011] NZEnvC 48.

⁸⁷ *Nelson City Council v Harvey*, [2011] NZEnvC 48 at paragraph [53], attached to Will-say statement of JR Styles, CB page 38.

⁸⁸ Email from Dr Chiles to Andrew Sowersby contained in Appendix 2 to s 42A Report, CB at page 601.

reasonably regularly on some days.⁸⁹

[133] The most recent monitoring was undertaken by Dr Chiles in accordance with a protocol agreed by the parties.⁹⁰ Results are set out in Tables 1 and 2 below, reproduced from Dr Chiles' Supplementary Evidence.

Table 1 – Average L_{AFmax} values at 155 Gaddums Hill Road

| Firearm | Range 1 (50m) | Range 1 (25m) | Range 2 (25m) | Range 3 | Range 4 |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 9mm Glock (Police) | | | 71 dB (σ 1.1) | | 70 dB (σ 2.4) |
| 9mm simulation pistol (Police) | | | < 50 dB | | |
| .223 Bushmaster suppressed (Police) | | | 63 dB (σ 2.4) | | 60 dB (σ 1.7) |
| .223 Bushmaster unsuppressed (Police) | | | 73 dB (σ 1.1) | | 76 dB (σ 2.6) |
| 40mm teargas launcher (Police) | | | 58 dB | | 48 dB |
| 9mm semi auto pistol | 85 dB (σ 1.1) | 69 dB (σ 0.9) | 64 dB (σ 0.8) | 64 dB (σ 1.5) | 61 dB (σ 1.0) |
| 9mm semi auto pistol in a pistol carbine | 65 dB (σ 0.9) | 68 dB (σ 1.0) | 66 dB (σ 0.9) | | |
| .38 super race gun | 73 dB (σ 0.5) | 77 dB (σ 2.0) | 73 dB (σ 0.9) | 71 dB (σ 1.2) | 67 dB (σ 1.8) |
| .40 semi auto pistol | 66 dB (σ 0.7) | 71 dB (σ 0.7) | 65 dB (σ 0.8) | | |
| .22LR semi auto pistol | 62 dB (σ 1.3) | 63 dB (σ 0.7) | 60 dB (σ 0.7) | | |
| .22LR rifle | 65 dB (σ 0.7) | 61 dB (σ 1.6) | 63 dB (σ 1.1) | | |
| .45 semi auto pistol | 63 dB (σ 0.8) | 68 dB (σ 1.5) | 63 dB (σ 0.6) | 62 dB (σ 1.1) | 60 dB (σ 1.9) |
| .357 revolver | 61 dB (σ 1.9) | 67 dB (σ 0.7) | 59 dB (σ 1.3) | 56 dB (σ 1.7) | 55 dB (σ 2.6) |
| .357 lever action rifle | 56 dB (σ 1.4) | 56 dB (σ 0.6) | | | |
| 12 gauge shotgun | | 67 dB (σ 1.1) | 64 dB (σ 1.1) | 62 dB (σ 0.8) | 59 dB (σ 1.4) |
| 45/70 rifle | | | 72 dB (σ 0.4) | | |
| .44 cap and ball pistol (1) | | | 70 dB (σ 1.5) | | |
| .44 cap and ball pistol (2) | | | 63 dB (σ 1.0) | | |
| .45 muzzle loader | | | 72 dB (σ 1.1) | | |
| Targets dropping | < 50 dB | | | | |

Table 2 – Average L_{AFmax} values at 180 Gaddums Hill Road

| Firearm | Range 1 (50m) | Range 1 (25m) | Range 2 (25m) | Range 3 | Range 4 |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 9mm Glock (Police) | | | 74 dB (σ 3.2) | | 72 dB (σ 2.2) |
| 9mm simulation pistol (Police) | | | < 50 dB | | |
| .223 Bushmaster suppressed (Police) | | | 64 dB (σ 1.5) | | 58 dB (σ 1.4) |
| .223 Bushmaster unsuppressed (Police) | | | 76 dB (σ 1.0) | | 75 dB (σ 2.4) |
| 40mm teargas launcher (Police) | | | 51 dB | | 54 dB |
| 9mm semi auto pistol | 67 dB (σ 1.4) | 69 dB (σ 1.5) | 66 dB (σ 0.9) | 72 dB (σ 2.7) | 61 dB (σ 1.2) |
| 9mm semi auto pistol in a pistol carbine | 66 dB (σ 1.0) | 69 dB (σ 1.3) | 66 dB (σ 0.9) | | |
| .38 super race gun | 75 dB (σ 1.2) | 84 dB (σ 1.8) | 79 dB (σ 2.8) | 78 dB (σ 4.8) | 67 dB (σ 1.9) |
| .40 semi auto pistol | 67 dB (σ 1.3) | 72 dB (σ 2.2) | 70 dB (σ 1.5) | | |
| .22LR semi auto pistol | 62 dB (σ 1.8) | 65 dB (σ 1.2) | 63 dB (σ 0.9) | | |
| .22LR rifle | 69 dB (σ 2.1) | 66 dB (σ 1.4) | 65 dB (σ 1.6) | | |
| .45 semi auto pistol | 65 dB (σ 0.4) | 71 dB (σ 2.7) | 68 dB (σ 2.7) | 70 dB (σ 4.1) | 62 dB (σ 2.1) |
| .357 revolver | 62 dB (σ 1.5) | 72 dB (σ 2.7) | 63 dB (σ 1.8) | 71 dB (σ 4.3) | 54 dB (σ 1.9) |
| .357 lever action rifle | 57 dB (σ 1.1) | 58 dB (σ 1.6) | | | |
| 12 gauge shotgun | | 71 dB (σ 1.6) | 68 dB (σ 0.7) | 64 dB (σ 2.0) | 60 dB (σ 3.3) |
| 45/70 rifle | | | 76 dB (σ 0.7) | | |
| .44 cap and ball pistol (1) | | | 77 dB (σ 4.3) | | |
| .44 cap and ball pistol (2) | | | 70 dB (σ 0.8) | | |
| .45 muzzle loader | | | 75 dB (σ 1.1) | | |
| Targets dropping | < 50 dB | | | | |



⁸⁹ JR Styles SOE at paragraph 4.5, CB page 901.

⁹⁰ TA O'Neill SOE Appendix A, CB page 959.

[134] As can be seen from the Table headings, the L_{AFmax} values in this Table are average values calculated from the levels measured by Dr Chiles. For each value, the Table lists the standard deviation denoted by the symbol σ . The lower the standard deviation, the smaller the difference between the maximum and minimum levels measured by Dr Chiles, and vice versa.

What do the noise experts consider the noise effects of Club activities to be?

[135] From Tables 1 and 2 above, it can be seen that the following gun types result in loudest noise effects, exceeding an "Average 65 dB L_{AFmax} ", as confirmed by Dr Chiles and Mr Styles in response to questions from the Court.

- (a) the Police Glock pistol;
- (a) the Police 223 Bushmaster rifle when unsuppressed;
- (b) the .38 super race gun;
- (c) the 45/70 rifle;
- (d) the .44 cap and ball pistol; and
- (e) the .45 muzzle loader.

[136] The .40 semi-auto pistol and both .44 cap and ball pistols also exceeded 65 dB L_{AFmax} .

[137] Mr Styles stated that the monitoring of individual firearm types has shown that only 9 mm simulation pistols and the 40 mm teargas launcher are able to comply with a noise limit of 55 dB L_{AFmax} .

[138] As a broad generalisation, the available monitoring data shows noise levels experienced at nearby residences are typically within the range 60 to 80 dB L_{AFmax} , with a small number of results varying slightly up or down from those levels. These levels are broadly consistent with Mr Styles' earlier monitoring results.



[139] A very small number of results may possibly meet an L_{AFmax} limit of 55 dB. At measured values of 60 dB L_{AFmax} , the noise at dwellings would be 5 dB above a 55 dB L_{AFmax} limit and some 15 to 20 dB above background levels. At measured values of 70 dB L_{AFmax} , which appears to be at about the mid-range of measured noise levels, the noise at dwellings would be 15 dB above a 55 dB L_{AFmax} limit and some 25 to 30 dB above background levels. At measured values of 80 dB L_{AFmax} , the noise at dwellings would be 25 dB above a 55 dB L_{AFmax} limit and some 35 to 40 dB above background levels.

[140] The experts agreed that:⁹¹

- Shooting noise in compliance with a limit of 55 dB L_{AFmax} would still be clearly audible and some people are still likely to be annoyed even for the restricted periods of shooting allowed for in the Review Decision. While domestic amenity would be compromised, most people would be able to continue with normal domestic activities inside and outside their homes.
- For noise levels up to approximately 75 dB L_{AFmax} , each shot would be loud and obtrusive. For activity outside, this would interrupt conversations and prevent relaxation. With doors and windows open there would be considerable disturbance inside, and even with windows closed, shots would still be clearly audible. Most people would be highly annoyed.
- At higher sound levels such as 85 dB L_{AFmax} , each shot will cause increased disruption to residential activity and is likely to cause serious annoyance. People are likely to experience startle reactions.

[141] We were advised that an increase in noise levels of 10 dB represents a doubling of noise levels. There is no reliable basis for predicting how many times louder noise levels will be when increases of 20 and 30 dB or greater occur. Dr Chiles indicated they could quadruple at 20 dB, based on a subjective rule of thumb, but considered the rule "broke down" at such large increases.⁹² He said the increases would be "significant" and Mr Styles agreed. However, that evidence did not assist us as in our experience, noise experts generally consider a 5 dB increase is "significant".



⁹¹ JWS at section 7.

⁹² Transcript page 104, line 30.

[142] Seeking respite indoors would generally not be possible as the facades of even modern, well-constructed houses with all doors and windows closed would not attenuate the level of noise to be inaudible or not disturbing indoors. In warmer weather, with windows and doors open respite from shooting will not be readily available to residents.

[143] Mr Styles provided further expert opinion on noise effects in Section 5 of his statement of evidence. These can be summarised as follows:

- (a) it is well recognised and understood that the impulsive nature of shooting noise is more annoying at the same decibel level than many other noises, such as industrial noise, people noise or traffic noise;
- (b) the unpredictability of when shooting noise might start is a major factor that exacerbates the adverse effects on people;
- (c) noise levels as high as 80 to 87 dB L_{AFmax} , are up to 62 dB above background levels and would be very loud and completely dominant in the environment.

[144] Dr Chiles also set out further opinion on noise effects in his evidence-in-chief:

- (a) club activity is likely to be loud and intrusive at neighbouring houses, of which there are approximately 15. He considered this will be the case both outside and inside, when doors and windows are open. He considered this would be likely to interfere with normal domestic activities and that with doors and windows shut, shots are still likely to be clearly audible inside houses.
- (b) he considered the current noise levels would be unreasonable if a new shooting range was established. However, the fact that houses came to an existing noise source should alter the amenity expectations of residents.
- (c) he considered that, from the time residential development occurred within approximately 500 m of the Club it has generated unreasonable noise due to the unconstrained times of activity.

[145] In response to questions, he said for shooting noise people respond at lower levels than other sources, and that for shooting noise limits regularly occurring at 60 to 80 decibels, most people would find that highly annoying.⁹³

⁹³ Transcript page 95, line 29 and page 99, line 4.



Health effects

[146] Health effects were raised as a concern by a number of submitters. Dr Chiles responded to these concerns in his evidence in rebuttal. Key responses were:

- (a) measured sound levels are below thresholds for the protection of hearing, so there should be no risk of hearing damage; and
- (b) sound levels of shooting outside during the day could result in sleep disturbance.

[147] Reference was made during the hearing to a large body of information being available about the health effects of increasing more general noise effects such as transportation noise. From our questioning at the hearing, we were unable to identify any work on the specific health effects of shooting noise.

[148] As part of his examination, Mr Randal questioned the noise experts with reference to the two reports (Exhibits 7 and 8), which were produced by Dr Chiles and Mr Styles respectively. While the questioning in relation to the reports was not extensive, the content of both documents has some relevance to our decision.

[149] The first was a report entitled "Evidential basis for community response to land transport noise", June 2019, New Zealand Transport Agency Research Report 656. Section 4 of the Report addresses health effects of noise exposure, citing World Health Organisation work which identifies noise as a harmful environmental pollutant. The same section of the Report refers to a 2013 New Zealand Study which showed that road traffic noise was responsible for significant decreases in health-related quality of life. The Study found that the largest impact occurred when noise sensitive persons were exposed to high levels of noise. It was also found that noise annoyance was a strong indicator of noise sensitivity.

[150] We have placed limited weight on this as it was not explored in any detail at the hearing. We note, however, that when Mr Styles was asked if he had no view on health effects with increasing noise levels, he replied that the concept is entirely valid and that there will be adverse health effects arising from the annoyance.⁹⁴



⁹⁴ Transcript page 192, line 31

[151] The second was a report entitled "Exposure-response relationships for transportation noise." The authors, Miedema and Vos, are often quoted for their work in this field and the Court is familiar with it. More importantly, Mr Randal referred Mr Styles to graphs showing the percentage of people who are highly annoyed as noise levels increase. While we acknowledge that direct comparisons cannot be made with shooting noise, the percentage of people who are highly annoyed by road noise increases from less than 5% at 50 dB Ldn to around 10% at 60 dB, to between 25 and 30% at 70 dB and probably around 50% at 80 dB. The percentage of people who are highly annoyed by aircraft noise increases from around 5% at 50 dB Ldn to around 20% at 60 dB, around 40% at 70 dB and probably around 80% at 80 dB. For clarity, we note that Ldn is the average sound level measured over a 24-hour period.⁹⁵

[152] Dr Chiles considered that "As a guide for regular shooting I would expect there to be slight annoyance for most people at 50 to 55 L_{AFmax} and moderate to high annoyance at 60-70 L_{AFmax} ".⁹⁶

[153] As noted earlier in our decision both noise experts advised that people respond to shooting noise at lower decibel levels than many other noises, suggesting shooting noise may cause greater annoyance effects. If Mr Styles is also correct that there will be adverse health effects arising from the annoyance, the issue is one of greater concern than only the general annoyance that shooting noise causes, and is relevant to the effects of the activity on residents' health.

Competitions

[154] Dr Chiles considered⁹⁷ that extending the hours of activity for competitions and the increased intensity of activity during competitions would give rise to unreasonable noise effects. Mr Styles agreed with Dr Chiles.⁹⁸

[155] Dr Chiles also considered competitions as likely to be perceived as an intensification and elongation of existing noise disturbance, rather than as one-off events.⁹⁹

⁹⁵ Transcript page 144, line 15.

⁹⁶ Response dated 28 June 2018 to question from Andrew Sowersby when preparing the s 42A Report, CB page 594.

⁹⁷ Dr Chiles SOE at paragraphs 36 to 39.

⁹⁸ JR Styles SOE at Section 7.

⁹⁹ Dr Chiles SOE at paragraph 14.



Noise management and mitigation

[156] In the JWS, the experts stated that they were unaware of any practicable measures that would reduce sound from current shooting activities to below 55 dB L_{AFmax} . They said that full enclosure of the ranges is likely to be the only possible solution. Otherwise, all or most activity would have to cease if a 55 dB L_{AFmax} noise limit was imposed. The Club said full enclosure would be unacceptable as it would prevent IPSC shooting and is unaffordable.

[157] The two experts identified some measures that could reduce sound levels, which in approximate order of effectiveness would be:

- (a) the loudest firearm types could be prohibited;
- (b) firing positions could be limited to the covered sheds; and/or
- (c) the sheds could be upgraded with sound insulating and absorbing linings.

[158] The experts indicated that a reduction of 10 dB L_{AFmax} might be able to be achieved by prohibiting the loudest firearms. This has been shown to be the case in the monitoring of the noise from the individual firearms.

[159] In the JWS, they considered that annoyance would be reduced by removing metal targets to avoid pinging. In his rebuttal evidence, Dr Chiles added that damping of metal targets would be a practicable option to mitigate the pinging noise.

[160] Other potential mitigation options explored with experts at the hearing were limiting the use of the ranges to a maximum of two at a time and setting a limit on the number of rounds that could be fired. We return to the first of these later in our decision but do not pursue the second option as it would not significantly reduce the loudest noise sources and would be difficult if not impossible to police effectively.

J. What activities are authorised by the 2001 Consent?

Jurisdiction

[161] This appeal is not about enforcement. However, there is a need to ensure that any new or amended conditions do not inadvertently authorise activities that are not authorised by the 2001 Consent.



[162] It is a fundamental principle of resource management law that consents cannot authorise activities that were not applied for.¹⁰⁰

[163] This is an important issue as the Appellant contends that numerous activities have expanded beyond what was applied for at the time of the 2001 Consent. Mr Williams submitted that:¹⁰¹

It is trite law that the consent in question could not approve more than was sought through that application. The Appellant and s 274 parties' position is that given:

- (a) the expansion in the number of shooting ranges and the range and type of guns and rifles used at the Club since 2001; and
- (b) that the hours and days of operations permitted through the Commissioner's decision equally exceed the reference to "weekends for Club members" and "occasional weekdays for Club members and other users", as set out expressly in the application

the degree of restraint now sought through this review is commensurate with what is required to return the situation to that approved under the consent in 2001 in any event.

[164] Despite inviting submissions from counsel on the issue of scope, we received no submissions from the Club which specifically addressed this issue. However, in its evidence the Club claimed that the 2001 Consent authorised the four ranges presently in use and the extent of the activities presently occurring at the Club. We did not find its evidence supported this.

[165] The Council submitted that the activities are not limited in a precise way to those activities specifically listed in the 2001 consent application; that some flexibility is afforded by the "in general accordance" condition. Counsel referred to *Atkins v Napier City Council*,¹⁰² arguing that scope can be determined by reference to scale and intensity of the proposed activity or altered character or effects/impacts of the proposal. However, that case related to determining the scope of an application on appeal, and was focussed on whether or not all those affected by the proposal were before the Court. As the scale and intensity of the current activity or altered character or effects/impacts of the activity are significant issues in this case, the question of whether the activities are "in general accordance" with what was applied for is important.



¹⁰⁰ *Manners-Wood v Queenstown Lakes District Council* W77/2007, 12 September 2007.

¹⁰¹ Appellant's Opening submissions at paragraph 77.

¹⁰² *Atkins v Napier City Council* (2008) 15 ELRNZ 84 (HC) at paragraph [20].

[166] We consider that the matter of what the 2001 Consent authorised can be determined only by reference to the application. As the Court said in *Clevedon Protection Society Inc v Warren Fowler Ltd and Manukau City Council*,¹⁰³ the interpretation of the limits of a resource consent is a jurisdictional issue rather than an evidential one; a resource consent has to look back at the application documents because the consent cannot go beyond those documents.

The 2001 Consent

[167] The 2001 Consent was processed on a non-notified basis as an application for a retrospective consent for a discretionary activity to operate a pistol range.¹⁰⁴

What was applied for?

[168] Condition 1 of the 2001 Consent requires that: "The development be carried out in general accordance with the details submitted with the application."

[169] The application was made on 31 May 2001, and described the proposed works as "Operation of a pistol range for club members shooting on Saturdays and Sundays and occasional week days for members, police and other groups".¹⁰⁵

[170] Range inspection details for two ranges were attached to the application and indicated that:

- "Firearms to be used" on the ranges were "Revolvers, Pistols and Police 223 Rifles".
- Calibres to be used on Range One were "22 to 45 Calibre" and on Range Two "22 to 44 Mag.Cal" ; Range One had 15 paper-on-wood targets with steel frame turning and Range Two had up to eight paper and steel targets; and
- The length of both Ranges was 50 metres.



¹⁰³ *Clevedon Protection Society Inc v Warren Fowler Ltd and Manukau City Council* Decision C43/97 at page 20.

¹⁰⁴ Commissioner's Decision Report at paragraph 2, CB page 866.

¹⁰⁵ Application No PD201041 for resource consent dated 31 May 2001, CB page 157.

Number of ranges authorised

[171] The 2001 consent application documents refer to Ranges 1 and 2 only. There was no reference in the documents to any intention to construct Ranges 3 and 4 at a later time. Those ranges were constructed in 2005. Ms Hawes (for the Club) said this was with the knowledge of the Council.¹⁰⁶

[172] An attachment to the s 42A Report relating to the Review sets out the Club's comments on the Council's Notification Report. The Club said that¹⁰⁷:

- The range inspection report that was considered by the Council at the time of the consent application stated that earth walls would be built on both sides of the ranges. It is the Club's position that this allowed the Club to create ranges 3 and 4;
- The Club's position is that there was a consent issued for depositing additional soil. At the time Club members met with the Council's Parks Manager Terry McMillan, showed him where the dirt was being deposited and that Ranges 3 and 4 would be created. The Club says Mr McMillan said that was within the terms of its consent; and
- In any case the effects of the activity have not increased because of the additional ranges.

[173] Neither the 2001 application nor the 2001 Consent made any reference to four ranges. We determine therefore and for the purpose of this proceeding that the 2001 Consent authorised the use of Ranges 1 and 2 only. No land use consent application for a variation to the 2001 Consent or for a new consent has been applied for since.

[174] For completeness, we record that part of the Club's argument is that the effects of the activity have not increased as a result of the additional ranges, but it provided no evidence in support. As Ranges 3 and 4 are closer to 160 Gaddums Hill Road, increased noise effects at that property must be considered a possibility if not a likelihood. Ms Hawes stated that when the Club has a CAS competition, all four ranges are used at the same time and agreed in response to a question from the Court that there would be an increase in noise effect as a result of having four ranges operating instead of two.¹⁰⁸ When asked for his views, Dr Chiles said he did not understand the use of all four ranges formed a normal part of Club operations but if "there was shooting going on all four ranges at the same time then there would be a greater density of shots



¹⁰⁶ NR Hawes EIR responding to MR O'Neill's paragraph 8, CB page 1026.
¹⁰⁷ CB page 684.
¹⁰⁸ Transcript page 22, line 7.

and there would be some increase in effect".¹⁰⁹ Mr Styles' view was that if all four ranges were operating it would be possible to fire a lot more shots than you could if you only had two ranges open and there would be benefit in limiting use to two ranges at a time.¹¹⁰

[175] We are satisfied, based on the above, that the use of all four ranges at the same time increases the noise generated from the Site.

Number of days authorised

[176] Apart from shooting by club members on Saturdays and Sundays, the 2001 consent application proposed that the Site would be used on "occasional" weekdays by members, the police and other groups. There was no clear common position on the meaning of 'occasional'. Ms Hawes stated that the Club had been operating on at least two weekdays since 2011.¹¹¹ Mr van Kregten considered that 100 days a year fell within the definition of "occasional", although he later conceded that 100 days is "probably on the high side."¹¹²

[177] We have referred to dictionary definitions of "occasional" as follows:¹¹³

- Happening on, made for, or associated with a particular occasion;
- Happening casually or incidentally, incidental;
- Occurring or met with now and then; irregular and infrequent; sporadic.

[178] The theme is that "occasional" means an activity that occurs now and then; is irregular and infrequent. In the context of a very high noise-generating activity such as a pistol club, we consider that, on the most generous interpretation, it is unlikely that occasional would be any more often than one weekday a month, particularly as the same activity continues to occur eight or more times a month on weekend days. We accept that if weekend use is reduced in the future, a less restrictive interpretation of "occasional weekdays" might be reasonable. Any interpretation of the meaning of "occasional" would



¹⁰⁹ Transcript page 127, line 29.

¹¹⁰ Transcript page 174, line 33.

¹¹¹ Transcript page 6, line 26.

¹¹² Transcript page 43, line 19.

¹¹³ From Shorter Oxford English Dictionary, Sixth edition, Volume 2.

still be subject to other considerations relating to hours of use during those days and what constitutes reasonable noise, which we return to in our evaluation and findings.

[179] We consider that, to remain within the scope of the 2001 Consent, the upper limit of days on which shooting can occur in accordance with the 2001 Consent is equivalent to "52 x two weekend days" plus one weekday a month or a total of 116 days in any year, less public holidays. This must include Police use on the 12 weekdays in a year.

Number of hours of use authorised

[180] The 2001 consent application is silent on hours of use.

Competitions

[181] The 2001 consent application does not include any reference to or provision for competitions involving non-Club members. It is clear that use on a Saturday or a Sunday is for members only. No other types of uses were identified for weekends whereas they were for the "occasional" use on weekdays (by "members, police and other groups"). The use of the facility by non-members at weekends is not "in general accordance with the details submitted with the application" as required by Condition 2 of the 2001 Consent, and accordingly is not authorised by the Consent.

Police use

[182] We are very aware of the importance of training facilities for Police staff. Nevertheless, we have no jurisdiction to allow training activities to be undertaken in excess of what is authorised by the 2001 Consent. The 2001 consent application is specific stating that Police use of the Site will be on "occasional weekdays".

[183] The Police training is identified by four submitters as being of particular concern to them. The Glock pistols used by the Police are one of the noisiest firearms used at the Site, with noise levels of 70 dB $L_{AF\ max}$ or higher being received at 155 and 180 Gaddums Hill Road, whichever range is in use.



[184] The days sought by the Police are well in excess of the original “occasional weekdays” in the 2001 consent application. The hours sought are extensive for the level of noise generated (even though it may not be continuous) and can go into the night from time to time. This was not sought in the application.

[185] Taking the above into account, we are satisfied that the use sought by the Police very significantly exceeds what is authorised by the 2001 Consent. Consequently, it cannot be authorised through the current Review and would require a variation to the existing consent or a new consent.

Use of the Site by Groups

[186] We are satisfied that some use of the Site by groups, such as school groups, on “occasional weekdays” is authorised by the 2001 Consent, but that the Club is not open to other users at any other time, unless by arrangement as stated by the Club in 2000.¹¹⁴ Any such use would have to occur on the “occasional weekdays” at the times when the Site is being used by Club members and the Police to avoid extending the number of days noise is generated. Some control on the type of firearms that can be used will also be required.

Types of firearms

[187] As noted earlier in our decision, documentation accompanying the 2001 consent application stated, “Firearms to be used” as “Revolvers, Pistols and Police 223 Rifles”. This indicates to us that any use of shotguns or any use of rifles by anyone other than the Police would likely need to be authorised by an application to vary the 2001 Consent. We also note that the application relates to the activities of a pistol club, not a gun club or shooting club, and in our view, it can reasonably be inferred that the purpose of the Club was for Club members to shoot pistols, not rifles and shotguns. However, we accept that some use of rifles on occasional weekdays by Police was applied for.



¹¹⁴ Letter from the Club to the Council, 15 November 2000, CB page 585.

Overview and commentary in relation to what activities are authorised by the 2001 consent

[188] By way of an overview, we consider that, based on the 2001 consent application, the maximum number of days authorised by the 2001 Consent in any year is 116, less any public holidays falling on authorised shooting days. We are satisfied that no competitions are authorised by the 2001 Consent and that Ranges 3 and 4 are not consented.

[189] We are not satisfied that the use of shotguns, the use of rifles other than by the Police or the use of the loudest firearms is authorised by the 2001 Consent. However, this could be tested by way of an application for a variation to the 2001 Consent. That is a matter for the Club and the Council to address.

K. Evaluation and findings

Our approach

[190] Under s 131(1) of the Act we must have regard to the matters in s 104 of the RMA, and whether the activity allowed by the 2001 Consent will continue to be viable after the change. We may have regard to the manner in which the 2001 Consent has been used. Under s 132(1), we may change the conditions of the 2001 Consent if one of the circumstances specified in s 128 of the Act applies.

[191] Section 104 requires that we must, subject to Part 2, have regard to effects (actual, potential and positive), any relevant provisions of national standards or policy statements, regional policy statements or regional or district plans, and any other matter we consider relevant and reasonably necessary to determine the Review.

[192] In the following section we address:

- (a) the underlying matters on which we rely;
- (b) section 16 RMA;
- (c) reverse sensitivity
- (d) noise effects;



- (e) relevant plan provisions;
- (f) other relevant matters
- (g) what changes are required to the conditions?
- (h) viability of the activity following change of conditions;
- (i) Part 2.

Underlying matters

[193] The underlying matters on which we rely are:

- The purpose of the Review is to consider the adverse noise effects of the Gun Club activity and determine what conditions could address those effects.
- Compliance with a noise limit in a resource consent condition does not preclude us from determining that noise exceeds a reasonable level.¹¹⁵
- We note the Council's advice that, as there were no obvious inaccuracies in the application, the consent cannot be cancelled in accordance with s 132(3) of the Act.¹¹⁶
- There are significant differences between the activities the 2001 Consent authorises and those being undertaken at the Site.
- The evidence of the noise experts, which we accept, that the L10 noise limits in the 2001 Consent are "completely unsuitable for the measurement of gunfire noise".¹¹⁷ and in Dr Chiles' words "technically flawed and ineffective at managing shooting noise effects."¹¹⁸



¹¹⁵ *Nelson City Council v Harvey* [2011] NZEnvC 48 at paragraph [64].

¹¹⁶ We note also that this ground was not advanced by the Council or the Appellant in the hearing.

¹¹⁷ JR Styles SOE dated October 2018, paragraph 2.1 - attached to his "Will-say" statement, CB page 14.

¹¹⁸ Dr Chiles SOE at paragraph 10, CB page 109.

- The evidence of Mr Styles and Dr Chiles, which we accept, that “Setting aside the viability of GPC and legal/planning issues of “who was there first”, with the time limitations for GPC in the Council decision, we agree that 55 dB LAFmax would be an appropriate noise limit at the neighbouring houses, for shooting by all users of the ranges.” For the avoidance of doubt, we consider this to be a clear statement of the experts’ professional opinions based on their specialist expertise alone, without any consideration of wider planning and legal issues. Further, we note that both experts agree this limit is to apply to shooting by “all users of the ranges”.

Section 16 of the Act - Duty to avoid unreasonable noise

[194] Section 16 is relevant to our determination of the appeal. We are to have regard to the effects of the Gun Club activity under s 104 but consider that in determining the most appropriate conditions for the activity, the obligation placed on occupiers of land with regard to noise emissions is relevant.

[195] Section 16 of the Act requires:

Every occupier of land ... shall adopt the best practicable option to ensure that the emission of noise from that land ... does not exceed a reasonable level.

[196] Under the Act, the best practicable option (**BPO**):

...in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to -

- (a) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and
- (b) the financial implications, and the effects on the environment, of that option when compared with other options; and
- (c) the current state of technical knowledge and the likelihood that the option can be successfully applied.

[197] In *Empire Entertainment Ltd v Ellzin Trust and others*, the High Court stated that s 16 imposes a general duty on all occupiers of land to control the emission of noise from that land. It said: “Whether the section focuses on the duty to adopt the best practicable option or not, the clear intent of the section is to limit emissions of noise from land to



reasonable levels”,¹¹⁹

[198] It is clear to us that the outcome of this case ultimately depends on what we define as reasonable noise, taking into account a balanced consideration of all the relevant facts. In *Ngataringa Bay 2000 Inc v Attorney General*, the Tribunal observed (referring to *Auckland Kart Club Inc v Auckland City Council*):¹²⁰

... that what is reasonable in terms of s 16(1) is what is reasonable to the receiver of the noise; that what is reasonable is a question of fact and degree; that it was necessary to consider separately the technical options and the financial implications; and after having done so, found that the best practicable option was the optimum combination of all the methods available to limit the noise to the residents to the greatest extent achievable, and that the 60 dBA noise level was the best option available to protect the residents. (*Our underlining*)

(references omitted)

[199] We refer later and in more detail to the *Harvey*¹²¹ decision, but agree with the Court’s finding that nothing in the Act suggests that pre-existing noise should be subject to any lesser degree of control or mitigation than more recent noise.

[200] The Club believes its management of the Site is in line with the provisions of s 16 of the Act.¹²² However, it provides no meaningful assessment of the BPO and no comparison with any methods other than to continue largely as at present. Instead, it relies on three statements substantiated with little, if any, evidential support or justification:

- The Club meets s 16 by strictly adhering to maximum timeframes and days of shooting as communicated, so neighbouring residents are clear when shooting may be expected, and when no shooting will occur.¹²³
- The full enclosure of the range is beyond the financial means of the Club and that shooting on a covered range would prevent IPSC shooting, which is an essential part of the Club’s activities. No costings have been prepared.¹²⁴

¹¹⁹ *Empire Entertainment Ltd v Ellzin Trust and others* [2010] NZRMA 525 at [41].

¹²⁰ *Ngataringa Bay 2000 Inc v Attorney General* A16/94 at page 14- 15, referring to *Auckland Kart Club Incorporated v Auckland City Council* A124/92.

¹²¹ *Nelson City Council v Harvey*, [2011] NZEnvC 48.

¹²² H van Kregten SOE at paragraph 34, CB page 80.

¹²³ H van Kregten SOE at paragraph 35, CB page 80.

¹²⁴ H van Kregten SOE at paragraphs 45 and 46, CB page 81.



- The Club is reluctant to restrict the use of noisier firearms, as these are considered essential in training for competitions that the Club members engage in.¹²⁵

[201] Mr Webb submitted that the noise experts agree there are no practical measures that would reduce noise to an acceptable level. We had no evidence that the Club was willing to consider any reduction in noise levels of any kind.

[202] We return to this later but make the following preliminary observations in relation to s 16:

- (a) the nature of the discharge is the emission of noise that both noise experts and residents agree is unreasonable and in the residents' views is intolerable at times;
- (b) the receiving environment is sensitive to adverse noise effects and the evidence is clear that the effects are at least significant and, in our view, very significant – to the point where residents' health is being adversely affected and some have to leave their homes on occasion to get relief;
- (c) we cannot see what basis there is for arguing that an activity can result in effects of the scale currently being generated and continue unabated because there are no financial resources to mitigate the effects. The intent of s 16 is to avoid unreasonable noise, so while mitigation is one option for reducing noise levels, avoidance of some activities is another.

Reverse sensitivity

[203] We set out our understanding of how the surrounding area has developed earlier in our decision. This matter assumed some importance in the hearing. The arguments can be broadly summarised as follows. The Club argued that residents living in the vicinity of the Club all 'came to the nuisance' and as such should accept the noise effects the Club generates albeit subject to some level of control. The Council argued that factor was relevant to determining what level of noise is reasonable. The Appellant argued that, if the Club and the Council are correct, an activity would never need to change so as to reduce its effects on others.



¹²⁵ H van Kregten SOE at paragraph 47, CB page 82.

[204] In support of his submission that the residents came into an existing environment, and are, therefore, not entitled to the degree of rural peace they might otherwise expect, Mr Webb referred to a number of English authorities. First, he acknowledged that it is generally accepted that it is not a defence to a claim in nuisance to show that the plaintiff has come to the nuisance.¹²⁶ Secondly, and with reference to *Coventry v Lawrence*,¹²⁷ he submitted that there had been "some reprieve from the rigidity of this common law rule."¹²⁸ He cited from that decision:¹²⁹

Accordingly, it appears clear to me that it is no defence for a defendant who is sued in nuisance to contend that the claimant came to the nuisance, although it may well be a defence, at least in some circumstances, for a defendant to contend that, as it is only because the claimant has changed the use of, or built on, her land that the defendant's pre-existing activity is claimed to have become a nuisance, the claim should fail.

[205] With reference to the development of the surrounding area, Mr Webb submitted that the Club is having to defend its consent against a set of approvals and circumstances over which it has no control; it is the change of use of the surrounding area that gives rise to the nuisance.

[206] In closing, he submitted that "the decision of the Appellant (and two of the section 274 parties) to buy property in the vicinity of GPC's range without diligent (sic) checking its operations and effects was foolhardy". Mr Webb referred to Lord Denning's dissenting judgment in *Miller v Jackson*,¹³⁰ who considered that the proper approach was for the Court to "balance the right of the cricket club to continue playing cricket on their cricket ground," as they had done for 70 years, "as against the right of the householder," whom he described as "a newcomer" who had built a house on the edge of the cricket ground which four years ago was a field where cattle grazed".¹³¹

[207] Mr Williams referred to *Ports of Auckland Limited v Auckland City Council* where the High Court confirmed "It is no defence at common law that the plaintiff has come to the nuisance."¹³²

¹²⁶ *Sturges v Bridgman* (1878) 119 CHD 852, *Coventry v Lawrence* [2014] UKSC 13.

¹²⁷ *Coventry v Lawrence*, above n 126.

¹²⁸ The Club's Opening submissions at paragraph 25.

¹²⁹ *Coventry v Lawrence* [2014] JPSC 13.e at paragraph 58.

¹³⁰ *Miller v Jackson* [1977] 1 QB 966 at pages 976, 981.

¹³¹ We note that Mr Webb did not advise us that Lord Denning was in the minority.

¹³² *Ports of Auckland Ltd v Auckland City Council* (1998) 5 ELRNZ 90 at page 103.



[208] The Court emphasised that planning decisions should be internally consistent and there must be created a seamless whole that reconciles competing uses. It said:¹³³

It would be simplistic to say that because the Port company has its position recognized by the relevant planning documents it cannot be the subject of a successful claim for nuisance. In *Wheeler v JJ Saunders Ltd* planning permission to accommodate pigs for breeding did not insulate the defendants from an injunction and damages relating to strong smells emanating from the premises.

[209] We accept that the High Court's decision should inform our approach to the submissions about nuisance in this case.

[210] Mr Williams also referred us to *Auckland Regional Council v Auckland City Council*¹³⁴, where the Environment Court observed:

We do not accept the submissions based on leaving promoters of enterprises to judge their own locational needs, not protecting them from their own folly, or failing to consider the position of those who come to a nuisance. We consider that those submissions do not respond to the functions of territorial authorities under the Resource Management Act, nor do they respond to the thrust of the provisions sought by the Appellant.

[211] We were also referred to the Court of Appeal's decision in *North Canterbury Clay Target Association Incorporated v Waimakariri District Council*.¹³⁵ The Court found that a certificate of compliance did not protect the Gun Club from encroachment by subsequent dwellings. In other words, it confirmed that the notional boundary at which noise measurements were to be taken is ambulatory.¹³⁶

[212] All counsel referred us to *Harvey*,¹³⁷ where the Court said, in relation to the pre-existence of an activity:

[83] Firstly, although we accept that pre-existence of a noise generating (or other) activity may commonly be a relevant factor in determining questions of reasonableness, offensiveness or objectionability, we do not consider that it will necessarily be the decisive factor in any case. Noise or other adverse effects may be unreasonable, offensive or

¹³³ *Ports of Auckland Ltd v Auckland City Council* (1998) 5 ELRNZ 90 at page 106.

¹³⁴ *Auckland Regional Council v Auckland City Council*(1997) 3 ELRNZ 54 at page 61.

¹³⁵ *North Canterbury Clay Target Association Incorporated v Waimakariri District Council* [2016] 20 ELRNZ 175

¹³⁶ Mr Randall also referred us to the Environment Court's decision in that proceeding in support of the submission that it is appropriate to apply a plan rule, even if the measurement used is not suitable for gunfire.

¹³⁷ *Nelson City Council v Harvey* [2011] NZEnvC 48 at paragraphs [83], [104] and [105].



objectionable notwithstanding that they existed in a particular area before other people arrived there. Mr Camp's approach of making an automatic loading for the pre-existence of the noise is, in our view, far too simplistic.

[104] In any event, we had not accepted the proposition that because someone moves to a nuisance it means they have to put up with it. ...

[105] In making that comment we are aware of the common law principle that relief might not be granted to someone who has come to the nuisance. However, we consider that the overriding RMA purpose of promoting sustainable management (as defined in s5(2)) requires the application of considerably wider criteria than just who was there first. We note that s31(1)(d) RMA provides that the functions of local authorities include ... *the control of the emission of noise and the mitigation of the effects of noise*. Nothing in RMA suggests that pre-existing noise should be subject to any lesser degree of control or mitigation than more recent noise.

[213] We see similarities between the *Harvey*¹³⁸ case and the case before us, not least of which is the evidence of Dr Chiles where he said that "the GPC activity is likely to be loud and intrusive at neighbouring houses. ... However, in my opinion residents moving into this area should have had some expectation of this disturbance".¹³⁹ He also considered that the current noise levels would be unreasonable if a new shooting range was established. However, the fact that houses came to an existing noise source should alter the amenity expectations of residents.¹⁴⁰

[214] As in the *Harvey* case, we consider that Dr Chiles stating someone "coming to the noise" should expect higher than normal adverse effects is too simplistic and only one of the factors to be considered. In contrast, Mr Styles considered it appropriate to determine what is a reasonable level of noise without regard to that factor. We record that the witnesses were diametrically opposed on this point, with some comments of an inappropriate personal nature made.¹⁴¹ We consider Mr Styles' approach to be particularly relevant in the circumstances of this case and deserving of greater weight than Dr Chiles' approach.

¹³⁸ *Nelson City Council v Harvey* [2011] NZEnvC 48.

¹³⁹ Dr Chiles SOE at paragraph 12, CB page 109.

¹⁴⁰ Dr Chiles SOE at paragraph 28, CB page 112.

¹⁴¹ We consider that Dr Chiles' reference to a statement made by Mr Styles (Transcript pages 110, line 28 and 112, line 11) as "absurd" and "bizarre" is unhelpful and disrespectful. Section 7.2(c) of the Court's Practice Note 2014 requires that every expert witness is expected to treat the evidence of experts called by other parties with the respect due to the opinions of a professional colleague, even if there is a fundamental disagreement between the views each expresses. Any criticism should be moderate in tone and directed to the evidence, and not the person.



[215] We consider the following matters are relevant to the issues raised about nuisance and reverse sensitivity:

- At the time of the 2001 consent application, both the Club and the Council were aware that noise could become an issue in the future, even though it was not at that time because of the rural residential zoning of the surrounding land.
- The Eagle Eye Developments Limited Subdivision was processed as a restricted discretionary activity with no discretion related to noise or amenity under the District Plan rules.
- Nevertheless, the Club was identified as an affected party for Stage 2 of the subdivision and provided a letter of support, even though the subdivision was located immediately adjacent to or near the Site's boundary.
- The Wainui Park subdivision was processed as a full discretionary activity. The documentation provided to us indicated that the reporting officer recognised the presence of the Club and identified that reverse sensitivity was a main resource management issue but did not address reverse sensitivity in terms of the subdivision being near the Club.
- The residents acknowledge they were aware of the existence of the Club in the locality but had not experienced or did not anticipate the levels of noise now generated by the Club.
- Having granted various subdivision consents in the immediate vicinity of the Site, the Council can reasonably be expected to have been aware of reverse sensitivity concerns before it extended the Site's lease.
- The levels of noise being generated by the Club's activities are significant.
- There are questions surrounding the extent of activities authorised by the 2001 Consent and now undertaken by the Club.

[216] In our view, it is abundantly clear that all three parties were aware of the potential for adverse noise effects to occur from the Club's activities but that does not alter the fact that noise levels must be reasonable, which is the primary focus of our decision. Put another way, even if the residents came to an area where there was no expectation of residential development occurring in the locality of a noisy activity at the time consent



was granted, the obligations of s 16 would apply and noise would have to be controlled at reasonable levels.

Noise effects

Existing effects

[217] For the Appellant, Mr Williams submitted that "It would with respect be an aberration to allow a recreational activity with such irrefutably significant effects on the health and wellbeing of those living in the setting to continue, in such unrestrained fashion. That outcome would I submit be both without precedent under the RMA, and the slightest degree of merit in sustainable management terms".¹⁴²

[218] The positive effects of the activity were described as providing a facility for members to practice a range of shooting sports and for the Police to conduct firearms training.

[219] From our review of the evidence of the noise experts and of the residents, there is a high level of consistency between what the experts predict the noise effects of the Club's activities will be and the effects being experienced by the residents. We are satisfied that:

- Up to 5,000 shots can be fired in a day.
- For noise levels up to 75 dB L_{AFmax} , each shot will be loud and obtrusive preventing relaxation outside, causing considerable disturbance inside with doors and windows open with shots being clearly audible even with doors and windows closed. Most people will be highly annoyed.
- At higher sound levels such as 85 dB L_{AFmax} , each shot will cause increased disruption to residential activity and is likely to cause serious annoyance. The experts agree that residents are likely to experience startle reactions, and that is confirmed by the evidence of residents.
- Seeking respite indoors is unlikely to provide much relief and will generally not be possible in warmer weather with windows and doors open.



¹⁴² Appellant's opening submissions at paragraph [15].

[220] Mr Styles stated that the noise effects from shooting at higher decibel noise levels would be very loud and completely dominant in the environment. Dr Chiles stated that the Club activity is likely to be loud and intrusive at neighbouring houses and that from the time residential development occurred within approximately 500 m of the Club, it has generated unreasonable noise due to the unconstrained times of activity.

[221] The residents' evidence variously describes the effects as: "anxiety producing and unpleasant", "intolerable", "very stressful", "just too intense" and "gives you a fright and causes your heart to race". Other descriptions are "we feel like prisoners in our own home and are forced to leave our home", "dreads going outside when the red flag is being flown", "even inside with the windows closed, shots are clearly audible and disturbing", "no human can be expected to endure that gunfire noise, that often, at that level" and "the sudden impact of these loud shots gets our hearts racing and the kids have to cover their ears".

[222] We found the evidence of all the residents opposing the activity to be credible, reliable, and genuine in terms of describing their experiences. Their descriptions of the effects they were experiencing were consistent with the effects the noise experts considered can be expected at the noise levels being generated. In combination, this provides a very strong and compelling statement of what effects the Club's activities are causing. We are satisfied that those effects are unreasonable by any measurement yardstick and by a substantial amount. The amenity effects are particularly serious if some residents have to leave home to get respite and, in our view, there is evidence that the now existing noise environment has the potential to cause and is causing adverse health effects.

[223] These effects have continued unabated for almost 10 years, and have likely increased as shooting practices and firearms have changed over time.

What is reasonable in terms of future noise effects and future noise limits

[224] We start by observing that in situations where consents for high noise generating activities have been granted without noise limits, the activities occur substantially less frequently than three to five times a week, or even two or three times a week almost year-round. This is the case for the examples referred to by Dr Chiles and those in Mr Randal's closing submissions, such as Eden Park and motorsport tracks. Consequently, we do not accept that these examples are a valid basis for not setting a noise limit for the Club's



operations.

[225] As recorded in paragraph [123], Dr Chiles and Mr Styles agree that 55 dB L_{AFmax} would be an appropriate noise limit at the neighbouring houses.

[226] The positions of the parties in relation to reasonable noise can be summarised by the following:

- Mr Webb said the Court can invoke s 16 of the Act and the BPO, but the BPO is not the imposition of a 55 dB L_{AFmax} noise limit because all noise experts agree that none of GPC's activities at its range could comply with that limit.
- Mr Randal submitted that imposing a limit of 55 dB L_{AFmax} would go to the heart of the activity that was consented in 2001 and that the Council's position is that such a limit is contrary to the principle that s 128 reviews should not prevent the activity for which the resource consent was granted.
- Mr Williams submitted that his client's case rests on a very simple proposition that that there be a noise limit, as the noise limit is the vital control. He submitted in his opening that a noise limit of 50 to 55 dB L_{AFmax} is appropriate.
- In his closing submission filed with the agreement of the other parties, Mr Williams said that if the Court rejected his fundamental submission, the Appellant proposed the acceptance of a higher noise limit on an interim basis. This limit was 65 dB L_{AFmax} if shooting was confined to Saturdays and two weekdays or 75 dB L_{AFmax} if shooting was confined to Saturdays and one weekday. This interim period would be for 18 months to two years following which the 55 dB L_{AFmax} limit would apply.

[227] In determining what is reasonable under s 16(1), we consider that what is reasonable to the receiver of the noise is highly relevant to our decision.¹⁴³ On that basis the level of noise that is required to ensure the residents can have reasonable enjoyment of the environment they live in is 55 dB L_{AFmax} .

[228] From the Club's perspective, it wishes to continue IPSC and CAS shooting, even if it is for reduced periods of use compared to historical levels. Dr Chiles said that, in his



¹⁴³ Relying on the reasoning in *Auckland Kart Club Incorporated v Auckland Council* A124/92 and *Ngataranga Bay 2000 Inc v Attorney General* A16/94 decisions.

opinion, existing noise levels will be reasonable if the duration of shooting does not exceed 17 hours a week. Mr Styles considered use at present levels would only be reasonable if it occurred no more than six to 10 days a year.

[229] In our evaluation of this issue, we took into account the following:

- Ms Hawes provided us with various versions of how many hours the Club now operates, most recently either 17 or 20 hours a week. Two local residents estimate that actual hours of use have been in the order of 15 to 17 hours a week. We consider that actual shooting hours are important as, if we were to adopt Dr Chiles' recommendation, noise effects would continue largely as before, which in our view is unacceptable.
- At the current higher noise levels, the noise experts predict that residents will be startled. It is unacceptable for this to continue unabated.

[230] For those reasons we do not accept Dr Chiles' recommendation as providing an acceptable outcome. Similarly, we do not accept that six to 10 days use a year at current levels, as considered appropriate by Mr Styles, would be workable or is appropriate.

[231] We do not consider continued use of the Site with no reduction in current noise levels can be considered reasonable under any circumstances without reducing the hours of use to the point where the Club could not function. We consider that the point made in paragraph [202] (b) is a key factor in terms of what is reasonable, or unreasonable. Regardless of any desire of the Club to continue shooting loud firearms, that cannot come with such adverse effects on other people's amenity or, more importantly, at the expense of other people's health.

[232] In considering what reduced limits might constitute reasonable noise, we took into account the noise emitted from different firearm types and the noise experts' advice on the effects of shooting noise at different levels. Dr Chiles said that "As a guide for regular shooting I would expect there to be slight annoyance for most people at 50 to 55 L_{AFmax} and moderate to high annoyance at 60-70 L_{AFmax} ".¹⁴⁴ Mr Styles opinion is that if the limit is 63 dB L_{AFmax} , as recommended by Mr Hegley at the Council hearing, then the hours each week should be reduced to nine.



¹⁴⁴ CB page 594, Response dated 28 June 2018 to question from Mr Sowersby when preparing the s 42A Report.

[233] A review of Tables 1 and 2 in Dr Chiles' Statement of Supplementary Evidence and reproduced above, shows a number of different firearms could continue to be used if the noise limit was 65 dB L_{AFmax} . We consider that any higher limit would cause unreasonable levels of annoyance and result in unacceptable adverse effects on the amenity and health of nearby residents, taking into account the noise experts' evidence that people react at lower levels of shooting noise than general noise.

[234] This is higher than the 63 dB L_{AFmax} limit referred to in the evidence of the Club's own noise expert to the Commissioner's hearing. While we acknowledge an additional 2 dB would be necessary to allow the continued use of some firearm types, we consider that is not unreasonable under all the circumstances of the case, provided it is for a limited or interim period only. We consider that interim period is to be no more than two years, which provides time for the Club to investigate alternative methods, including alternative sites as part of a comprehensive BPO assessment to reduce noise to reasonable levels.

[235] By way of a summary, we consider that as a minimum, a very significant immediate interim reduction from current noise levels to 65 dB L_{AFmax} must occur for health and amenity reasons. Within two years, the level must reduce further to the 55 dB L_{AFmax} recommended by Dr Chiles and Mr Styles, which is consistent with levels considered appropriate in a number of other New Zealand locations.

[236] Our interim finding is to prohibit the use of the Glock pistols at the Club for more than three hours each day of shooting and then only for a two-year interim period. This is because of their very high level of noise. The Police are invited to submit to the Court about whether noise suppressors can be fitted to the pistols or whether quieter alternative pistols could be used for training purposes to comply with the 65 dB L_{AFmax} interim period noise limit. Having considered this submission, the Court will then make a final decision on whether or not to make an exception for the use of Glock pistols.

Relevant plan provisions

[237] The only relevant planning document to which we were referred is the TRMP. We have set out the relevant provisions earlier. They have informed our overall assessment.



Other relevant matters

[238] Under this head we consider s 104(1)(c) other matters. It is convenient to also consider here s 131(1)(b) which provides that we may consider the manner in which the Consent has been used.

[239] Matters relating to the lease and the need for a discharge consent are not matters before the Court and we do not address them in this decision.

[240] We consider the expansion of activities at the Club over time compared to what is authorised by the 2001 Consent to be a relevant matter.

[241] In considering this matter, we took into account the following:

- The Club has been shooting on many weekdays each year for many years, but the 2001 Consent is based on an application for use on “occasional weekdays”.
- When the Review was initiated to address adverse effects arising from the Club’s current activities, the Club sought to increase the days and hours of operation, which would result in increased adverse effects as no reduction in intensity of use or mitigation was offered in return.
- The Club added two additional ranges without seeking consent from the Council to vary its land use consent.
- The Club has allowed substantially increased use by the Police for training well in excess of the “occasional weekdays” stated in the application, based on which the 2001 Consent was granted.
- It appears there has been a significant intensification of use. Rifles and shotguns are now used which were not part of the application or authorised by the 2001 Consent, except for the use of rifles by the Police on occasional weekdays.

[242] We consider that the Club has not complied with the requirement of Condition 1 of the 2001 Consent to undertake its activities “in general accordance with the details submitted with the application”. Further, it has not followed any of the requirements of the Act to seek a variation to the Consent before proceeding with additional or an extension of authorised activities that would or could have the potential to increase



adverse effects.

[243] In view of the extent of adverse noise effects occurring, it is unclear to us why the Council did not more closely consider the activities being undertaken by the Club in relation to what is authorised by the 2001 Consent and why it did not progress the Review faster than it did.

What changes are required to the conditions?

[244] As set out earlier in our decision, we consider that as a minimum, a very significant immediate interim reduction from current noise levels to 65 dB L_{AFmax} must occur for health and amenity reasons. Within two years, the level must reduce further to the 55 dB L_{AFmax} recommended by Dr Chiles and Mr Styles and taking into account levels considered appropriate in a number of other New Zealand locations. These findings set out what we define as "reasonable noise" in the context of s 16.

[245] We now turn to s 16, which requires the Club to adopt the BPO to ensure the reasonable noise level is not exceeded. We were guided by the approach taken in *Auckland Kart Club*¹⁴⁵, that the best practicable option was the optimum combination of all the methods available to limit the noise to the residents to the greatest extent achievable.

[246] Based on the evidence, including responses to our questions relating to options at the hearing, the methods available are:

- (a) limiting the types of firearms that can be used at the Site;
- (b) limiting the days and hours of use;
- (c) limiting the number of rounds fired;
- (d) limiting the number of ranges used at one time;
- (e) physical noise mitigation methods such as covering ranges or shooting from insulated structures; and
- (f) finding an alternative site.



¹⁴⁵ Refer paragraph [195] of our decision.

[247] Ultimately, it is the Club's decision as to how it determines the BPO, and we have focussed our attention on conditions relating to the hours of operation, noise levels and location within the Site.

[248] However, the starting point must be that existing noise levels are too high, too intense and go on for too long to be reasonable. While the Club has made it clear it does not want to be restricted or modify its current activities to any significant extent, that is not an option open to it.

Days and hours of operation and noise limits

[249] We determined earlier in our decision that to comply with the 2001 Consent after an interim period, the number of days when shooting can occur is 116 days a year. This means that shooting can occur on approximately one third of all days on a year-round basis, but ensures that for the remaining two thirds of all days, residents will be able to enjoy their local environment without interruption from gunfire. We do not consider that shooting on a greater number of days a year would meet the s 16 requirement for noise to be reasonable.

[250] Accordingly, the Club can operate on Saturdays and one weekday each week and every fourth week can operate on an additional weekday (every second week during the interim period). The choice of weekdays can be decided by agreement between the parties. For the purposes of preparing the Draft Conditions, we have decided on Tuesdays and every second Wednesday (until 30 June 2022) and Tuesdays and every fourth Wednesday (after 30 June 2022). There is to be no shooting on Sundays, public holidays and from Christmas Eve day (midnight on 23 December) until midnight on 2 January each year. Police use shall be up to two weekdays a month for two years, then one weekday per month.

[251] Based on the evidence, we accept that with a noise limit of 55 dB L_{AFmax1} , the 17 hours a week allowed in the Commissioner's decision will not result in unreasonable noise. The hours included in the conditions average 17 hours a week in the longer term. For simplicity, we have adopted the same days and hours for the interim period.

[252] We strongly suggest that the Club recognises the adverse effects it is having on its neighbours and starts to work constructively with them to minimise those effects to the greatest extent achievable. The authorised operating hours are to be recorded on the



sign board to be erected near the site entrance.

[253] A limited exception can apply to Police use of Glock pistols for a period to midnight on 30 June 2022.

Location of activities within the site

[254] Shooting can only occur on Ranges 1 and 2. The Council supported a condition limiting use to two ranges at any time.¹⁴⁶

Viability of the Club following change of conditions

[255] We are required by s 131(1)(a) to have regard to whether the activity allowed by the consent will continue to be viable after the change *in conditions*.

[256] The matter of viability is difficult. The Club asserted that:

- (a) the Review Decision "sets out a sensible and workable solution, even if it significantly curtails GPC/s activity";¹⁴⁷
- (b) the imposition of a 50-55 dBa $L_{AF\ max}$ noise level cannot be met, and "will mean there is no regard to whether the activity allowed by the consent will continue to be viable",¹⁴⁸ "either the activity cannot continue or the activity will be so limited in scale that GPC will never be able to sustain a viable membership";¹⁴⁹
- (c) IPSC shooting is an essential component of the Club's activities – restriction of use to a covered range precludes that;¹⁵⁰
- (d) further restriction of operating hours limits the ability of Club members to participate as many are working and unable to use the Club during weekdays. Such restriction will not enable the Club to attract new members. Gradual renewing of memberships is a necessary part of the viability of any club;¹⁵¹



¹⁴⁶ Closing submissions at paragraph 46 (b).

¹⁴⁷ The Club's Opening submissions at paragraph 12.9 and paragraphs 16 and 16.1.

¹⁴⁸ The Club's Opening submissions at paragraph 12.5

¹⁴⁹ The Club's Opening submissions at paragraph 16.1.

¹⁵⁰ H van Kregten SOE at paragraph 82.

¹⁵¹ H van Kregten SOE at paragraph 82.

- (e) Club competitions are also a key part of the Club's viability. It is an established custom that, when members compete in competitions elsewhere, the Club hosts other Clubs for competitions in Gisborne;¹⁵²
- (f) the cost to the Club for acoustic screening will be prohibitive.¹⁵³

[257] In considering the Club's viability, we are faced with a situation where:

- (a) the noise limits in the 2001 Consent are not appropriate as a metric or criterion for measuring shooting noise (refer paragraph [118]) and, in the opinion of Dr Chiles, "technically flawed and ineffective at managing shooting noise effects";¹⁵⁴
- (b) existing noise levels arising from Club activities are unreasonable by a very significant degree.

[258] We determined that it was necessary to thoroughly review the 2001 Consent, the operation of the Gun Club, the effects of the noise it generated and how the adverse effects of the noise could be properly addressed.

[259] We have set out what we consider to be necessary for Club activities to address the adverse noise effects.

[260] The viability of the Club cannot be assessed on the assumption that:

- (a) it can operate as of right for the days and hours it has operated in the past. The starting point must be that it operates within the limits of what was applied for at the time Consent was granted, which we have determined as 116 days a year;
- (b) it can operate at levels of shooting noise, loudness and intensity that continue to cause adverse effects on the amenity and health of nearby residents;
- (c) the requirements of s 16 and meeting the purpose of the Act can be ignored.



¹⁵² H van Kregten SOE at paragraph 82.

¹⁵³ H van Kregten SOE at paragraph 82.

¹⁵⁴ Dr Chiles SOE at paragraph 10, CB page 109.

[261] In view of the above, viability cannot be assessed from the starting point of what is occurring now. The Club's assertion that it is meeting the BPO is not supported by any consideration of the nature of the noise or the sensitivity of the receiving environment to the adverse effects of noise. Further, the Club provided no real assessment of alternative methods, the financial implications, or the effects on the environment of continuing with present activities compared with any other options, such as a reduced level of Club activities.

[262] We cannot see what basis there can be for assuming that an activity can result in effects of the scale currently being generated and continue unabated because there are no financial resources to mitigate the effects. Mitigation is one option, avoidance of some activities is another, which the Club appears unwilling to accept to the necessary extent.

[263] We acknowledge that, under the conditions of the Review, the Club will not be able to continue with all its activities. However, many of those activities are outside the terms of the 2001 Consent. No evidence was presented to demonstrate that the Club cannot continue to operate in some reduced form to ensure no unreasonable noise, save for the assertions made about IPSC shooting and hosting of competitions.

[264] We are satisfied that the conditions are necessary and appropriate to address the adverse effects of the Club's activities. A consequence of the new conditions is that some activities Club members want to continue will not be possible. We have included in the conditions an interim period of two years, which provides sufficient time for the Club to seek a variation to its existing consent to allow other activities or to seek new consents for more activities at the Site or an alternative site.

Part 2

[265] The Council endorsed the analysis of Part 2 matters contained in the s 42A Report. Mr Webb did not refer to Part 2.

[266] Mr Williams said that "The Appellant and s 274 parties further submit that the Part 2 considerations of relevance to this review are overwhelmingly in favour of their position". He also submits, with respect there are no Part 2 considerations militating in favour of, in effect, continuation of the *status quo*.



[267] We did not find the analysis in the s42A Report helpful. In closing, Mr Randal submitted that “the GPC site provides a recreational resource for members of the Club, which contributes to the social well-being of those members”. and that the “GPC Site also provides a valuable resource for NZ Police training, which contributes to the wider community’s health and safety...”. He further submitted that on the other hand, ss 5, 7(a) and 7(c) matters weigh in favour of more stringent conditions, and that Part 2 does not “provide the answer” in this case.¹⁵⁵

[268] Based on our own evaluation of Part 2, we agree with Mr Randal’s submissions as far as they go. However, we do not consider that the current activities promote the sustainable management of natural and physical resources because they do not avoid, remedy, or mitigate adverse noise, amenity and human health effects on the environment.

[269] We note that adverse noise effects can extend 500 m from the Site, which affects an area of approximately 80 hectares of land zoned for rural residential development. In our view this is a large area to be significantly adversely affected by a recreational activity on public reserve land on a year-round basis.

[270] We find that a significant reduction in current levels of Club activities is required to achieve a reasonable noise environment for the surrounding residents and we have decided on the conditions necessary to achieve that.

L. Section 290A – Commissioner’s Decision

[271] Section 290A of the Act requires us to have regard to the Commissioner’s decision and we have done so. We have reached a different view on how to address the effects of the activity.

[272] Most particularly, we do not agree that limiting the hours of use without setting a noise limit will reduce noise to reasonable levels in accordance with s 16 of the Act or reduce noise levels to those necessary to mitigate the unacceptably high levels of adverse effects the activity is causing. We also consider that competitions are an intensification of the activity that should be avoided.



¹⁵⁵ Council’s closing submissions at paragraphs 57-59.

M. Result

[273] The Court determines the following:

- (a) **the appeal is allowed;**
- (b) **the resource consent PD 201041 shall be amended by the substitution of the conditions set out in Appendix 1 (Draft Conditions),**
- (c) **The Draft Conditions shall apply from 11.59pm on Monday 28 July 2020, subject to (d) below.**
- (d) **Parties may suggest alternative days and times to those set out for Club activities in Conditions 4, 5 and 7 by way of a joint memorandum no later than 5pm on Monday 14 July 2020, provided there is no increase in total days or hours of operation. The Club is to seek the views of NZ Police and should they wish to comment, their views shall be provided in the joint memorandum.**
- (e) **Having considered the parties' memorandum, the Court will then issue its final decision.**
- (f) **Costs are reserved. Any application for costs must be made within 10 working days of receipt of this decision and the party against whom costs are sought must respond within a further five working days.**

For the Court:



Environment Judge MJL Dickey



Appendix 1
Draft Conditions

- 1 The development be carried out in general accordance with the details submitted with the application (Reference PD 201041), except where those details are amended by the following conditions.
- 2 The Consent Authority may, subject to s 128 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this resource consent annually from the date the consent is granted for any of the following reasons:
 - To review the effectiveness of the conditions of this resource consent in avoiding or mitigating any adverse effects on the environment from the consent holder's activity and if considered appropriate by the Consent Authority, to deal with such effects by way of further or amended consent conditions.
 - To impose additional, or modify existing conditions of consent relating, but not necessarily limited to the matters specified hereunder if the Consent Authority considers it necessary to deal with any adverse effect on the environment which may arise from the exercise of this consent and which is appropriate to deal with at a later date:
 - (a) hours of operation;
 - (b) noise levels;
 - (c) vehicle parking; and
 - (d) location within the site.
- 3 There shall be no shooting on Mondays, Thursdays, Fridays or Sundays, all Public Holidays and the period between, and including, from midnight on 23 December to midnight on 2 January.



4 Until midnight of 30 June 2022, shooting at the Site may only occur on:

- Tuesdays from 0900 to 1700 hours;
- Saturdays from 0900 to 1600 hours; and
- Every second Wednesday from 0900 to 1700 hours.

In addition, the Police may undertake shooting up to 2100 hours on a maximum of two of the permitted weekdays in any calendar year.

5 From 1 July 2022 shooting at the Site may only occur on:

- Tuesdays from 0900 to 1700 hours;
- Saturdays from 0900 to 1600 hours; and
- Every fourth Wednesday from 0900 to 1700 hours.

6 A noise limit of 65 dB L_{AFmax} shall apply to all activities at the Site for the period to midnight on 30 June 2022. Thereafter, a noise limit of 55 dB L_{AFmax} shall apply to all activities at the Site. Noise shall be measured in accordance with NZS6801:2008 Acoustics – Measurement of Environmental Sound within the notional boundary (as defined within that standard) of any dwelling on another site.

7 Police may the use the Site for the period to midnight on 30 June 2022, subject to their operating within the hours set out in Condition 4 and subject to the use of silencers on Bushmaster rifles at all times. Glock pistols may be used for no more than three hours a day on any of the days a year of police use. In all other respects, Police activities must comply with the noise limits for the Site. From 30 June 2022, Police use must comply fully with the same conditions as other users of the Site, and may occur up to 12 weekdays a year.

8 The consent holder shall provide notice of intended Police Training activities on a publicly accessible club website at least 20 working days prior to the training taking place.



9 The Club shall maintain an accurate register of all activities at the Site to the satisfaction of the Gisborne District Council setting out:

- (a) times the Club is open;
- (b) times the Club is used each day;
- (c) number of people on site at any time;
- (d) activities being undertaken anytime a person is on site.

The register shall be made available to the Council on request at any reasonable time.

10 No competitions involving non-members of the Club are to take place at the Site.

11 Shooting may only occur on Ranges 1 and 2.

12 The consent holder shall install and maintain a sign board in a prominent position near the entrance to the Club and clearly visible and easy to read from Gaddums Hill Road. The sign must display:

- (a) The name of the Club and clearly including the word "pistol";
- (b) The operating days and operating hours of the Club in accordance with these conditions;
- (c) A notice stating the NZ Police training will be advertised on the Club's website, the address of which must be clearly stated and visible from Gaddums Hill Road.



BEFORE THE ENVIRONMENT COURT

Decision No. [2010] NZEnvC 48

ENV-2009-WLG-000221

ENV-2010-WLG-000048

IN THE MATTER of applications under section 316
of the Resource Management Act
1991

BETWEEN NELSON CITY COUNCIL
DELAWARE BAY RESIDENTS
ASSOCIATION INC
Applicants

AND SHARON HARVEY and BRUCE
REGINALD HARVEY
Respondents

Court: Environment Judge B P Dwyer
Environment Commissioner J R Mills
Environment Commissioner H Beaumont

Heard: at Nelson on 2 August 2010

Counsel/ Appearances:

K Beckett for Nelson City Council
N McFadden for Delaware Bay Residents Association Inc
S Goodall for S and B Harvey

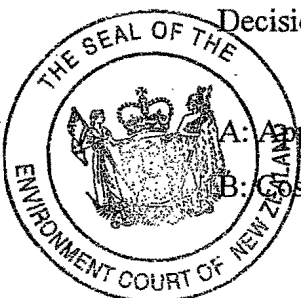
INTERIM DECISION

Decision Issued:

31 MAR 2011

A: Applications granted.

B: Costs reserved.



Introduction

[1] This is a joint decision on two separate enforcement order proceedings relating to the operation of the Cable Bay Rifle Range (the Range) situated at Cable Bay Road, R D 1, Nelson, being part of the land in computer freehold registers 9201, NLD6D/326 and NLHC/808, Nelson Land Registration District (the site).

[2] The first set of proceedings is an application for an enforcement order made by Nelson City Council (the Council) against Bruce Reginald Harvey and Sharon Harvey (Mr and Mrs Harvey/the Respondents). The Council sought an order in these terms against Mr and Mrs Harvey.

- (a) *An order under section 314(1)(a)(ii) of the Resource Management Act 1991 prohibiting the respondents from using or allowing any other person to use firearms except .22 calibre firearms on the land shown as the Restricted Shooting Area on the attached Contour Map (Scale 1: 12,500) except on the Cable Bay Rifle Range shown as Area A on the attached Contour Map (Scale 1: 4,000) and then provided the Cable Bay Rifle Range is used in accordance with the restrictions set out in Attachment A.*
- (b) *This order shall not apply to the use of firearms within the restricted shooting area by Jack Harvey, Donald Harvey, Gordon James Harvey, Michael William Noel Harvey, Lisa Yvonne Harvey, Scott Trussler, Brian Isaac Harvey and Clinton James Harvey.*

(Attachment A was a detailed set of restrictions which the Council contended ought be applicable to the operation of the Range).

[3] The second set of proceedings was also an application for enforcement orders made by the Delaware Bay Residents' Association Incorporated (the Residents' Association) against Mr and Mrs Harvey seeking orders in the following terms:

- (i) *An order under Section 314(1)(a)(i) of the Resource Management Act requiring the Respondents to adopt the best practicable option to ensure that the emission of noise emanating from the land occupied by the Respondents from the Respondent's shooting*



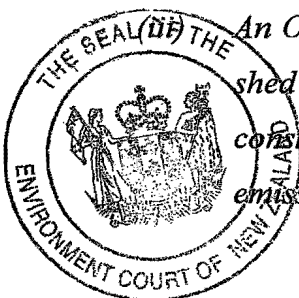
ranges does not exceed a reasonable level, namely the relocation of the shooting range activity from its present location to another location at which a noise level not exceeding 50 dBA can be achieved, in combination with restrictions on operating hours, shots fired and an optimum combination of methods to limit noise to the greatest extent achievable.

- (ii) *An order under Section 314(1)(b)(ii) requiring the Respondents to remedy the adverse effects on the environment caused by the emission of unreasonable noise generated from the Respondents shooting range activities.*
- (iii) *An order under Section 314(1)(c) requiring the Respondents to remedy the adverse noise effects on the environment caused by the operation of the Cable Bay Shooting Adventures shooting ranges.*

This application dated 15 July 2010 was an amendment of an initial application filed on 27 April 2010. After receipt of the amended application an order requiring the provision of further particulars was made by the Court and those particulars were provided by way of memorandum dated 21 July 2010.

[4] The further particulars provided by the Residents' Association detailed with some precision the orders then sought, in these terms.

- (i) *An Order under Section 314(1)(a)(i) requiring that the Respondents cease the operation of the Cable Bay Adventures shooting range at its existing location.*
- (ii) *An Order under Section 314(1)(b)(ii) requiring that the Respondents relocate the Cable Bay Shooting Adventures shooting range to the site shown marked "Proposed Range" on the map annexed (Co-ordinates S 41 11.402, E 173 24.783) ("the new site").*



An Order under Section 314(1)(b)(ii) requiring that an acoustic shed (designed and approved by an Acoustic Expert) be constructed at the new site for the purposes of reducing noise emission from firearms and requiring that all firearms be fired

from the acoustic shed save for certain limited exceptions for shotguns.

(iv) *An Order under Section 314(1)(b)(ii) limiting the hours of operation for all firearms and use of the range on the new site as follows:*

(omitted)

(v) *Any other Orders the Court considers necessary to avoid, remedy or mitigate the adverse effects of the Respondents operation.*

[5] The Residents' Association filed a notice pursuant to s274 in respect of the Council's application and the Council filed a s274 notice in respect of the Residents' Association's application. There was accordingly a commonality of parties in respect of the proceedings, although ultimately, each set of proceedings required separate resolution.

[6] Prior to (and during) our hearing there were various discussions between the parties with a view to resolving the matters in dispute between them. Insofar as the Residents' Association and Mr and Mrs Harvey were concerned, those efforts were largely unsuccessful. However, the Council and Mr and Mrs Harvey were able to substantially reach agreement and filed a joint memorandum, dated 30 July 2010, identifying those matters in respect of which they had reached agreement and those matters where there remain disagreement.

[7] The matters of disagreement related to some of the details of the restrictions set out in Attachment A of the Council's application for enforcement order, specifically matters pertaining to:

- Whether or not a suppressor pipe used to suppress the sound of firearms required to be certified as being as effective as an on rifle suppressor;



Whether or not the Sundays on which shotguns might be fired from outside a firing shed on the site should be restricted to being permitted on the first and third Sundays of each month or whether the Sunday

use could be flexible and decided by Mr and Mrs Harvey from time to time;

- The extent of supervision of the Range use which was required.

Resolution of the Council application will be largely confined to consideration of those matters. However, the Council application must also be determined in the context of the considerably more wide ranging Residents' Association's application.

[8] The Council application was more restricted in scope than the Residents' Association application for a reason. The Harveys' operation of the Range has previously been the subject of not less than three decisions of this Court.¹ In September 2007, the Council had issued an abatement notice against Mr and Mrs Harvey pertaining to the operation of the Range. The abatement notice was appealed to the Court. Decision C-77/2008 dismissed the appeal, but required certain modifications of the abatement notice whose final form was fixed (by consent) in order C 086/2008 (No 2) which issued on 2 October 2008.

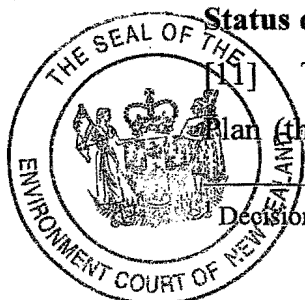
[9] Operation of the Range since October 2008 has revealed certain ambiguities and shortcomings in the abatement notice and difficulties in its enforcement. The current Council proceedings sought an enforcement order replacing the abatement notice which would remedy the shortcomings, ambiguities and enforcement difficulties whilst at the same time respecting, as far as possible, the controls which had emerged from the Court in the abatement notice appeal.

[10] The Residents' Association's application was similarly a response to the shortcomings and ambiguities which had emerged in operation of the abatement notice and which were ultimately brought to a head by a shooting event held on the site over Labour weekend 2009. We will discuss that in some detail further in this decision.

Status of Rifle Range Activity

The site is contained in the Rural Zone of the Nelson Resource Management Plan (the District Plan). The Range is a permitted activity in that zone. That is a

Decision C 77/2008; C 86/2008 and C 086/08 (No 2).



consequence of the operation of Rule RUr 20.1 which provides that *any activity* is a permitted activity provided it does not contravene any other relevant Rules and does not fall within certain excluded activities. We were told that the only relevant Rule which the activity might possibly contravene was Rule RUr 47 which imposes noise levels within the Rural Zone. Rule RUr 47.1 imposes a daytime noise performance standard in the zone of 55 dBA (L_{10}) which cannot control noise from firearms.

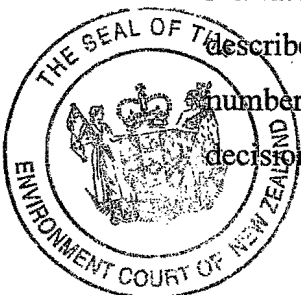
[12] There was no dispute that the Range activity is permitted. The matters in dispute before the Court revolved around questions as to whether or not noise generated by firearms on the Range exceeds a reasonable level (and is accordingly unreasonable) or is offensive or objectionable to such an extent as to have an adverse effect on the environment. In decision C 77/2008 the Court had previously held that the imposition of controls by way of abatement notice was necessary to ensure that the noise of the activity was not objectionable.

[13] We did not understand there to be any dispute that the noise could potentially exceed a reasonable level or be offensive or objectionable unless use of the Range was subject to appropriate controls. The argument between the parties was about the nature, detail and extent of controls which ought be imposed under either the Council's or the Residents' Association's proceedings.

Background

[14] Background matters pertaining to Harveys' operation of the Range were canvassed in considerable detail in Decision No C 77/2008. Among other things it was identified in that decision that there are a number of components of the activity conducted by Mr and Mrs Harvey. Decision C 77/2008 identified two categories of use of the Range, non-police use and police use. (There is also a third category, personal use by members of the Harvey family.)

[15] The term non-police use described commercial use of the Range by recreational and sporting shooters using a variety of firearms. The term police use described firearms training undertaken by police officers and involves the use of a number of types of firearms in various situations. We shall use those terms in this decision also.



[16] We witnessed and listened to examples of both sorts of shooting during our site visit. A number of different firearms were discharged on the Range and coincidentally, a police firearms training exercise was undertaken on the day of our site visit so that we were able to observe that also.

[17] The Range is located on a farm which has been owned by the Harvey family for over 50 years. The site is situated approximately 15 minutes drive northeast of Nelson City. Cable Bay Road runs for a distance of about 7 or 8 kms from SH 6 to Cable Bay.

[18] We did not traverse the full length of the road from the SH 6 turnoff to Cable Bay but that area which we did view, showed that Cable Bay Road is a two-lane rural road running through the floor of a fairly narrow valley bordered by steeply rising hills on either side of the valley floor. That portion of the valley which we saw comprised primarily farming land (particularly along the valley floor and lower hill slopes), with the hill slopes either in native or reverting vegetation.

[19] We understand that for many years the principal activity in the valley was farming. However, in 1996 the Council approved the subdivision of a parcel of land then owned by E and A Ingham which partially adjoins the site, to the north and east. The subdivision created 19 allotments ranging in size from 4ha up to 61ha, thereby creating something of a rural/residential enclave in the valley. A number of the members of the Residents' Association (including some of those who provided evidence to the Court) are persons who have purchased allotments in the Ingham subdivision.

[20] For the sake of completeness, we record that there are presently two other shooting ranges in this vicinity, both operating in quarries on or near the site. One is the range of the Seaborne Rifle Club and the other the Cable Bay Pistol Club. We did not hear evidence of complaints about operation of these ranges.

[21] The Range which is the subject of these proceedings, is situated on the western side of Cable Bay Road. There is a firing shed about 100m or so off the road



and the Range itself runs westward from the shed across a gently rising open paddock into a steep bush-clad slope. There are some distance markers in the paddock and targets can be fixed at various distances on the hill. The firing shed has the appearance of a farm shed and to the casual observer the use of the site for shooting purposes would not be immediately apparent, unless shooting was actually being undertaken at the time of observation.

[22] Members of the Harvey family are enthusiastic shooters. Mr Harvey testified that his father had used the Range as a practice range since 1952. He grew up learning to shoot there as did his children, nieces and nephews and other children in the district. This activity has involved many different types of firearms. The Harvey family also undertake hunting and pest eradication shooting on the site.

[23] In 1989 Mr Harvey moved into a house situated in close proximity to the Range. He is a competitive shooter who has won a number of New Zealand championships. He regularly uses the Range for training purposes as do other persons associated with him in the sport of competitive shooting. Mr Harvey testified that his current personal use of the Range would involve somewhere in the order of 250 rounds per week from shotguns or high powered rifles, together with a considerably greater number of rounds from his .22 rifle. Mr Harvey and his associates regularly shoot sport and clay targets on the Range.

[24] In October 2000, Mr and Mrs Harvey established the business of Cable Bay Shooting Adventures. The business makes the Range available for use by a number of persons for shooting activities. These include:

- Hunters who use the range to sight in their rifles (commonly high calibre rifles) for hunting use;
 - Clay target shooters who use shotguns;
 - What Mr Harvey described as *tourist shooters*, being persons who use the range for entertainment or relaxation and are provided with .22 rifles for that purpose;
- Student groups;
- Competition shoots by various shooting clubs and organisations.



[25] These users of the range are charged a fee to undertake their shooting and we were told by Mr Harvey² that in the last year the Range had earned the Harvey partnership about \$35,000. We were not given details of the breakdown of that income between the various types of users or between non police and police use.

[26] In decision C 086/08 (No 2) the Court imposed a series of hourly, weekly and monthly limits on the numbers of rounds which might be fired on the range by its various users (other than the police). These limitations were imposed on rifles above .22 up to .308 calibre and shotguns but did not apply to .22 calibre firearms.

[27] The limitations appear to apply to all non-police use of the range, including the Harveys' own use. Without going into the fine detail of the restrictions, they allow a total of 1350 shots per week from .308 rifles and 2,500 shots per week from shotguns fired inside the firing shed. Additionally up to 2,000 shotgun shots per month were allowed outside the shed. These restrictions also have further hourly and daily sublimits. The terms of the abatement notice allow two *special event days* per year when the restrictions might be exceeded.

[28] When regard is had to the fact that there is no restriction on the number of .22 calibre shots which might be fired (Mr Harvey advised that constitutes up to about 80 percent of the tourist shooting) it will be apparent that at times there will be very intensive and extensive firing being undertaken on the Range even if it is not up to the limits stipulated in the Council abatement notice.

[29] An example of the extent of shooting allowable under the present restrictions is an annual duck shooting warm up day which has been held twice on the site as a special event. Mrs Harvey advised³ that last year there were 101 participants and the year before, 103. Each participant fired between 50 and 75 shots, so that somewhere between 5,000 and 7,500 shotgun rounds would have been fired on the site on each day.



Harvey Affidavit 14 July 2010, para 10.
Pages 135-136, NOE.

[30] In addition to the larger scale special events, the restrictions allow for what Mr Harvey referred to as *Gentlemens' Club* shooting, once per month, when a group of his shooting associates carry out clay target shooting on a Sunday. This can involve about 750 shots⁴.

[31] Police use of the Range is in addition to that described above. The Range is ideal for police firearms training as it is easily accessible from Nelson. Firearms training in Nelson occurs twice a year on Mondays to Thursdays over an 8 week period from 9 am to 4 pm with live firing usually occurring during a 2 or 3 hour period in the afternoon. The live firing could be for as little as 45 minutes but might extend for over 2 hours on occasions.

[32] Police training currently involves the use of two types of gun, the Glock semi-automatic pistol and the .223 Bushmaster semi-automatic rifle. The maximum number of participants in a training session is ten per day, but the more usual number is between six and eight. Each shooter would fire 50 pistol rounds and 30-50 rifle rounds per day, on average.

[33] The conditions on police use included in the current abatement notice, restrict use of the range to coincide with the periods and times described above, but do not limit the number of shots fired nor the firearms to be used. On the basis of the figures in the preceding paragraph, police use of the Range might commonly involve somewhere between 500 and 800 shots per day, compressed to within a period of 2-3 hours.

[34] The initial Council abatement notice, Decision C77/2008 and the consequential decisions which followed it, sought to resolve the conflict inherent in use of the site as a rifle range with its adjoining rural/residential neighbours. Whether or not that had been achieved was the subject of a large body of the evidence before us. Issues were raised about compliance (or rather non-compliance) with, practicality of and interpretation of the abatement notice. These issues emerged very shortly after the final form of the Council's abatement notice was confirmed by the Court.

⁴Pages 133-135, NOE.



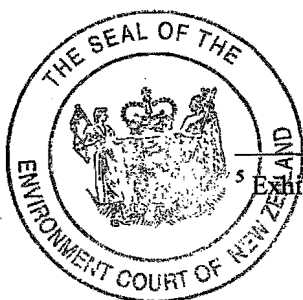
[35] In October 2008, a monitoring report from Mr S J Lawrence (a warranted officer of Nelson City Council) identified seven examples of alleged breaches of the conditions of the abatement notice.⁵ Many of the instances alleged by Mr Lawrence appear to be minor and were characterised by Mr and Mrs Harvey as *teething problems*. However, one of the allegations in the monitoring report was that the hourly firing rate had been exceeded at least nine times and that cannot be characterised as a minor breach.

[36] Whatever the position about compliance, matters were brought to a head on Labour Weekend 2009 when the Harvey property was the site of a National 3 Gun Event. This event, which involved the firing of shotguns, rifles and pistols on the Friday, Saturday and Sunday of that weekend, was the subject of a considerable amount of the evidence which we heard

[37] Mr H M Black, who is a member of the Residents' Association and resides near the site, deposed that somewhere in the vicinity of 4000 rounds were fired on the Friday and again on the Saturday, with a similar level on the Sunday. Shot counts made by Mr Black were:

- Saturday (8.45 am – 9.45 am), 603 shots;
- Saturday (3 pm – 3.30 pm), 332 shots;
- Sunday (11 am – 11.30 am), 249 shots;
- Sunday (4 pm – 4.30 pm), 315 shots.

[38] Mr Lawrence went out to the site on the Saturday morning as the result of a telephone complaint from Mr Black. He observed the site from two positions, one on nearby Maori Pa Road and one from a building site on a property known as the Cleary property. His observations were undertaken from 10.39 am to midday during which time he counted somewhere between 500 and 550 shots. His count was accordingly, reasonably consistent with Mr Black's figures.



⁵ Exhibit E Lawrence Affidavit 11.12.09.

[39] Mr Lawrence described his observations in these terms:⁶

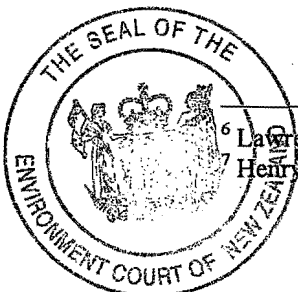
17 For the period I was observing the range and surrounding area the noise from gun shots was virtually non stop. Any gap would be no more than one or two minutes with each gap followed by continuous fire from multiple weapons. The noise was loud and could be heard at a loud level from Maori Pa Road and the surrounding area. In my opinion the noise was very intrusive and objectionable. If this level of firing was maintained for three days and I lived in the vicinity then I would have found it intolerable.

[40] Mr B G V Henry (another Council warranted enforcement officer) went to Cable Bay Road on the Sunday, again in response to a complaint from Mr Black. He spoke to Mrs Harvey at the Range. She confirmed that a shooting competition was being held.

[41] Mrs Harvey told Mr Henry that there were three types of shooting being undertaken by competitors. There were 36 contestants who were divided into three groups of 12. Mr Henry observed shotgun firing being undertaken and was advised by Mrs Harvey that each contestant would fire 46 shotgun rounds on the Range. Other groups of competitors were firing rifles and pistols at other shooting positions on the Harvey property which were not situated on the Range itself.

[42] Mr Henry heard shotgun, rifle and pistol fire while he was doing his inspection. He commented as follows:⁷

23 The shots that I heard while at the range, Maori Pa Road and Mr Black's were reverberating around the valley. I found them disturbing. If the volume of shot gun blasts on and adjacent to the Range that Mrs Harvey related were to be fired on each of the three days I would have found each day's shooting of this type intolerable if I lived on Cable Bay Road or on Maori Pa Road in the vicinity of Mr Black's property. It would have been in my opinion, objectionable.



⁶ Lawrence Affidavit 11 December 2009.
⁷ Henry Affidavit 10 December 2009.

[43] When the proposition was put to Mr and Mrs Harvey that the shooting activities being undertaken were in breach of the abatement notice, they gave a somewhat unexpected answer. That was that the abatement notice applied only to the firing of weapons on the Range itself. Harveys contended that firing undertaken on the site other than at the Range, was not covered by the abatement notice and was accordingly not subject to the controls contained within it.

[44] Arguably, the Harveys were correct in that assertion. Paragraph 1 of the abatement notice provides as follows:

1. Location in respect of which abatement notice applies:

Cable Bay Rifle Range situated at Cable Bay Road, RD1, Nelson adjacent (approximately 100-150metres) to the dwelling occupied by Mr Bruce Harvey on the property with the following legal description:

[45] It is apparent from that description, that the abatement notice applies to the Cable Bay Rifle Range situated approximately 100-150m from the Harvey house, being the Range which we have described in Para [21] of this decision. The Harveys appear to be correct in their assertion that the abatement notice does not, on the face of it, apply to the balance of the site.

[46] We suspect that the drafter of the abatement notice did not turn his/her mind to the issue of off Range use and that although the Labour Weekend event may have been outside of the spirit of the abatement notice, it did not breach the notice on a literal interpretation. It is also apparent from the descriptions of Messrs Black, Lawrence and Henry, that the effects on the neighbours of the site of firearms being discharged off the Range were equally concerning as if they were fired on the Range.

[47] It was the Labour Weekend 2009 incident which was the catalyst for the Council and the Residents' Association seeking the enforcement orders which they have. In addition to the apparent deficiency in the abatement notice in not applying over the whole site, Mr Lawrence also deposed that there were other practical difficulties in enforcing the abatement notice in its existing form. The Residents' Association also pointed to the difficulties arising out of the abatement notice being



restricted to the identified Range but further contended that even if the abatement notice was complied with, the number of rounds being fired and the noise generated, exceeded a reasonable level.

The Expert Evidence

[48] We heard evidence from two expert witnesses. They were Dr J Trevathan for the Residents' Association and Mr S Camp for Mr and Mrs Harvey. Both witnesses are qualified acoustic engineers. Additionally, Dr Trevathan appended to his evidence a document titled:

BEL ACOUSTIC CONSULTING

REPORT ON:

NOISE FROM RIFLE RANGE: CABLE BAY, NELSON

JANUARY 2009

This document is a report prepared by Mr G Bellhouse of Bel Acoustic who had conducted measurements on the level of noise emitted from the rifle range in order to assess the effect on neighbouring properties.

[49] The acoustic engineers had between them taken a number of measurements of the noise emanating from the Range, at various sites. Dr Trevathan took his measurements at what is known as the Cleary property. Mr Bellhouse took measurements at what were referred to as the Phillips and Cleary properties. In 2007, Mr Camp had taken measurements near the boundary of what is known as the Bryant property and at the Phillips' property. There was no challenge to the accuracy of the various readings.

[50] The Bel Acoustic Report contained the following comment about the noise environment at Cable Bay. It said:



The existing ambient level of noise in the area of the Phillips measurement location was also measured. The results are:

L₁₀ 44 dB(A)

L₉₅ 40 dB(A)

L_{eq} 42 dB(A)

This is indicative of a quiet rural area with little intruding noise apart from an occasional vehicle on one of the roads below, which was my assessment of the environment. This is in line with measurements previously taken by others.

Dr Trevathan described the area as neither particularly quiet, nor particularly noisy. The Bel Acoustic description of this being a quiet rural area was consistent with our observation during our site visit.

[51] The Bel Acoustic Report measured the noise using an L_{peak} parameter. Mr Bellhouse considered this an appropriate descriptor for the measurement of impulse noise. He described this as ... *Peak sound pressure level is a measure of the peak pressure of sound present for an extremely short period of time (microseconds or milliseconds) and requires the use of a Class 1 sound level meter (a precision grade type of meter).*

[52] The Bel Acoustic Report measured the noise generated from a variety of firearms in a number of situations. The Report advised that at the Cleary location the L_{peak} level exceeded 80 dBA in all tests but one and at the Phillips location the L_{peak} exceeded 80 dBA in most of the tests and concluded:

At a level of noise emission greater than 80dB L_{peak} gunfire noise should be viewed as unreasonable when it occurs regularly and for prolonged periods. It is very noticeable and likely to be disturbing and intrusive.

[53] Dr Trevathan and Mr Camp both used L_{max} parameters for their measurements. L_{max} is the maximum noise level recorded using a measure which responds to noise as quickly as the human ear. L_{peak} is the peak noise level being the highest level of noise produced. The human ear does not respond quickly enough to impulsive sounds such as gun shots and hence L_{peak} is significantly higher than L_{max} , typically around 30 dB higher so that 80dBA L_{peak} generally (but not precisely) equates to 50dBA L_{max} .



[54] Dr Trevathan's measurements, taken on the Cleary site on 26 March 2010 for .308 and .22 rifles fired from within the firing shed on the Range, measured noise levels of 63 to 65 dB L_{Amax} for the .308 rifle and 53 to 55 dB L_{Amax} for the .22 rifle.

[55] Mr Camp's measurements in 2007 at the Bryant property for .308 rifles, recorded dBA L_{max} readings of between 57 and 63 and a shotgun reading of 55. At the Phillips' property two measurements for a .308 rifle gave L_{max} readings of 62 and 64.

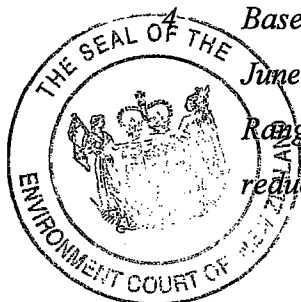
[56] One of the issues which was the subject of debate before us was a proposal that the Range be moved to another position (Relocation Area One) which had been identified on the site. That was considered by Dr Trevathan and Mr Camp particularly as to the issue of whether or not relocation would result in noise levels at neighbouring properties of less than the 80 dB L_{peak} (approximately 50 dBA L_{max}) identified in the Bel Acoustic Report.

[57] The outcome of discussions between the two acoustic consultants was a joint statement dated 27 July 2010 (the Joint Statement). The Joint Statement provided as follows:

Areas of Agreement

- 1 *The District Plan noise rules are not applicable to noise from gunshots.*
- 2 *L_{AFmax} is an appropriate descriptor and International Guidelines recommend 50 to 55 dB L_{AFmax} with few exceptions.*
- 3 *Noise levels at the existing range are well above 50 dB L_{AFmax} even with the mitigation measures that have been implemented. We have measured noise levels from suppressed .308 rifles within the shed of 62 to 67 dB L_{AFmax} at the 'Cleary' and 'Phillips' sites.*

Based on measurements undertaken by Dr Trevathan on 28 June 2010, relocating the Cable Bay Shooting Adventures Range to the area known as "Relocation Area One" would reduce noise levels received at residential sites by around 10dB



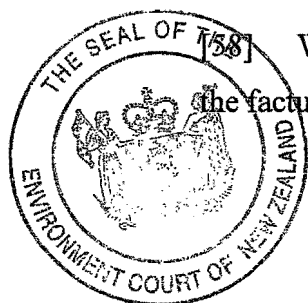
– equivalent to a halving of loudness (without the benefit of a shed at the new site).

- 5 Without the shed, noise levels will be less than 50dBA L_{AFmax} with .223 rifles and 9 mm pistols. Shotguns and high calibre rifles will generally be between 50 and 55 dB L_{AFmax} .
- 6 There are noticeably less echoes around the hills at Relocation Site One and this may further reduce the annoyance of the gunshots.
- 7 A small additional noise reduction is likely when an acoustically designed shed is installed at the new site.
- 8 Relocation of the activity to Relocation Area One would provide a significant improvement for residents.

Areas of Disagreement

- 9 Mr Camp argues that noise levels at the existing range (including high powered rifles at 62 to 67 dB L_{AFmax}) are not objectionable. Dr Trevathan's assessment has been limited to a consideration of reasonable noise.
- 10 Dr Trevathan believes that restrictions on use are appropriate in this locality even if noise levels were reduced to less than 50dB L_{AFmax} . Mr Camp is of the view that restrictions are unwarranted at levels less than 55 dB L_{AFmax} to ensure noise emissions are reasonable.

(L_{AFmax} and dB are the ISO equivalents of the terms previously used by the witnesses, L_{max} and dBA. We will also use the term dB L_{AFmax} for the balance of this decision).



[58] We turn to consider the appropriate enforcement orders to be made in light of the factual background and Joint Statement set out above.

Enforcement Orders

[59] The scope of enforcement orders is set out in s314 RMA which relevantly provides as follows:

314 Scope of enforcement order

(1) *An enforcement order is an order made under section 319 by the Environment Court that may do any one or more of the following:*

(a) *Require a person to cease, or prohibit a person from commencing, anything done or to be done by or on behalf of that person, that, in the opinion of the Environment Court,—*

(i) *Contravenes or is likely to contravene this Act, any regulations, a rule in a plan, a rule in a proposed plan, a requirement for a designation or for a heritage order, or a resource consent, section 10 (certain existing uses protected), or section 20A (certain existing lawful activities allowed); or*

(ii) *Is or is likely to be noxious, dangerous, offensive, or objectionable to such an extent that it has or is likely to have an adverse effect on the environment:*

(b) *Require a person to do something that, in the opinion of the Environment Court, is necessary in order to—*

(i) *Ensure compliance by or on behalf of that person with this Act, any regulations, a rule in a plan, a rule in a proposed plan, a requirement for a designation or for a heritage order, or a resource consent; or*

(ii) *Avoid, remedy, or mitigate any actual or likely adverse effect on the environment caused by or on behalf of that person:*

(c) *Require a person to remedy or mitigate any adverse effect on the environment caused by or on behalf of that person:*

[60] The Council seeks its order pursuant to s314(1)(a)(ii) and the Residents' Association pursuant to ss314(1)(a)(i), 314(1)(b)(i) and 314(1)(c). We consider that any or all of those provisions provide a basis for making the orders sought.



[61] Insofar as the Council application is concerned, the specific basis of the application is the contention in the affidavits of Messrs Lawrence and Henry that the noise from an event such as that of Labour weekend 2009 was intolerable to such an extent as to be *objectionable*. That was the basis of the Council abatement notice upheld by the Court in Decision C 77/2008, which preceded the Labour Weekend 2009 incident.

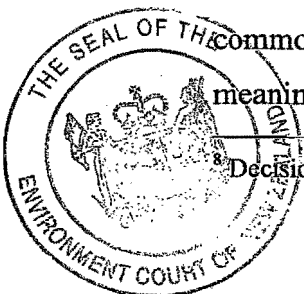
[62] The Residents' Association's application is primarily based on s314(1)(a)(i), more particularly contravention of the obligation contained in s16(1) RMA which requires that...*Every occupier of land...shall adopt the best practicable option to ensure that the emission of noise from that land ... does not exceed a reasonable level.*

[63] The observation was made in the Bel Acoustic Report that unreasonable noise is different to offensive or objectionable noise. It was contended that although offensive or objectionable noise will ipso facto be unreasonable, not all unreasonable noise will necessarily be offensive or objectionable. Although we accept that is the case, we consider that in practice the distinction between noise which exceeds a reasonable level on the one hand and offensive and objectionable noise on the other, will commonly be blurred and will often be a question of degree. We will consider all three matters in our assessment.

[64] A number of decisions of the Court and Planning Tribunal have considered the issue of whether or not noise has exceeded a reasonable level. We refer to the observation in *Auckland Kart Club Inc v Auckland City Council*⁸ that . . . *what is reasonable is a question of fact and degree.* The fact that a particular noise complies with standards contained in a district plan does not preclude the Court from determining that it nevertheless exceeds a reasonable level.

[65] The terms *offensive* or *objectionable* are not defined in RMA and are commonly cited in conjunction with each other. In normal usage there is a certain commonality of meaning between the two. We refer to the various dictionary meanings of those words considered by the Court in *Donnelly v Gisborne District*

⁸Decision A 124/92, page 21.



*Council*⁹ and adopt the meanings used by the Court in that case of...*undesirable, displeasing, annoying or open to objection.*

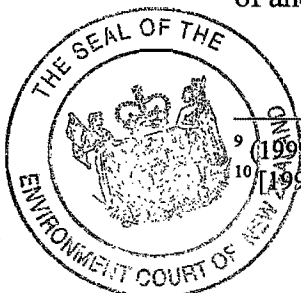
[66] For the sake of completeness we note that a finding that a particular noise is offensive or objectionable, of itself, is not a basis for relief under the relevant provisions. It is also necessary to find the noise has or is likely to have an adverse effect on the environment.

[67] In determining whether noise from the Range exceeds a reasonable level or is offensive or objectionable, we are aware that the test to be applied is an objective one. We repeat the reference from *Zdrahal v Wellington City Council*¹⁰ which was cited in Decision C 77/2008 namely that:

It is not enough that a neighbour or other person within the relevant environment considers the activity or the matter to be offensive or objectionable. It is not enough that the Tribunal itself might think the matter was objectionable ... the Tribunal in a case like this must transpose itself into the ordinary person, representative of the community at large, and so decide the matter.

[68] The Joint Statement of the noise witnesses revealed a disagreement between them as to the level at which noise emissions from the Range exceeded a reasonable level or might be considered objectionable. Their differences revolved around the 50-55 dB L_{AFmax} measurement. However, we understood that Dr Trevathan and Mr Camp agreed that determination of the reasonableness, offensiveness or objectionability of noise involves more than just a consideration of the measured noise levels in isolation.

[69] We also consider that determination of those issues involves wider consideration than the standards contained in district plans or the matters identified in NZS 6802:2008 (Acoustics-Environmental Noise) which is directed at the setting of and compliance with specific noise limits.



⁹ (1999) 5 ELRNZ 138.
¹⁰ [1995] 1 NZLR 700.

[70] The Court suggested to the noise witnesses that an appropriate means of determining whether noise exceeded reasonable levels or was offensive or objectionable in any given instance, might be application of the FIDOL factors identified in the publication *Good Practice Guide for Assessing and Managing Odour in New Zealand*¹¹. Those factors are:

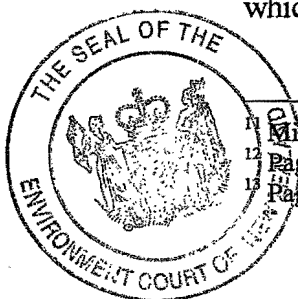
- Frequency- how often an individual is exposed to odour;
- Intensity- the strength of the odour;
- Duration- the length of a particular odour event;
- Offensiveness/Character- the hedonic tone of the odour which may be pleasant, neutral or unpleasant;
- Location- the type of land use and nature of human activities in the vicinity of the odour source.

Both the witnesses agreed that the factors above would provide a useful check list for assessing noise effects (with appropriate amendment). We do not suggest that they provide the only basis for doing so or will be relevant in every instance. We propose to use them in undertaking our assessment as to whether or not noise generated from the Range exceeds a reasonable level or is offensive or objectionable in this case. A number of the witnesses referred to some of these factors in their evidence, albeit not in the structured manner we have done.

Frequency

[71] Under the present operating conditions of the Range (imposed by the abatement notice) there can be thousands of rounds per week fired from rifles up to .308 calibre and shotguns. Mr Harvey estimated that actual use of the range could be up to 2000 rounds per week from both shotguns and rifles¹² and that the busiest day of the week for tourist use is Sundays.¹³

[72] There is no control under the existing abatement notice on the number of rounds from .22 calibre rifles, nor is there any limitation on the number of rounds which might be fired by the police during their use of the Range. In her affidavit, Ms



11 Ministry for the Environment-June 2003.
 12 Pages 154-155 NOE.
 13 Page 159 NOE.

B R Rounce (a member of the Residents' Association) stated that there appeared to be *hundreds of rounds going off* when the police are using the Range and that is consistent with our earlier calculation (para [33] supra).

[73] It seems that somewhere between 3,000 and 4,000 shots per day would have been fired during the Labour Weekend 2009 shooting competition. We accept that is not typical of Range usage. However, such a level of usage was not in breach of the abatement notice because much of the shooting took place off the Range itself and was accordingly permissible in terms of currently applicable controls.

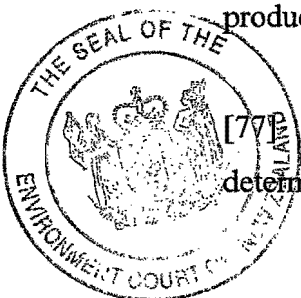
[74] We have noted previously (para [29] supra) that the Harvey site is also used for pre-duck shooting warm-up shoots which can involve somewhere between 5,000 and 7,500 shots per day and that Gentlemen's Club firing on one Sunday per month involves about 750 shots per day (para [30] supra).

[75] It is apparent that shooting on the Range in particular, and on the site in general, can involve many hundreds of shots per day and thousands of shots per week. The activity persists throughout the year with peaks at various times such as the Gentlemen's Club shoot, police shooting and the duck shooting warm-up. Although the controls on discharge of .308 rifles and shotguns on the range require one day per week to be free of firing, that control does not apply to .22 rifle discharges nor off Range discharges. Accordingly, the discharge of firearms is a high frequency activity on the site.

Intensity

[76] We accept that the dB L_{AFmax} measurement used by Dr Trevathan and Mr Camp in their Joint Statement is an appropriate descriptor of the intensity or level of the noise being experienced by at least some neighbours when .308 rifles and shotguns are being fired on the Range. Additionally, we note that in the Bel Acoustic Report the observation is made that police Glock pistols or M4 rifles produce similar levels of noise to the .308 rifle.

[77] Recitation of the bare noise levels of itself, does not greatly assist the Court in determining the actual effects of shots generating that level of noise. However, we



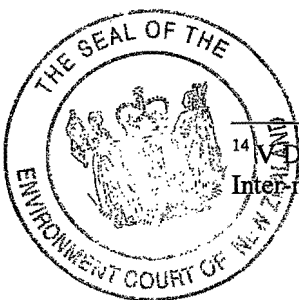
heard .308 rifles and police firing from an observation position off the site and in our subjective view it was very loud and intrusive indeed.

[78] Both Dr Trevathan and Mr Camp referred to a review of international shooting noise regulations¹⁴ in various jurisdictions around the world. Paragraph 2 of the Joint Statement noted that the recommended noise limits at residential receivers contained in the international regulations, were between 50 to 55 dB L_{AFmax} , with few exceptions. It is undisputed that the noise of .308 rifles and shotguns from the site substantially exceeds those levels at some neighbouring properties. Even .22 rifles are at the higher end of this spectrum at some receptors according to Dr Trevathan's measurements (para [54] supra).

[79] It will be seen from the Joint Statement that Mr Camp was of the view that noise levels at 62-67 dB L_{AFmax} were not objectionable. Dr Trevathan considered that noise from the Range should not exceed 50 dB L_{AFmax} at any neighbouring dwelling and that even at that level there should be restrictions (days and hours of operation) in place. Mr Camp was of the view that restrictions are unwarranted at noise levels of less than 55 dB L_{AFmax} .

[80] It was surprising to find such a divergence of views between two expert witnesses on such an issue. However, it became apparent that Mr Camp's opinion as to the appropriate noise level was driven by his view that the Harveys' activities preceded residential development in the area and that the rural/ residential property owners who had moved in to Cable Bay Road had to accept what was in existence, as they had *come to the nuisance*.

[81] In his initial affidavit, Dr Trevathan referred to evidence previously presented by Mr Camp in proceedings in Ashburton regarding establishment of a rifle range. In that evidence, Mr Camp had supported 50 dB L_{AFmax} as being the appropriate level of noise to be received from a rifle range by neighbouring properties.



¹⁴ Desamaulds- Shooting Noise Regulation, Review of Various National Practices, Proceedings of Inter-noise 98 Christchurch.

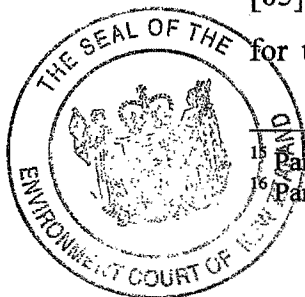
[82] Mr Camp explained that the 50 dB L_{AFmax} level was applicable to a situation where a new rifle range was to be established in the vicinity of existing dwellings. He went on to contend ... *that same evidence discusses 55 dB L_{AFmax} as being appropriate for existing ranges. My earlier affidavit on this project reiterated that I consider 55dB L_{AFmax} is acceptable for existing ranges with existing residential neighbours, and 60 – 65 dB L_{AFmax} is acceptable in situations where new housing encroaches on existing ranges.*¹⁵ It is that latter view which led to him taking the position he does in this case, that the levels of noise generated from the Range are not offensive or objectionable. We make two observations regarding that proposition.

[83] Firstly, although we accept that pre-existence of a noise generating (or other) activity may commonly be a relevant factor in determining questions of reasonableness, offensiveness or objectionability, we do not consider that it will necessarily be the decisive factor in any case. Noise or other adverse effects may be unreasonable, offensive or objectionable notwithstanding that they existed in a particular area before other people arrived there. Mr Camp's approach of making an automatic loading for the pre-existence of the noise in determining whether it was objectionable is, in our view, far too simplistic.

[84] Secondly, Mr Camp's proposition that the Range pre-dated arrival of rural/residential neighbours, thereby justifying the application of a less stringent noise limit, is demonstrably incorrect. It is correct that a rifle range had been established on the site and used by members of the Harvey family for their private shooting activities since 1952. Mr Harvey deposed that since then his family would have used the Range approximately once a week.¹⁶ In 1989 he moved into the house next to the Range which increased his personal use. He would fire up to 250 rounds of shotgun or high calibre rifle ammunition per week, together with .22 rifle shooting.

[85] The Ingham subdivision was approved in 1998. Mr GH Williams (a witness for the Residents' Association) moved into his property in November 1998. Ms

¹⁵ Para 19 Camp Affidavit of 14 July 2010.
¹⁶ Para 5 Harvey Affidavit of 14 July 2010.



Rounce and her partner bought their land in August 1999 and commenced living on it in February 2000. Neither witness was aware of any rifle range activity at those times and it appears from their affidavits that Mr Harvey's private shooting activities were not of such a degree as to attract their concern.

[86] It was Mr Harvey's evidence that the commercial activity of Cable Bay Shooting Adventures commenced in October 2000 and grew strongly between 2001 and 2004. Regular police use commenced sometime in 2006, although Mr Harvey claims they had used the Range on an intermittent basis previously. The establishment of commercial activity from October 2000 clearly post-dates subdivision and the arrival of rural/residential neighbours to this site.

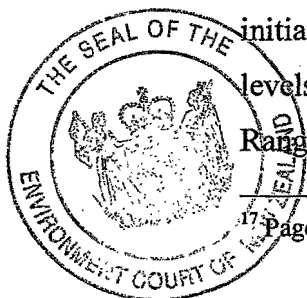
[87] The consequence of establishment of the commercial shooting activity and police shooting is that the discharge of larger calibre rifles and shotguns on the Range has gone from the 250 per week estimated by Mr Harvey for his personal use to (potentially) the 5000 or 6000 per week which are now permissible in terms of the Council abatement notice.

[88] Mr Camp did not think that actual usage would be as high as the 5000-6000 shots per week which are potentially allowed. The Court suggested to him that even at a lesser number of shots actually fired the increase in numbers was an issue. The Notes of Evidence record this exchange¹⁷:

HIS HONOUR: *No, but let us say there is a 10 fold increase to two (thousand) are you seriously suggesting that if you go there when there is 250, you have got to accept two and a half thousand? Or we have got to accept the different standards.*

MR CAMP: *No, I do not think you should be having to accept that huge increase in scale.*

[89] In light of that acknowledgement it is untenable to argue, as Mr Camp initially did, that pre-existence of the limited use, private rifle range means that noise levels of 62-67 dB L_{AFmax} from the thousands of shots now being fired from the Range might not exceed a reasonable level or be offensive or objectionable. That



would have been our view, irrespective of Mr Camp's eventual agreement, in any event. In his evidence in the Ashburton proceedings to which we have referred previously, Mr Camp made the comment:¹⁸

My subjective impression of gunshot noise at 65dB was that it was completely inappropriate for the "back yard" of a residential property.

[90] There was no dispute between Dr Trevathan and Mr Camp that noise from the Range regularly exceeds 50 or 55 dB L_{AFmax} at neighbouring residential sites by a considerable margin. Accordingly, the intensity factor substantially exceeds that which the noise witnesses agreed was appropriate for a residential property, once Mr Camp's views about neighbours coming to the noise are set aside.

Duration

[91] Under the present controls contained in the abatement notice, non-police firing may occur between the hours of 8 am and 8 pm. Police training is permitted for any consecutive period of 3 hours between 12 noon and 4.30 pm. One day per week has to be kept free of firearms activity. That is a *floating* day chosen by the Harveys and notified to their neighbours.

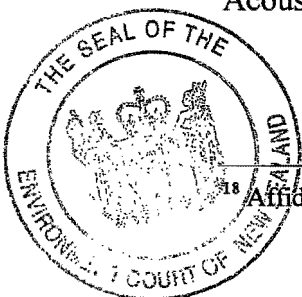
Offensiveness/Character

[92] The noise generated by firearms was described by the expert witnesses as an impulse or impulsive noise. In layman's terms it might be described as a brief *crack*. The Bel Acoustic Report had this to say about the noise of gun fire:

Because of the impulsive nature of the sound, for a given level of noise, gunfire is much more disturbing and intrusive than other types of noise and this needs to be taken into account in an assessment.

[93] A number of the witnesses referred to the echoing effect of shots fired from the existing Range. That was something which we ourselves observed. The Bel Acoustic Report gave this description:

As each shot was fired there was a very noticeable string of echoes (four or five) emanating from the various hillsides down the valley.



18 Affidavit of Dr Trevathan 23 April 2010, Exhibit B, para 4.3.

The sound of the shot was reflected off the hillsides at increasing distances. This effect tended to enhance the sound and added to the disturbing effect of each impulse.

[94] In her affidavit of 8 February 2010, Ms Rounce described the noise in these terms:

... all of the noise was extremely disruptive because of the intensity of the noise itself, the "shock" that it gives you when a firearm is discharged, and in particular because shotguns are used and the echo from the hills carries right around the valley ...

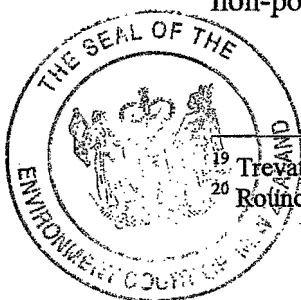
[95] We find that of its very nature, the noise of a firearm discharge has the potential to be disturbing and intrusive. Additionally, police firing commonly involves shooting in volleys¹⁹ which we understand to mean a number of shots fired in quick succession and fired by numbers of officers simultaneously. Mrs Rounce described that in these terms:²⁰

... even now when the Police are using the range it is like a war zone with what would appear to be hundreds of rounds going off, resounding around the hills in the valley while the next volley goes off. It is like continuous "rolling thunder".

Location

[96] The Range is situated in what would normally be described as a typical rural location. That is not to say it is a noiseless location. The point is often made in proceedings before this Court that rural areas can be noisy due to the sound of agricultural processes, agricultural equipment and other rural activities (including the discharge of firearms for hunting and pest extermination).

[97] In this case a particularly significant aspect of location is that the Range is located in close proximity to a rural/residential enclave which predates commercial non-police and police use of the Range. The presence of a number of residential



¹⁹ Trevathan Affidavit, 28 July 2010 para 17.
²⁰ Rounce Affidavit, 8 February 2010.

neighbours with limited separation distances from the site introduces a degree of sensitivity to the location.

[98] It is common ground that rifle ranges and shooting activities are permitted activities in the Rural Zone of this District Plan. We accept as a general proposition that rifle ranges are more likely to be found in rural areas than in other areas. However we do not think it can be suggested (as we understood Ms Goodall to do) that they are such a widespread feature of rural areas that persons moving into such an environment ought be on the lookout for the presence of a rifle range. Even if that was the case, it would be reasonable to expect that rifle ranges would be obliged to comply with standards as to the emission of noise. In this case, the District Plan does not contain a noise standard for the Rural Zone which controls impulsive noise during daylight hours.

[99] The second aspect of location which is relevant in this instance is the physical location of the Range in a situation which produces echoing as the sound of shots is reflected off the surrounding hillsides. This echoing factor was commented on by a number of the witnesses and was observed by us on our site visit. It considerably exacerbates the effect of the shots.

[100] It was noticeable to the Court that when firing was undertaken from Relocation Area One during our site visit, the echoing effect appeared to be substantially diminished. It is agreed that Relocation Area One does have a lesser echoing effect.

Outcome of FIDOL Considerations

[101] When the above factors are taken into account, we consider that the present combination of private, non-police and police activity on the Range and on the site fails all three of the tests to which it is subject in this case. The noise generated by those activities exceeds a reasonable level as well as being offensive and objectionable to such an extent that it has an adverse effect on the environment, specifically the amenity of the properties and residents situated in proximity to the site at Cable Bay Road.

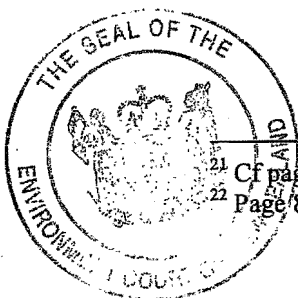


[102] The combination of the frequency of the shots, the loud noise (particularly high calibre rifles and shotguns) at neighbouring properties, their duration for long periods of the day throughout the year, the impulsive character of the noise exacerbated by echoing and the location of the rifle range in a rural/residential situation, lead us to that conclusion.

[103] We understood Mr Camp to implicitly agree with Mr McFadden that the noise being experienced by neighbours was unreasonable. He had directed his attention to the matter of whether or not the best practicable option to avoid such noise had been adopted²¹. In response to a question from the Court he accepted that if the range was considered to be a *new range* then it was probably objectionable²².

[104] We discussed that matter in paras [84]-[86] (supra) where we held that the commercial non-police and police activity on the Range was *new* in relation to the rural/residential subdivision and development. In any event, we had not accepted the proposition that because someone moves to a nuisance it means they have to put up with it. Although that might be a relevant factor in determining whether or not any particular effect is unreasonable, offensive or objectionable and if so, what remedy the Court should grant, it will not necessarily be the determinative factor in any given case.

[105] In making that comment we are aware of the common law principle that relief might not be granted to someone who has come to the nuisance. However, we consider that the overriding RMA purpose of promoting sustainable management (as defined in s5(2)) requires the application of considerably wider criteria than just who was there first. We note that s31(1)(d) RMA provides that the functions of local authorities include... *the control of the emission of noise and the mitigation of the effects of noise*. Nothing in RMA suggests that pre-existing noise should be subject to any lesser degree of control or mitigation than more recent noise.



²¹ Cf pages 69-70, NOE.
²² Page 81, NOE.

Remedy

[106] Our finding that the noise generated by the rifle range activity exceeds a reasonable level and is offensive or objectionable brings us to consider the appropriate remedy.

[107] The Residents' Association seeks (inter alia) that Mr and Mrs Harvey be required to adopt the best practicable option to ensure that the emission of noise from the site does not exceed a reasonable level, in accordance with s16 RMA.

[108] Section 2 RMA defines best practicable option in these terms:

Best Practicable Option, in relation to a discharge of contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to –

- (a) *The nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and*
- (b) *The financial implications, and the effects on the environment, of that option when compared with other options; and*
- (c) *The current state of technical knowledge and the likelihood that the option can be successfully applied:*

[109] The best practicable option promoted by the Residents' Association was the relocation of the range from its present location to one where a noise level not exceeding 50dB L_{AFmax} could be achieved in combination with restrictions on operating hours, shots fired and any other methods to limit noise. The evidence before us as to a possible alternative location revolved around Relocation Area One. We now consider the suitability of Relocation Area One and the overall site having regard to the best practicable option criteria.

The nature of the emission and the sensitivity of the receiving environment

[110] The nature of the noise emission (an impulse sound) is the same from the existing Range or anywhere else on the site. The sensitivity of the receiving rural/residential environment remains the same wherever on the site the noise is generated. Dr Trevathan and Mr Camp agreed that moving the Range from its present position



to Relocation Area One would reduce the level of noise received at the Cleary and Phillips properties. Relocation would also reduce the echo effect which is a feature of the present location.

The financial implications and, the effects on the environment, of that option when compared with other options

[111] Mr and Mrs Harvey estimate that the cost to them of relocating the Range would be somewhere in the order of \$35,000. They consider that to be an unreasonable cost for them to bear.

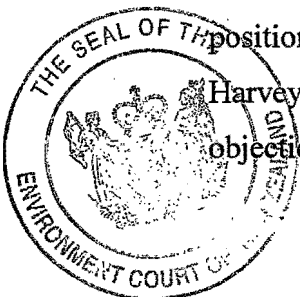
[112] There is a certain unknown element about the effects on the environment of relocation. Shifting to Relocation Area One will probably minimise or at least reduce the echoing effect from the present Range. It also appears that moving to Relocation Area One will substantially reduce noise effects on the Phillips and Cleary building sites although probably not to 50 dB L_{AFmax} for all types of firearms. However, it is unknown whether or not relocating the Range will result in greater adverse effects than at present on other nearby property owners.

The current state of technical knowledge and the likelihood that the option can be successfully applied

[113] We understood that there is nothing further which can be technically done to suppress the noise of firing on the Range. Relocation was the only feasible option which was suggested to us in order to address the noise issues.

[114] In terms of the likelihood of relocation being successfully applied, we refer to our comments in the preceding paragraph that it is presently unknown what the effects of moving to another site might be on properties other than the Cleary and Phillips properties. That is a matter of concern to the Court.

[115] It is far from certain whether or not relocating from the Range's present position to Relocation Area One will ensure that the emission of noise from the Harvey property does not exceed a reasonable level (and is not offensive or objectionable).



[116] It will be apparent from our earlier findings that we consider determination of whether or not any given noise exceeds a reasonable level involves more than just a consideration of the intensity of noise in any instance. It is also the case however, that in considering noise generating activities, the intensity or level of noise is a particularly significant factor. There are two sub-issues to be considered in that regard.

[117] The first of these is the disagreement between Dr Trevathan and Mr Camp as to the appropriate level of noise to be received by neighbours of the site. Dr Trevathan considered that 50 dB L_{AFmax} was the appropriate level, whereas Mr Camp suggested a level of 55dB L_{AFmax} from Relocation Area One. As we have noted, Mr Camp's views on appropriate noise levels were based on the premise that the Range was an existing range not a new one. However, in response to a question from Mr McFadden, Mr Camp conceded that if the range was a *brand spanking new range* the appropriate level should be 50.²³

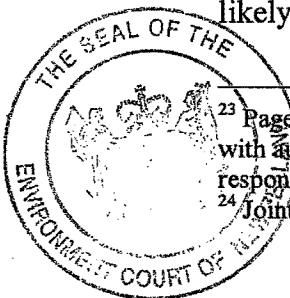
[118] Dr Trevathan and Mr Camp were accordingly in agreement that for a new range, 50dB L_{AFmax} was the appropriate level of noise at neighbouring properties. We consider that is the level which ought to apply in respect of commercial non police and police firing on the Harvey site. When the issue of existing/new range was resolved, it was the agreed position of both acoustic witnesses.

[119] The second sub-issue under this head is that it appears likely that higher calibre firearms and shotguns cannot meet the 50dB L_{AFmax} level from Relocation Area One in any event. The Joint Statement records that at Relocation Area One without an acoustically designed shed, shotguns and high calibre rifles will commonly generate noise at between 50 and 55 dB L_{AFmax} (presumably at the Cleary and Phillips' sites).²⁴

[120] The acoustic witnesses also agreed that a small additional noise reduction is likely if an acoustically designed shed is installed at Relocation Area One. However,

²³ Page 67, NOE. (The NOE did not record Mr Camp's full answer to the question due to problems with audibility however, both the NOE and Judge Dwyer's handwritten notes record Mr Camp's response that 50 was the appropriate level.)

²⁴ Joint Statement, para 5.



Mr Camp testified that the reduction in noise achieved by constructing a shed would not be as great as that achieved by the shed on the existing Range. We understand that an acoustic shed may not reduce the noise level at neighbouring properties to the 50dB L_{AFmax} which we have found to be appropriate.

[121] There was some discussion between the Court and Mr and Mrs Harvey as to their ability to meet 50dB L_{AFmax} if that was found to be the required level (as it has been). Although they both expressed a degree of optimism that 50 would be the normal situation, they could not guarantee that all the time. They both pointed to factors such as the wind blowing in a particular direction which could make a substantial difference to the level of noise received by neighbours. Mr Harvey also referred to the different noise effects of different calibres of rifle and the further possibilities of noise reduction from an acoustic shed.

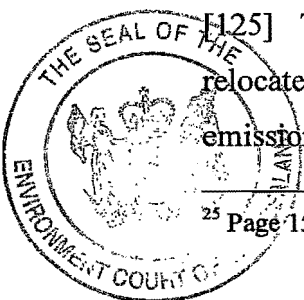
[122] The Harvey property contains over 600ha. Mr Harvey advised²⁵ that he had considered the whole property with a view to locating an alternative site for a rifle range and that any potential sites (other than Relocation Area One) were all closer to residents than the existing Range so the problem would just be shifted.

[123] As an aside, we note that because Relocation Area One is apparently in a flood plain, resource consent is likely to be required for the construction of an acoustic shed in this vicinity. Although it is not anticipated that this would be a problem, there can be no guarantee in that regard.

[124] Accordingly, it is uncertain whether shifting the Range from its existing position to Relocation Area One (or anywhere else on the site) will bring the level of noise received by neighbours within the 50dB L_{AFmax} level which the two noise witnesses agree is appropriate for a new rifle range and which we have accepted as being the appropriate level for the Range in this case.

[125] The Residents' Association's application sought an order that the Range relocates to Relocation Area One as the best practicable option to ensure that the emission of noise did not exceed a reasonable level. However there is considerable

²⁵ Page 151 NOE.



doubt as to the capacity of Relocation Area One to meet the 50dB L_{AFmax} level at neighbouring properties. If that level could be achieved at Relocation Area One it is possible that (subject to the imposition of conditions as to the hours of use and numbers of shots) an order for relocation might represent the best practicable option. The evidence which we heard did not enable us to reach that conclusion.

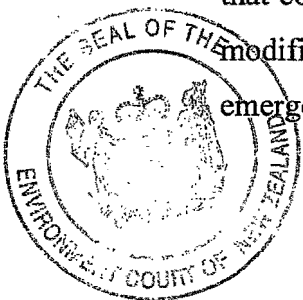
The Council Application

[126] The Council sought an enforcement order which corrected the anomalies in its abatement notice as amended in Decision C 77/2008. The Council contended that the abatement notice represented the appropriate status quo, subject to its ambiguities and shortcomings being resolved.

[127] The most significant aspects of the Council application were, firstly, that it sought to restrict the commercial, non police and police shooting activities to the existing Range and to exclude them from the balance of the site which the Council proposed would be a *Restricted Shooting Area* (except for .22 calibre shooting). This would overcome the problem experienced at Labour Weekend 2009 when restrictions on the use of the Range were *sidestepped* by shooting elsewhere on the site.

[128] Secondly, the Council sought a new set of clarified restrictions on use of the Range itself. Significantly, those restrictions did not extend to imposition of the 50dB L_{AFmax} limit on gunshot noise received by neighbours. There is a condition in the existing abatement notice requiring the noise of bullets or projectiles striking a target to be limited to 50dBA L_{max} but that restriction does not apply to the actual firing of the guns themselves.

[129] The position adopted by the Council cannot be sustained in light of the evidence which we heard. We do not intend to be critical of the Council in making that comment. The position which it advanced represents the status quo with some modifications. The Council has endeavoured to respect, as far as possible, what had emerged from the Court in Decision C 77/2008. It is not to be criticised for that.



[130] However, it is apparent on reading Decision C 77/2008 that the outcome reflected the evidence heard by the Court at that time. In those proceedings, Mr Camp and the Council's noise witness (Mr M J Hunt) had filed a joint statement setting out the appropriate conditions to be imposed on the Range and those conditions formed the basis of the abatement notice which issued from the Court. The conditions contained in those witnesses' joint statement did not impose any limit on the level of noise emitted from the Range and received by neighbouring properties.

[131] The Court did not have before it evidence such as that tendered by Dr Trevathan in this case and that evidence is determinative in our view. Once the issue of existing/new commercial use of the Range was resolved the evidence of Dr Trevathan and Mr Camp was consistent, namely that there ought be a restriction on noise received by neighbours from a new rifle range of 50dB L_{AFmax} .

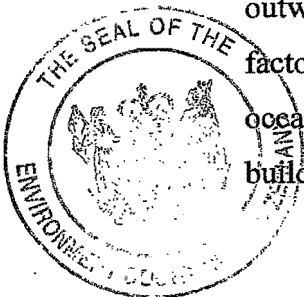
Outcome

[132] In the light of our finding that noise received from the Range not only exceeds a reasonable level but is also offensive and objectionable, we consider it is inevitable that enforcement orders be made. In reaching that determination we have had regard to the factors of:

- The Harvey family's longstanding shooting activities;
- The sporting and recreational benefits to the Harvey family and the wider community;
- The financial benefits of the activity to Mr and Mrs Harvey;
- The need for the police to provide for their firearms training; and
- The fact that the Range is a permitted activity in the Rural Zone.

All of those are positive factors which must be given due weight in our considerations.

[133] Regrettably, we consider that those positive factors are substantially outweighed by the negatives, which emerge from consideration of the FIDOL factors. In particular, the factors of frequency (some thousands of shots per day on occasions), intensity (noise levels of 62-67 dB L_{AFmax} received at neighbours' building sites and houses), offensiveness (the impulsive nature of gunfire) and



location (the proximity of the rifle range to rural/residential development) are, when considered together, decisive in our considerations.

[134] The change in the nature of the environment in 1998 from a primarily agricultural or farming area to a rural/residential area, bringing a number of close neighbours to the site is particularly significant in the context of these proceedings. There was a sense of grievance apparent in the evidence of Mr and Mrs Harvey that relative newcomers to Cable Bay Road oppose an activity which they are undertaking on a property that their family has occupied for many years.

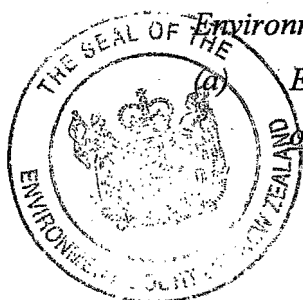
[135] Mr and Mrs Harvey did not object to the Ingham subdivision which, we understand, was carried out by a relative. Doubtless they might have reconsidered that position had they been aware that the subdivision could give rise to opposition to permitted activities on their own property. This is a classic case of reverse sensitivity.

[136] However, the fact is that the commercial, non-police and police use of the Range were not being undertaken on the site at the time of the subdivision. These gave rise to a massive increase in shooting activity on the site. Neither would the extent of Harveys' private shooting activities necessarily have been apparent to those looking to purchase the subdivided lots.

[137] Mr and Mrs Harveys' subsequent actions and, in particular, the incident of Labour Weekend 2009 demonstrate an inability on their part to understand that activities which give them (and many thousands of other New Zealanders) so much pleasure, might be regarded as unreasonable, offensive or objectionable when undertaken in close proximity to neighbours.

[138] The orders which we make are not on all fours with those sought by either the Council or the Residents' Association however we note that s319(1) RMA provides:

(1) After considering an application for an enforcement order, the Environment Court may-



Except as provided in subsection (2), make any appropriate order under section 314; (our emphasis)

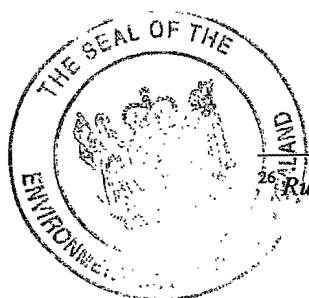
[139] It is apparent from the highlighted provision that we are not confined by the precise terms of the orders sought by the Council or Residents' Association and may make any appropriate order under s314²⁶. For the record we note that the orders which we make are intended to:

- Ensure compliance by Mr and Mrs Harvey with the provisions of s16 RMA;
- Require them to cease the emission of noise from the site which is offensive or objectionable to such an extent that it has an adverse effect on the environment.
- Require Mr and Mrs Harvey to avoid, remedy or mitigate the adverse effects on the environment caused by shooting on the site.

We make the following orders accordingly.

[140] **Firstly** we order the Respondents to cease forthwith on issue of this decision, use of the site for the discharge of firearms over .22 calibre (including shotguns) which generate noise exceeding ~~50~~ dB L_{AFmax} measured within 20 metres of the position of any dwelling or approved dwelling site on **any property** (other than the site) not owned by the Respondents. This order does not apply to:

- Target/sport shooting undertaken on the Range by or under supervision of the Respondents for which no charge is made, not exceeding 250 shots per week;
- Clay target shooting with shotguns undertaken on the Range by or under supervision of the Respondents on not more than **six Sundays** per annum. Such shooting not to take place on any two consecutive Sundays, to be limited to no more than **750 shots** on each occasion and to be undertaken during the hours of **10.00am and 4.00pm**. The Respondents are to notify Nelson City Council in writing of their intention to undertake such shooting no later than **76 hours prior** to each occasion.
- ~~Game~~ and pest eradication shooting undertaken on the site by or under supervision of the Respondents.



²⁶ *Russell v Manukau City Council* [1996] NZRMA 35.

[141] This order seeks to preclude use of the entire site (including the Range) for shooting by higher calibre rifles and shotguns and events such as that of Labour Weekend 2009, which exceed the appropriate noise level identified by Dr Trevathan and Mr Camp.

[142] We accept that the order will preclude police firearms training in its present form on the Range. We are keenly aware of the need for police officers to maintain their competence with firearms. However when the nature of police training which involves eight week periods, intensive volleying and similar noise levels to .308 rifles, is taken into account we consider that imposition of the identified noise limit is a minimum protection for neighbours.

[143] If the police do not have an immediately available alternative range we would consider a ~~motion~~ to vary the order hereby made to allow ~~one further police training~~ exercise. We issue this decision as an interim decision to leave these proceedings extant for the time being. This will enable consideration of any appropriate refinements of the orders which we now make without the need to commence proceedings afresh.

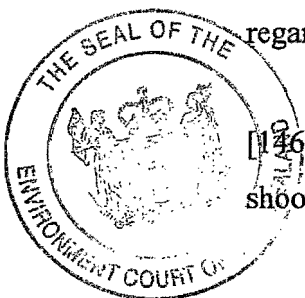
[144] The order is intended to allow target/sport shooting by the Respondents and people under their supervision for which no charge is made. This allows a continuation of Mr and Mrs Harvey's recreational activity at the level (250 shots per week) at which it has been undertaken.

Is this over 250?

*Is this at current site?
Does it mean 50 days?*

[145] The second exception allows continuation of the Gentlemen's Club shoots although on a more restricted basis than the once per month which was previously allowed. We recognise that clay target shooting is an activity which takes place on rural properties from time to time. We have endeavoured to balance the permitted activity rights of the Respondents against expectations of neighbours that a reasonable level of noise will be maintained in the environment and we have had regard to the FIDOL factors in imposing the restrictions which we have.

[146] We have not included provision for the special days such as the duck shooting warm up days. Again we recognise that such events will take place on rural



properties from time to time and are limited in number. However when the 5,000-7,500 shots per day and the level of noise received by neighbours are factored into the equation, we consider that the warm up days go well beyond what a non participating neighbour ought reasonably be required to tolerate and would also be offensive and objectionable.

[147] We have not attempted to restrict the Respondents' game and pest eradication shooting on the site. Those are activities which might reasonably be expected to be undertaken on rural properties.

[148] Secondly, we order the Respondents to cease within ~~six months~~ of the issue of this decision, use of the Range and site for the discharge of firearms of ~~.22 calibre or less~~ which generate noise exceeding 50 dB L_{AFmax} measured within 20 metres of the position of any dwelling or approved dwelling site on any property (other than the site) not owned by the Respondents. This order does **not apply to:**

- ~~X~~ ~~Target/sport shooting~~ undertaken on the Range by or under supervision of the Respondents for which **no charges** are made;
- **Game and pest** eradication shooting undertaken on the site by or under supervision of the Respondents.

[149] This order enables continuation of tourist shooting with .22 calibre rifles for a term of six months to enable the respondents to investigate whether it is feasible for them to carry on their commercial shooting activities elsewhere on the site, should they wish to do so. We are conscious of the income which the Range provides to Mr and Mrs Harvey, although we were not given any breakdown of income between tourist shooting with .22 calibre firearms and other commercial shooting and police shooting.

[150] We appreciate that in light of the controls to which shooting is to be subject, the Respondents may not consider it feasible to establish another range elsewhere on the site, however that outcome is the direct result of the manner in which the Respondents have undertaken their activities.



- 250/yrk. High Calibre.
- Uncontrolled Pest & Game eradication.
- Monitoring.

[151] In any event, we issue this decision as an ~~interim decision~~ so that should the Respondents establish or seek to establish another rifle range on the site which can comply with the 50 dB L_{AFmax} noise level at neighbouring properties, we might also consider what other controls ought be imposed on shooting in terms of numbers of shots and shooting days. Any party to these proceedings may seek further orders regarding those matters at any time on 15 working days notice.

[152] Pursuant to s314(5) RMA we direct that these orders apply to the successors and assigns of the Respondents to the same extent as they apply to the Respondents themselves.

[153] We direct the ~~Council~~ to submit to the Court for execution under seal a ~~formal order~~ embodying the orders contained in paras [140], [148] and [152] of this decision.

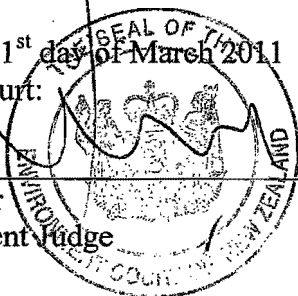
[154] We allow a period of 10 working days from the date of this decision for any parties to submit memoranda seeking to clarify any aspect of the formal order which is not apparent on the face of the decision. We make the observation that ensuring ~~compliance~~ with the terms of this order falls within the ~~functions of the Council~~ pursuant to s31(1)(d) RMA notwithstanding some reservations on the part of Counsel for the Council in that regard.

[155] Notwithstanding our intention that this decision be embodied in the form of an order, it is to take effect from the date on which this decision is received by Mr and Mrs Harvey pursuant to s315(1) RMA.

[156] Costs are reserved. Any costs application by the Council and/or the Residents' Association shall be made and processed in accordance with para 4.5.6 of the Court's Consolidated Practice Note 2006.

Dated this 1st day of March 2011
For the Court:

B P Dwyer
Environment Judge



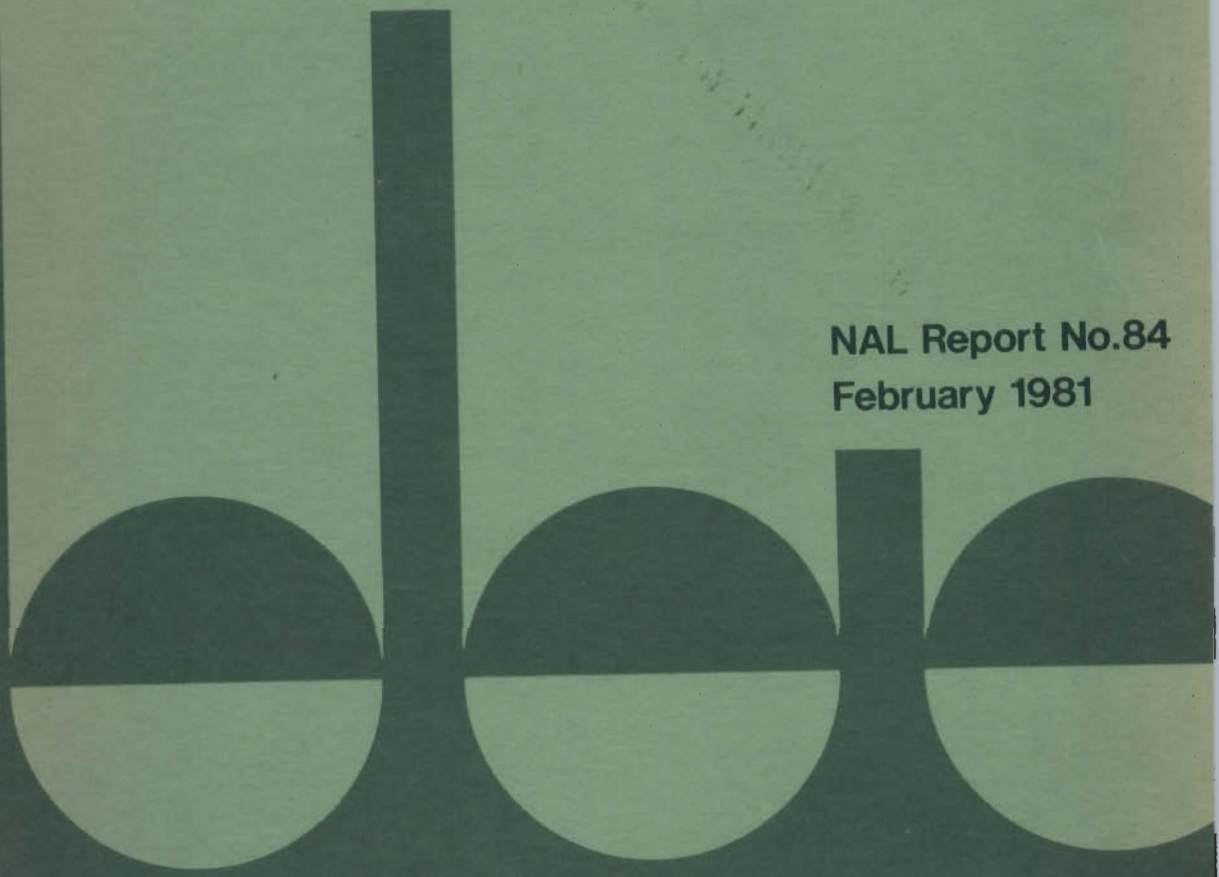
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NATIONAL
ACOUSTIC
LABORATORIES
COMMONWEALTH
DEPARTMENT
OF HEALTH

Community reaction to noise from Hornsby Rifle Range

NAL Report No.84
February 1981



**NATIONAL ACOUSTIC LABORATORY,
9th FLOOR A.M.P. BUILDING,
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NATIONAL ACOUSTIC LABORATORIES
COMMONWEALTH DEPARTMENT OF HEALTH

N.A.L. REPORT NO. 84

FEBRUARY 1981

COMMUNITY REACTION TO NOISE FROM
HORNSBY RIFLE RANGE

A.J. HEDE AND R.B. BULLEN

SOCIO-ACOUSTIC RESEARCH SECTION

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ABSTRACT

The impact on the community of the noise from Hornsby Rifle Range was assessed in a socio-acoustic investigation comprising a social survey of 201 residents and noise measurements at 10 sites around the range. Subjective reaction was measured by a composite score based on the responses to many different questionnaire items. It was found that reaction was determined largely by psychological variables which modify the effect that the noise has on the individual. In fact, attitude towards the range explained seven times as much of the variance in individual reaction as the noise level itself. The most useful indices of noise exposure seem to be A-weighted sound exposure level (ASEL) and Unweighted peak sound pressure level (LPEAK). On the basis of the present dose-response analysis it is proposed that for land-use planning, a suitable criterion level would be 55 dB ASEL or 85 dB LPEAK. It is estimated that there are approximately 470 residents whose lives are somewhat disturbed by the noise from Hornsby Rifle Range, and that about 150 of these can be described as "seriously affected". A number of noise abatement options are discussed.

SECTION 1 INTRODUCTION

1.1 Description of Hornsby Rifle Range

Hornsby Rifle Range is located in the Sydney suburb of Hornsby approximately 25 km north-west of the city. The range occupies a triangular area with an apex off Rosamond Street and extending some 4 km into a bushland reserve. The rifle range was first established in 1898 in what was then a remote area. In the past 20 years there has been considerable residential development particularly along the two ridges to the north and south of the range. Figure 1.1 provides an aerial view of the range and the surrounding residential area. The target butts are situated about 1 km from Rosamond Street with the firing mounds at 100 yard intervals up to 800 yds from the targets. However, extensive re-modelling is underway to convert the mounds to metric distances 100 m to 700 m.

1.2 Range Usage

Although administered by the Australian Army, Hornsby Rifle Range is used as a non-military range. The major users are the North Shore District Rifle Association (NRA) who shoot mainly on Saturdays with occasional competitions on Sundays, and the Sporting Shooters' Association of Australia (SSAA) who shoot only on Sundays. The weapons used by the SSAA include rifles of all sporting calibres whereas the NRA uses only 7.62 mm calibre rifles.

Details of range usage are given in Table 1.1. These data were taken from logs compiled by the two groups of shooters over a period of one full year (May 1979 - April 1980). During this period the range was used on 48 Saturdays and 41 Sundays with a total of approximately 150,000 shots being fired. On Saturdays the shooting commenced no earlier than 1.00p.m. and finished no later than 6.30p.m. - in fact, on all except 4 days the shooting had ceased by 5.00p.m. All the Saturday shooting was by the NRA who averaged 2,542 rounds each day at ranges from 300 yds. to 800 yds.

On Sundays, the rifle range is used mainly by the SSAA. In the year studied they used the range on 36 Sundays firing an average of 435 rounds on each day, and shooting almost invariably off the 100 yds. range. Shooting by the SSAA usually commenced at 1.00p.m. (except for three days when it started between 10.00 and 11.00a.m.), and always finished by 5.00p.m. There were 8 Sundays in the year when the range was used by the NRA firing off 300 yds. to 700 m. On each occasion shooting commenced in the morning, mostly at 9.30 and once at 8.32, and continued as late as 6.30p.m.

In the year 1979/80 it so happened that the range was not used at all on Saturday mornings. However, this is apparently

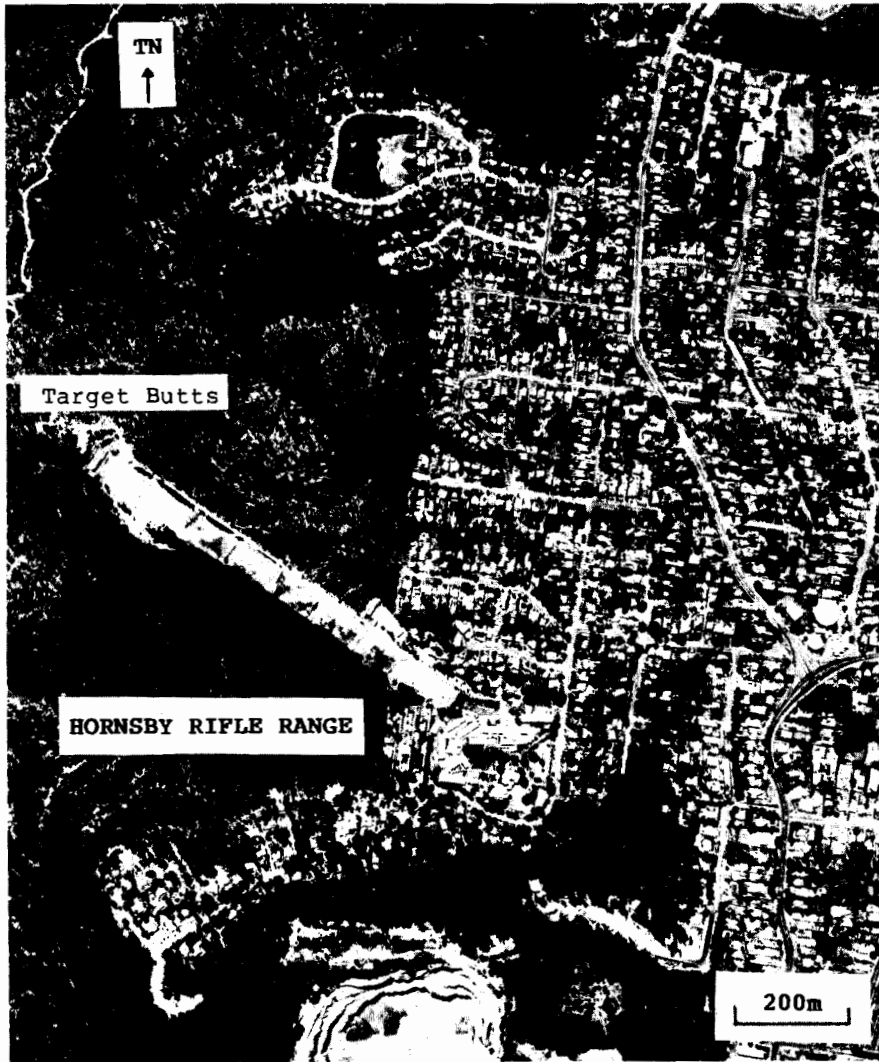


FIGURE 1.1 Aerial photograph of Hornsby Rifle Range and environs (scale: approx 1:10,000).

| Range | Saturdays | | Sundays | |
|----------|----------------|----------------------|----------------|----------------------|
| | Number of Days | Mean Number of Shots | Number of Days | Mean Number of Shots |
| 100 yds. | - | - | 36* | 422 |
| 200 yds. | - | - | 1* | 475 |
| 300 yds. | 10 | 2,089 | 3 | 1,325 |
| 400 yds. | 10 | 2,502 | 3 | 712 |
| 500 yds. | 9 | 2,445 | 5 | 989 |
| 600 yds. | 11 | 2,116 | 5 | 978 |
| 700 yds. | 8 | 2,161 | 2 | 892 |
| 800 yds. | 1 | 108 | - | - |
| 700 m | 5 | 2,672 | 1 | 432 |
| TOTALS | 48 | 2,542 | 41 | 826 |

TABLE 1.1 Range usage data for 1979/80. Mean number of shots at each firing position for Saturdays and Sundays. (*Indicates SSAA as distinct from NRA). Note that on some days more than one firing position was used and both groups used the range.

not typical - small groups from GPS schools occasionally shoot on Saturday mornings. The range is rarely used on weekdays - now and then a few shots are fired to test rifles etc.

1.3 The Present Investigation

Following complaints over a number of years from some of the residents, the Department of Defence called on the National Acoustic Laboratories to assess the noise problem around Hornsby Rifle Range.

After an initial rather limited study which involved 12 complainants keeping weekly noise records, it was decided to

mount a full-scale socio-acoustic investigation. Such an investigation consists of a social survey designed to assess the subjective reaction of the residents, as well as a noise survey to establish the distribution of noise throughout the community.

The primary aim of the present study was to determine the relationship between exposure to the rifle range noise and community reaction. It is only after this "dose-response" relationship has been established that one can gain an accurate assessment of the noise problem.

SECTION 2 THE SOCIAL SURVEY

2.1 Sample Selection

The survey area was defined by a rough semi-circle around the range (See Figure 2.1). Houses facing the highways to the east of the range (Galston Road and Pacific Highway) were excluded because of the high traffic noise levels.

The addresses of the 520 houses in the survey area were listed by field observation. The survey sample was selected by a computer program which specified a randomly chosen starting point in each street block. Every second house from this point was considered to be in the sample. When the last house so selected happened to be next-door to the starting point the former was excluded. Thus, the sample consisted of 248 dwellings none of which were on adjoining properties.

Only one interview was conducted at each dwelling, but the respondent was randomly selected using the procedure outlined in Section 2.3. It is argued that random selection of the respondent avoids the problems of sample bias which arise when interviews are sought with the head of household or with whomever answers the door.

2.2 The Questionnaire

A copy of the interview schedule is included in Appendix I. A conceptual summary of the 32 question schedule is as follows:

| | |
|-------------------|---------------------------------|
| Questions 1 - 6 | Satisfaction with Neighbourhood |
| Question 7 | Noise and Annoyance Sensitivity |
| Question 8 | Perception of Survey Purpose |
| Questions 9 - 12 | Neighbourhood Noises |
| Questions 13 - 24 | Reaction to Rifle Range Noise |
| Questions 25 - 27 | Attitudes Towards Rifle Range |
| Questions 28 - 32 | Classification Information |

Note that Questions 13 to 24 inclusive are omitted if the respondent does not report annoyance from the rifle range noise.

The interview schedule was designed to assess people's reactions and feelings about the rifle range noise in the context of their overall opinions about the neighbourhood. Accordingly, the early questions in the interview inquired about general neighbourhood features and gradually led into

questions about neighbourhood noises and the rifle range in particular. Thus, the respondent was able to spontaneously mention the rifle range as a problem in the area and to rate his/her reaction to the noise of shooting before being asked specifically about the rifle range. This approach guards against response bias which can result from some respondents' tending to exaggerate or underestimate their reaction when prompted by the noise-wording. Such bias can occur in any social survey where strong feelings about an issue (e.g., environmental pollution) may prevent people from being able to accurately report their own subjective reactions. In other words, the procedure of using neutral questions in the early part of an interview of this sort is standard practice in noise social surveys.

Subjective reaction to the rifle range noise was assessed by means of several questions (e.g., Q7k, Q11e, Q14, Q27). In these questions respondents were required to rate the strength of their reactions on a 0-10 scale using an 'opinion thermometer' (See Figure 2.2). In previous research by NAL it has been found that people in Australia are readily able to use this rating scale to express their reactions to noise.

The schedule also included questions designed to assess the respondent's sensitivity to noise (Q7) and attitudes towards the rifle range (Q25). These two factors have been found to be important modifiers of human reaction to noise.

A pilot test of the original interview schedule was conducted by the authors in September, 1979. Twenty two interviews were completed at dwellings not in the main sample. The schedule was revised to take account of any problems experienced with the wording of individual questions.

2.3 Field Procedures

Ten interviewers underwent a three-day training course which included extensive supervised practice with the schedule as well as thorough briefing on the procedures for field control. Details are given in the social survey manual (1).

Interviewers were given a list of addresses and were required to make up to four effective calls (including two evenings) to establish contact at each dwelling. The interviewers made up to three further calls to secure an interview with the respondent who was randomly selected as follows:

When contact was made at a dwelling, the interviewer first inquired who were the members of the household aged 18 or over. These were assigned a number corresponding to the order in which they were given. The interviewer then consulted a specially prepared random number table to find which of the household members was to be the respondent. If the selected respondent proved to be out-of-scope, another person was selected

OPINION THERMOMETER

HOW MUCH

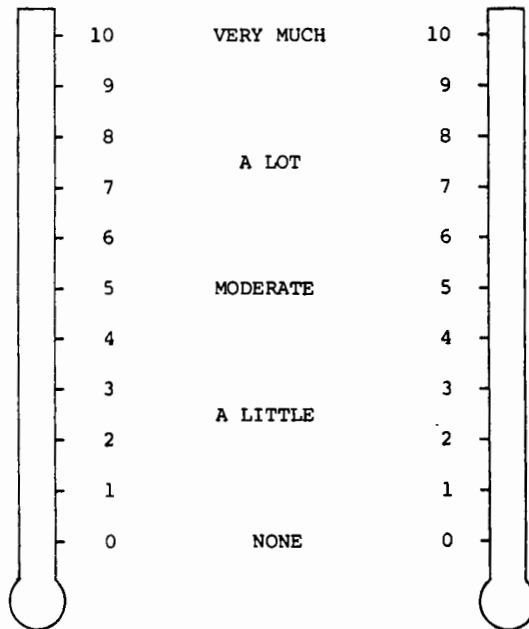


FIGURE 2.2 Opinion thermometer used by respondents to give ratings of subjective reaction.

using the table of random numbers. However, if the selected person refused to be interviewed the dwelling was designated as a refusal and no interview was conducted.

A selected person was deemed to be out-of scope if any of the following applied: The person -

- was not aged 18 or over,
- did not have an adequate command of English,
- was a non-Australian diplomat or a non-Australian service-person,
- was not a usual resident at the address,
- was too infirm to be interviewed,
- was going to be away from home for the entire survey period.

2.4 Response Rate

The survey was conducted in the period 6th - 15th November, 1979. The response details are summarized in Table 2.1. Of the 248 dwellings approached three were unoccupied leaving an effective sample of 245. Of these, there were 31 refusals (12.7%) and 11 dwellings where no contact was made after four calls (4.5%). In two cases the occupants were overseas according to information supplied by neighbours. A total of 201 successful interviews were obtained giving a response rate of 82% which is considered satisfactory.

| | Number | % |
|---|--------|------|
| SAMPLE SET | 248 | |
| SAMPLE LOSS | 3 | |
| EFFECTIVE SAMPLE | 245 | 100 |
| NON-RESPONSE (Total) | 44 | 18.0 |
| Refusal | 31 | 12.7 |
| Non-Contact | 11 | 4.5 |
| Occupants Overseas | 2 | 0.8 |
| COMPLETED INTERVIEWS (Response Rate) | 201 | 82.0 |

TABLE 2.1 Breakdown of response rate.

Every effort was made to avoid any publicity which might pre-sensitize the community being surveyed. Although nine people (4.5%) reported in Question 8 that they had heard about the survey none of them mentioned the rifle range noise when asked what they had heard.

2.5 Demographic Breakdown of Sample

Details of the composition of the survey sample in terms of the eight demographic variables are provided in Table 2.2. The breakdown of respondents by sex warrants some comment in that it differs from the 1976 Census figures for the collectors districts overlapping the survey area. In the Census the proportion of males to females over 18 years was 50.1% to 49.9% as compared with the present proportion 41.3% to 58.7%. This apparent over-sampling of females is due to the fact that while each household was restricted to one randomly-selected respondent, there was not an even distribution of males and females across households.

| | | | | | | | |
|----------------------|--------------------|--------------|--------------|-------------|-------------|-------|-----|
| a. <u>SEX</u> | | Male | | Female | | | |
| | Number | 83 | | 118 | | | |
| | % | 41.3 | | 58.7 | | | |
| b. <u>AGE</u> | | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70 |
| | No. | 35 | 63 | 29 | 33 | 23 | 18 |
| | % | 17.4 | 31.3 | 14.4 | 16.4 | 11.4 | 9.0 |
| c. <u>OCCUPATION</u> | | Professional | White Collar | Blue Collar | Home Duties | | |
| | No. | 46 | 48 | 45 | 62 | | |
| | % | 22.9 | 23.9 | 22.4 | 30.8 | | |
| d. <u>EDUCATION</u> | | Number | | % | | | |
| | 1-3 yrs. Primary | 1 | | 0.5 | | | |
| | 4-6 yrs. " | 12 | | 6.0 | | | |
| | 1-4 yrs. Secondary | 92 | | 45.8 | | | |
| | 5-6 yrs. " | 53 | | 26.4 | | | |
| | 1-2 yrs. Tertiary | 12 | | 6.0 | | | |
| | 3 & yrs. " | 28 | | 13.9 | | | |
| | Refuse | 3 | | 1.5 | | | |

TABLE 2.2 Breakdown of survey sample by demographic variables: a) sex, b) age, c) occupation, d) education.

| | | | | | | | |
|----|-----------------------------------|------|--------|--------|---------|------|-------------|
| e. | <u>HOME OCCUPANCY</u> | | Own | Buying | Renting | DK | |
| | No. | | 93 | 100 | 6 | 2 | |
| | % | | 46.3 | 49.8 | 3.0 | 1.0 | |
| f. | <u>LENGTH OF RESIDENCE</u> | <1yr | 1-2yrs | 2-5yrs | 5-10yrs | >10 | All of Life |
| | No. | 18 | 13 | 29 | 35 | 104 | 2 |
| | % | 9.0 | 6.5 | 14.4 | 17.4 | 51.7 | 1.0 |
| g. | <u>NO. OF ADULTS IN HOUSEHOLD</u> | | 1 | 2 | 3 | 4 | 5 |
| | No. | | 35 | 128 | 25 | 12 | 1 |
| | % | | 17.4 | 63.7 | 12.4 | 6.0 | 0.5 |
| h. | <u>FAMILY INCOME</u> | | | Number | | % | |
| | Less than \$5,000 | | | 29 | | 14.4 | |
| | \$5,000 - \$10,000 | | | 20 | | 10.0 | |
| | \$10,000 - \$15,000 | | | 45 | | 22.4 | |
| | \$15,000 - \$20,000 | | | 35 | | 17.4 | |
| | \$20,000 - \$25,000 | | | 25 | | 12.4 | |
| | More than \$25,000 | | | 24 | | 11.9 | |
| | Refuse | | | 23 | | 11.5 | |

TABLE 2.2 Breakdown of survey sample by demographic variables: e) home occupancy, f) length of residence, g) No. of adults in household, h) family income.

In particular, of the 35 households occupied by one adult, 26 of them (i.e., 74%) were occupied by a female. Because interviewers had recorded details of household membership, it was possible to calculate the breakdown by sex which would be expected from the distribution of males and females in different sized households. There were 193 households for which complete membership information was recorded (See Table 2.3). The number of male respondents expected by random choice from the actual numbers of males in the various households was 87.6. This number was not significantly different from the number of male respondents in the sample (Chi square = 0.84).

| Household Size (No of Adults) | Number of Households in Sample | No of Males in Sample Households | No. of Male Respondents | |
|----------------------------------|--------------------------------------|--|-------------------------|--------|
| | | | Expected | Actual |
| 1 | 35 | 9 | 9 | 9 |
| 2 | 128 | 126 | 63 | 59 |
| 3 | 19 | 28 | 9.3 | 6 |
| 4 | 10 | 22 | 5.5 | 5 |
| 5 | 1 | 4 | 0.8 | 1 |
| TOTALS: | 193 | 189 | 87.6 | 79 |

TABLE 2.3 Distribution of actual and expected numbers of male respondents by household size.

2.6 Questionnaire Results

The basic frequencies data obtained for each question are summarised on the copy of the interview schedule in Appendix I. In most cases the data are presented as the percentages of respondents who gave each of the listed responses. However, for questions requiring respondents to give a rating using the opinion thermometer the mean ratings are listed.

Note that if respondents gave zero ratings for Q11e (annoyance from shooting noise) then they were not asked Questions 13 to 24 inclusive. It has been found in previous studies that respondents become annoyed if they have to repeatedly deny being affected by a noise. There were 65 respondents for whom the noise questions were skipped. For analysis purposes they were assigned 'No' responses in Questions 15, 16, 19 and 23, and zero ratings in Questions 14, 18 and 24 on the grounds that they were completely unaffected by the rifle range noise.

While the basic data on each question are of general interest, a meaningful interpretation is possible only in the context of data on noise exposure. For this reason the results will be discussed after details of the noise survey are presented in the next section.

SECTION 3 NOISE MEASUREMENTS

3.1 The Units Used for Measurement

In studying the relationship between noise exposure and human reaction to it, it is necessary to define clearly the units to be used in measuring the quantities on each side of the "equation". The units should be measurable with reasonable accuracy, and have face validity. Thus, units of noise exposure should reflect the physical properties of the sound which are directly related to human reaction.

In the case of impulsive noise such as rifle shots, the maximum overpressure of the sound wave (the linear peak pressure) is commonly used to measure intensity and loudness. However, studies by Fidell et al (2) have suggested that the energy content of the impulse is a more reliable measure of its "noisiness". This concept is intuitively appealing, since the peak overpressure may occur over a very short time period and takes no account of the duration of the rest of the impulse. In this study, the acoustic energy of a rifle shot was represented by the sound exposure level (SEL). This unit gives the level of a sound with duration 1 second and the same total energy as the impulse, and is defined by

$$SEL = 10 \log \left\{ \frac{1}{t_0} \int_{-\infty}^{\infty} (p(t)/p_0)^2 dt \right\} \quad (1)$$

where p is the sound pressure due to the impulse, $p_0 = 2 \times 10^{-5} \text{ Nm}^{-2}$ and $t_0 = 1 \text{ sec}$. In the case of A-weighted SEL, $p(t)$ represents the output of an A-weighting filter.

For this study, unweighted (linear) and A-weighted SEL (referred to as LSEL and ASEL respectively) were calculated. The linear and A-weighted peak sound pressure level (LPEAK and APEAK) were also used. It should be noted, however, that the unit APEAK is lacking in construct validity. It represents the peak level of the output of an A-weighting filter, and thus is sensitive to phase distortion in the filter. It is therefore difficult to see that it can represent any quantity present either in the physical sound wave or in the signal after "processing" by the ear. The unit was included in the analysis only for comparison with other work.

In combining sound levels from a number of different shots, it is natural to use an energy-summation process, as suggested by Fiddel et al (2) and by Schomer (3). Schomer, in fact, suggests that for impulses of the levels recorded in this study, energy-summated ASEL would be the appropriate unit. Since only one rifle range is included in this study, the effect of altering the overall frequency of shots could not be investigated, and an energy-summated unit is thus

effectively equivalent to the energy-mean of this unit.

The distribution of levels of shots over different days, however, did vary substantially at different points around the range. It was therefore thought that units roughly equivalent to L_p , as used in traffic noise measurements, may show differences from energy-mean levels in their ability to predict reaction. Four such units were calculated - the level exceeded by 50 shots on 10 days of the year (L50:10), the level exceeded by 50 shots on 30 days (L50:30), and the levels exceeded by 500 shots on 10 and 30 days (L500:10) (L500:30). These units were calculated using ASEL as the basic unit for a single shot.

3.2 Preliminary Measurements

The task of finding a number of exposure measures for a single rifle shot is clearly simplified if the shot can be recorded. However, it is not clear that an analogue tape recorder can accurately reproduce the high peak levels and fast rise times of a rifle shot. This was therefore tested, using the instrumentation shown in Figure 3.1.

The microphone was placed as shown in Figure 3.2, and a shot recorded simultaneously on the tape recorder and the waveform recorder. The pressure waveform stored in the waveform recorder was then plotted. The peak sound pressure level, as measured on the sound level meter, was also recorded. Five shots were analysed in this way. The tape recordings were later analysed in the laboratory to obtain peak levels and waveform plots.

It should be noted that for these measurements, the microphone was much closer to the rifle, and thus peak sound pressure levels were higher and rise times faster, than would be the case for field measurements.

The mean difference between peak levels measured in the field and those obtained from tape recordings was +0.1 dB, and the r.m.s. difference was 0.4 dB. These differences are small and appear to represent the limit of reproducibility either of the playback heads of the tape recorder or of the "peak hold" circuit in the sound level meter, since repeated peak level determinations for the same shot gave similar r.m.s. deviations.

Plotted waveforms of a typical shot are shown in Figure 3.3. It is clear that the tape recorder can reproduce details of the pressure waveform quite well. The small differences in detail which can be detected would have negligible effect on determinations of SEL. It should be pointed out that apparent differences in the relative levels of peaks of the waveform can arise from the finite time between samples in the waveform recorder. (In this case, the

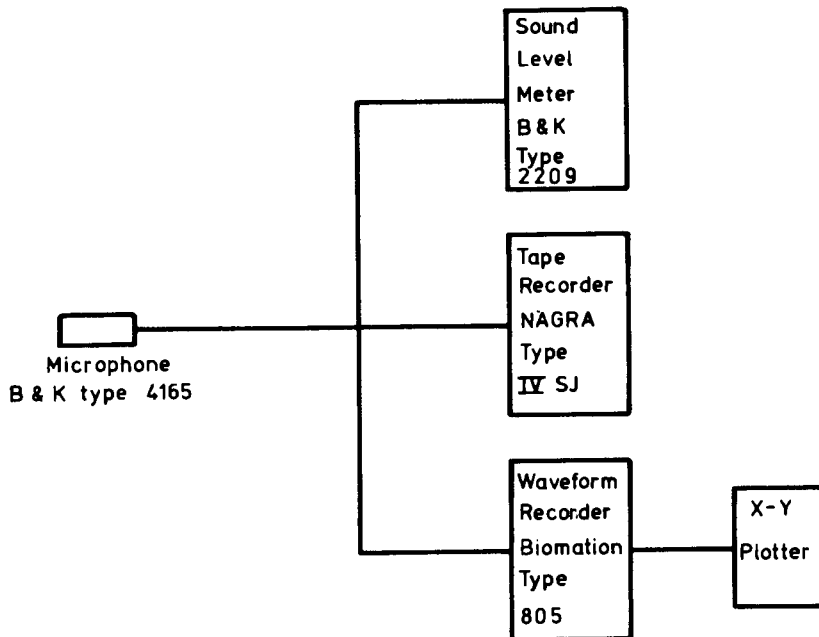


FIGURE 3.1 Instrumentation used in preliminary on-range test.

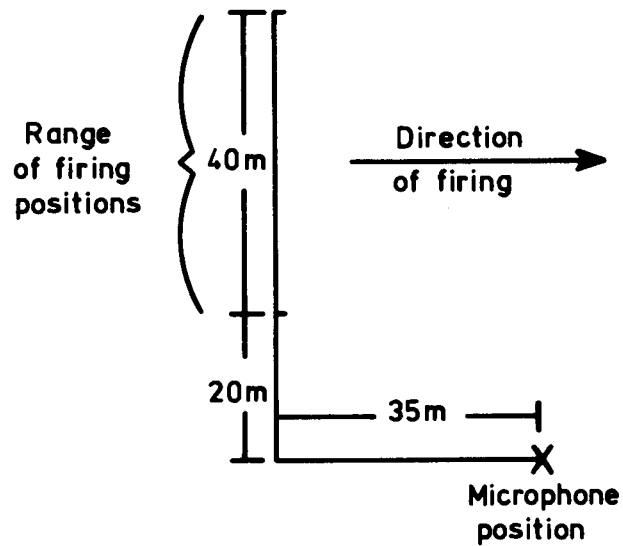


FIGURE 3.2 Microphone position used in preliminary on-range test.

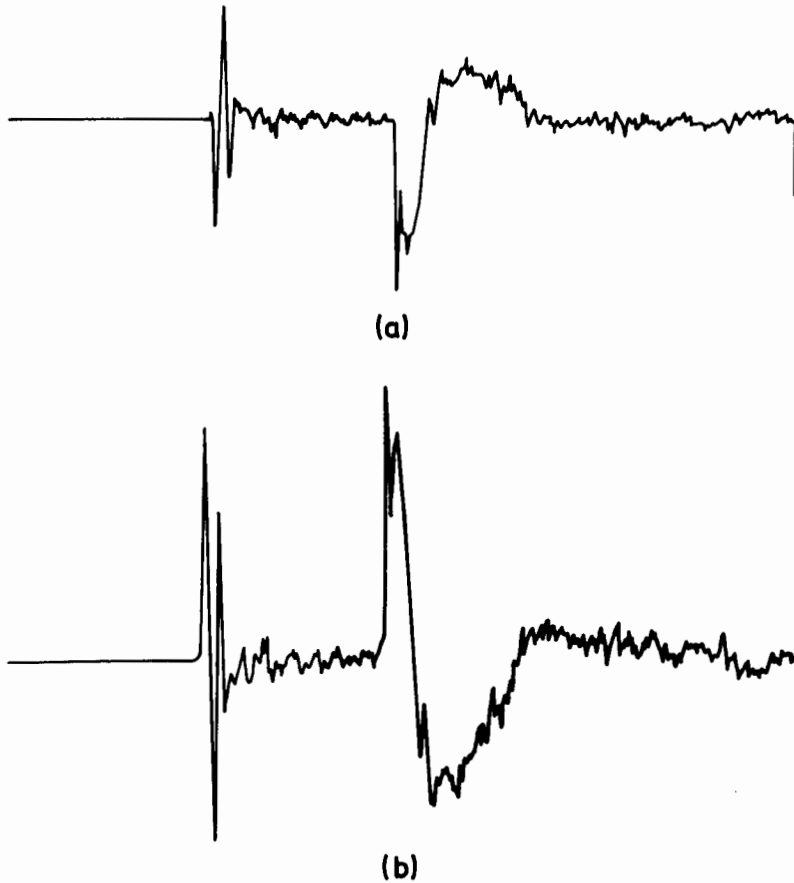


FIGURE 3.3 Pressure waveform of a typical rifle shot:
a) recorded directly from microphone,
b) reproduced by Nagra IV SJ tape recorder.
(Note that the output from the tape recorder is
inverted. The length of the record shown
is 20msec.)

sampling rate was 100 kHz.) A better indication of the recorder's response to peaks is its ability to reproduce peak levels on the S.L.M.

It is interesting to note from Figure 3.3 that the noise from a single shot has two distinct parts, separated in this case by approximately 4.5 msec. The first part represents a shock wave from the bullet. At Hornsby Rifle Range, the ammunition usually used has a muzzle velocity of approximately 730m/sec, and the bullet is supersonic for approximately 400m after leaving the muzzle. The second part represents the sound of the explosion in the rifle. These two components will have different frequency characteristics and directionalities (the shock wave, of course, being highly directional), and the time difference between them will depend on the position of the observer. Thus the noise propagating into the community is quite complex, and can be made more so by the presence of echoes and shielding. These factors result in a complicated pattern of noise exposure, which in some cases can change dramatically over quite small distances.

3.3 Measurement Procedures

The most accurate way of assessing noise exposure would be to take noise measurements at each surveyed residence. However, since this would involve measurements on a number of days at each of 201 sites, it was impracticable for this study. It was decided that measurements would be taken at ten selected sites on each of seven days, and exposure at residences be calculated by interpolation. The measurement sites are shown in Figure 3.4.

Ten shots were recorded at each site on each day, using a B & K 4165 microphone and a Nagra IV - SJ tape recorder. No meteorological information was recorded, but wind speeds and directions, as estimated by the shooters, were obtained, as well as details of the number of rounds fired and the distance of shooters from the targets (the range). More accurate meteorological data would have been of little use, since it is not available over a long period, and thus even if the effect of meteorological conditions could be established in detail, this would not have helped in assessing long-term noise exposure.

Tape recordings were analysed using the equipment shown in Figure 3.5. The HP 9810A was programmed to accept data words from the waveform recorder (a total of 2K words) and print out the mean-square value, which gives SEL. The sample rate of the waveform recorder was 10 kHz, giving a sample length of 200 msec. In some cases where echoes extended beyond this time, a second record, running from 200-400 msec. from the initial shot, was analysed and added to the first record. Another record, running from 1.8-2 sec. after the

NATIONAL ACOUSTIC LABORATORY,
9th FLOOR A.M.P. BUILDING,
1 KING WILLIAM STREET,
ADELAIDE 5000.

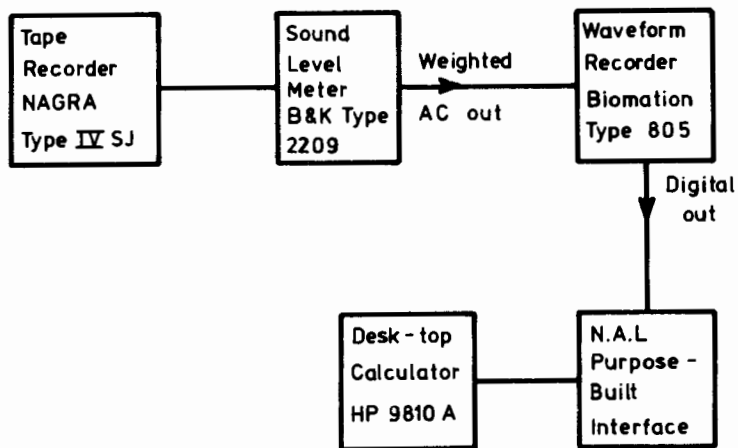


FIGURE 3.5 Instrumentation used in analysis of noise recordings.

shot, was analysed to give a "background" reading, which was subtracted from the reading for the shot. If the "background" reading was greater than half that of the shot, the shot was disregarded. This was most often caused by wind, in the "linear" readings, but could also be caused by background noise. Other shots were disregarded because they occurred too close to each other to be analysed separately.

The adequacy of the 10 kHz sample rate was checked by printing out the highest level reached in the waveform, and comparing this with the peak level recorded on the sound level meter. The fact that these almost always agreed to within ± 1 dB indicates that sampling error was unimportant in estimating the mean-square value of the waveform.

3.4 Analysis of Sound Levels

Results for each day and site are given in Appendix II. It will be noted that measurements at site 8 were possible on only one day, the noise on the other days being either inaudible or well below background levels. In later analysis, site 8 was disregarded.

Inspection of these results indicates that the angle between the line of firing and the measurement site appears to be the most important variable determining the sound level. This not only explains the high levels at sites 1, 4 and 10 relative to sites 6 and 7, which are much closer to the firing position, but also explains the uniformly lower values on day 4. On this day, the firing range was only 100 yds., so that angles to the line of firing were greater at all sites (see Figure 3.4). The most natural way to describe such directionality is to include a term of the form $K(1 + \cos\theta)^n$ in the predictive equations for sound levels, where θ is the angle to the line of firing and K and n are constants to be determined.

The vector wind speed between the firing position and the measurement site was determined from shooters' estimates on each day, and its effect was accounted for by a term BV , where V is the vector wind speed in knots and B a constant.

The effect of air absorption is difficult to quantify, since it is highly dependent on frequency. Figure 3.6 shows measured spectra of typical shots at sites 1 and 9, together with spectra corrected for air absorption. As would be expected, the shot at a smaller angle to the line of firing has more high-frequency content, since the bullet's shock wave is more prominent here. It was decided to estimate the high-frequency content of a shot by the difference between LSEL and ASEL (known as DSEL). Even at site 1, which has almost the smallest angle to the line of firing of any point

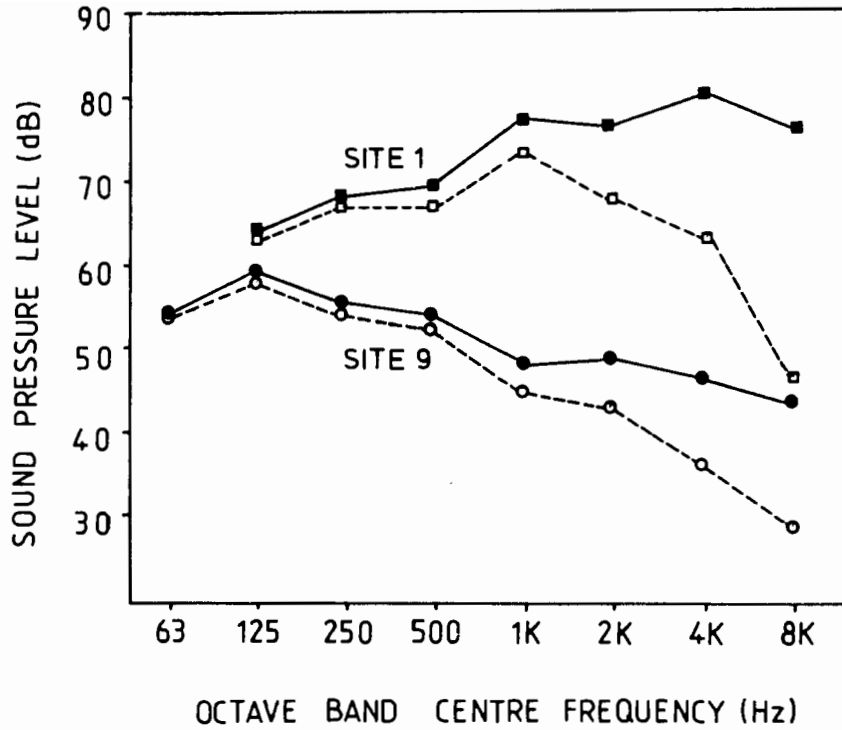


FIGURE 3.6 Spectra of typical rifle shots recorded at two sites. (----- spectra as measured; ——— spectra corrected for air absorption.)

in the survey, air absorption did not have appreciable effect on DSEL. That is, the difference between absorption - corrected LSEL and absorption - corrected ASEL was within 0.5 dB of the difference between their uncorrected values. Thus DSEL can be estimated by an equation of the form

$$DSEL = K(1 + \cos\theta)^n + BV + C \quad (2)$$

Multiple regressions of mean DSEL for each day and each site against θ and V for various values of n showed that the value of B was insignificantly small, and the best fit to the data was given by the equation

$$DSEL = 5.8 - 1.21 (1 + \cos\theta)^{2.7} \quad (3)$$

with a standard error of estimate of 1.7 dB.

From this equation, the frequency of maximum energy was estimated, and thence the likely air absorption. The resulting values of attenuation may be roughly described by the equation

$$Att = 0.2 + 0.04 (1 + \cos\theta)^5 \quad (4)$$

where Att is the attenuation in dB per 100 m.

On including all the above terms, as well as the distance-correction term $-20 \log (D/100)$, where D is the distance from the firing position, the predictive equation for ASEL becomes

$$ASEL = K(1 + \cos\theta)^n + BV - (0.2 + 0.4 (1 + \cos\theta)^5)D/100 - 20 \log (D/100) + C \quad (5)$$

Multiple regressions with various values of n give the equation of best fit to the energy-mean ASEL values for each day and each site. Inspection of residuals showed that sound levels at site 2 were consistently below their predicted level. This is not surprising, since site 2 is situated behind a rise of approximately 10m. Thus, levels at site 2 were dropped from the analysis, and the resulting equation of best fit has the following values for the parameters:

$$\begin{aligned} K &= 8.02 \\ n &= 2.6 \\ B &= 0.16 \\ C &= 62.5 \end{aligned} \quad (6)$$

The mean ASEL at site 2 is now 9.5 dB below its predicted level. The standard error of estimate is 5.5 dB.

The effect of air absorption on peak levels is even more difficult to quantify, since it depends on details of the frequency-dependence and phase characteristics of the absorption process. However, from inspection of the preliminary recordings made close to the range, it appeared that the peak level was due to the rifle noise, rather than the bullet shock. Since the former is dominated by lower frequencies which would not be highly attenuated over the relevant range of distances, no air absorption term was used in the analysis. Thus, the predictive equation for LPEAK is

$$LPEAK = K(1 + \cos\theta)^n + BV - 20 \log (D/100) + C \quad (7)$$

with a similar equation for APEAK.

In both cases, inspection of residuals from the equation of best fit showed that levels at sites 2 and 5 were consistently low. Site 5 is the site with the greatest shielding from houses. (Note that site 3 is on a rise, and is virtually unshielded.) It is perhaps reasonable that an integrated measure such as ASEL, which would respond to the effects of multiple reflections from buildings, would not be as sensitive to shielding by buildings as a peak level.

On removing these sites from the analysis, the predictive equation for LPEAK becomes

$$LPEAK = 94.0 + 5.49 (1 + \cos\theta)^{2.7} + 0.11V - 20 \log (D/100) \quad (8)$$

The correction at site 2 is -12.2 dB, and at site 5, -4.6 dB. The standard error of estimate is 6.0 dB.

The predictive equation for APEAK is

$$APEAK = 88.8 + 6.405 (1 + \cos\theta)^{2.8} + 0.13V - 20 \log (D/100) \quad (9)$$

with corrections of -13.6 dB at site 2 and -5.8 dB at site 5. The standard error of estimate is 7.6 dB.

3.5 Prediction of Energy-Mean Levels

Two-dimensional co-ordinates were obtained for each surveyed residence to indicate its position in relation to the range. Also, estimates were obtained of shielding by topography and by buildings. Topographic shielding was estimated by using the height of the rise between dwelling and firing position in a linear interpolation from the measured shielding at site 2. Shielding by buildings was estimated from the number of buildings between dwelling and firing position in a linear interpolation, with no shielding at site 6 and the measured shielding at site 5. Standard errors of estimate for shielding corrections are probably 2 to 3 dB. Some correction

for shielding was necessary for 55% of dwellings, although corrections were usually small.

Although the standard errors of estimate for unshielded sound levels given in the preceding section are large, analysis showed that most of this variance is between-days rather than between-sites variance. The standard error of estimate for the mean sound level over the seven measurement days was 1.1 dB for ASEL, 2.0 dB for LPEAK and 2.1 dB for APEAK. The large between-days variance is understandable, given the paucity and unreliability of the meteorological data. This can also be seen in the small regression co-efficients of V, equivalent to a mean effect of only 1.1 - 1.6 dB per 10 knots vector wind speed. The between-sites variance is, of course, the relevant figure for estimating the error in long-term mean levels. As could be expected, the integrated measure ASEL is seen to be a more reliable unit than peak levels.

For each day of shooting in the six months immediately preceding the survey, data was obtained giving the number of rounds fired, the range, and estimates of wind speed and direction. For each residence, energy-mean values of ASEL, LPEAK and APEAK, and level-mean DSEL, were then calculated over this period, using the equations given above. Data for the six months after the survey was also analysed to check for any seasonal effects, but mean levels were within 1 dB over the two periods. Energy mean LSEL could be approximated to within 1 dB by energy-mean ASEL plus level-mean DSEL. These results were used in analysis with the social survey data. As examples of the levels calculated values of the various indices at the dwellings nearest each measurement site are shown in Table 3.1.

| Site | ASEL | LSEL | APEAK | LPEAK | L _{50:10} | L _{50:30} | L _{500:10} | L _{500:30} |
|------|------|------|-------|-------|--------------------|--------------------|---------------------|---------------------|
| 1 | 71.6 | 72.6 | 100.8 | 100.2 | 83.8 | 82.4 | 77.2 | 75.8 |
| 2 | 49.7 | 52.2 | 73.3 | 76.2 | 63.9 | 60.9 | 57.1 | 53.5 |
| 3 | 51.8 | 56.4 | 78.5 | 82.3 | 66.2 | 62.3 | 59.7 | 55.2 |
| 4 | 62.5 | 65.7 | 89.5 | 91.2 | 76.5 | 71.2 | 69.4 | 64.0 |
| 5 | 50.4 | 55.8 | 71.0 | 76.9 | 64.2 | 60.3 | 57.1 | 52.6 |
| 6 | 53.8 | 59.4 | 80.0 | 84.9 | 70.0 | 63.4 | 62.8 | 55.4 |
| 7 | 50.8 | 56.6 | 77.7 | 82.9 | 64.7 | 61.1 | 58.0 | 53.4 |
| 8 | 41.0 | 46.8 | 67.5 | 73.1 | 54.3 | 51.4 | 47.4 | 44.7 |
| 9 | 54.5 | 59.8 | 80.4 | 84.7 | 70.0 | 65.0 | 63.1 | 56.8 |
| 10 | 59.3 | 63.5 | 85.4 | 88.2 | 73.9 | 70.6 | 67.3 | 62.3 |

TABLE 3.1 Values of the eight exposure indices at the dwellings nearest each measurement site.

3.6 Prediction of Percentile Sound Levels

In order to predict the ASEL exceeded by N shots on a given day, the probability distribution of sound levels must be known. On calculating the overall standard deviations of ASEL of individual shots about their mean level at each site, no significant inter-site differences were found. A common distribution between sites was assumed, and the distribution of differences between measured and predicted levels is shown in Figure 3.7. A χ^2 test showed no significant difference between this distribution and a normal distribution with standard deviation 5.6 dB.

Thus, the levels exceeded by 50 and by 500 shots on a given day were calculated using a rational approximation to the inverse cumulative normal curve, with a mean of the predicted ASEL for that day and standard deviation 5.6 dB. The tenth-largest and thirtieth-largest values of these levels over the period from six months prior to the survey to six months after, were denoted $L_{50:10}$ and $L_{50:30}$ or $L_{500:10}$ and $L_{500:30}$. See Table 3.1 for examples of these levels.

Errors in this case are more difficult to quantify, but intuitively should be significantly less than the error of estimate for a single day, since errors on different days will "cancel out" to some extent. As an estimate, the error could be put at $5.6/\sqrt{N'}$ dB, where N' is the number of days on which the predicted percentile is within 5.6 dB of the calculated "L-value". N' was typically about 20, giving an error similar to that of energy-mean ASEL.

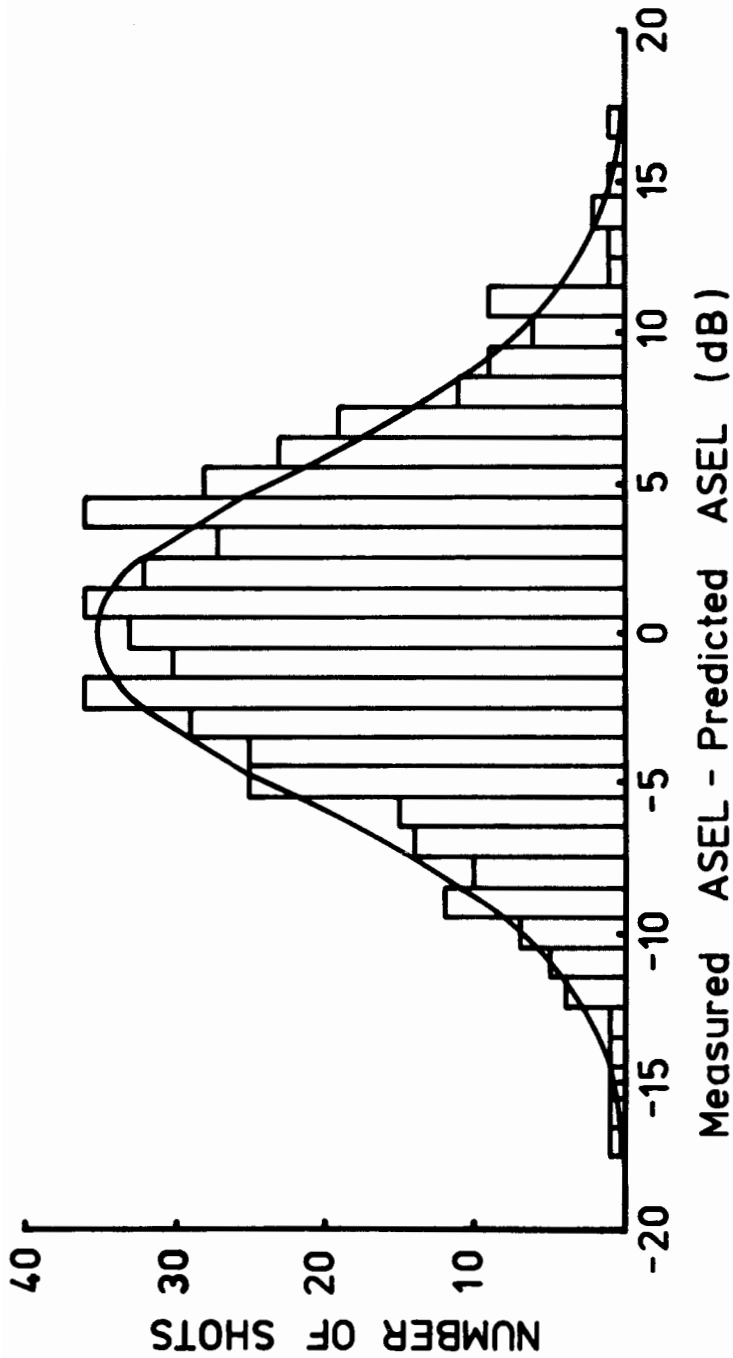


FIGURE 3.7 Distribution of differences between measured and predicted values of ASEL for individual shots. The curve shows a normal distribution with a standard deviation of 5.6 dB.

SECTION 4 ASSESSING SUBJECTIVE REACTION

4.1 Psychological Scaling

Subjective reaction is best assessed by means of psychological scaling procedures. The procedure used in this study was Likert scaling which entails adding the scores respondents get on a number of questionnaire items to obtain an overall measure. A requirement for psychological scales is that the scores on the component items must be significantly correlated. This ensures that the scale is reliable, that is, that it provides a consistent measure of the reaction being assessed.

The reliability of a Likert scale is given by the alpha statistic which is determined as follows:

$$\alpha = \frac{n r_{ij}}{1 + (n-1) r_{ij}}$$

where n = number of items in the scale
 r_{ij} = average of the inter-item correlations.

It is desirable to have scales with high values for reliability (e.g. $\alpha = 0.90$) and the minimum acceptable value is $\alpha = 0.75$.

4.2 Annoyance Scale

Subjective annoyance was assessed by the 0-10 opinion thermometer ratings given in Q.7k, Q.11e and Q.14, and also by the annoyance categories in Q.24. For scaling purposes these categories were assigned numerical scores as follows: highly annoyed = 10, considerably annoyed = 8, moderately annoyed = 5, slightly annoyed = 3, not at all annoyed = 0. Scores on this Likert scale of annoyance had a range 0-40. The scale proved to be very reliable ($\alpha = 0.94$). Table 4.1 summarizes details of the scale composition.

4.3 Disturbance Scale

In previous noise research subjective reaction has often been assessed solely by a scale based on the number of activity disturbances reported by respondents. Such a scale was included in the present study and was derived from Q.13: "FOR EACH OF THE FOLLOWING ACTIVITIES PLEASE TELL ME WHETHER OR NOT YOU FIND THAT THEY ARE DISTURBED BY NOISE FROM THE RIFLE RANGE...FIRSTLY, DO YOU FIND THAT THE NOISE DISTURBS CONVERSATION?..." Responses were scored on a 0/1 basis depending whether they answered 'yes' or 'no' for the six items. Thus,

| | Item | Item-total correlation | Alpha if item deleted |
|-------|--|------------------------|-----------------------|
| Q.7 | Neutral rating of annoyance. | .79 | .94 |
| Q.11e | Rating of annoyance from shooting noise. | .90 | .90 |
| Q.14 | Rating of annoyance from disturbances. | .89 | .92 |
| Q.24 | Annoyance categories. | .82 | .92 |

TABLE 4.1 Summary of Annoyance Scale

the disturbance scale was a 0-6 Likert scale. Although the reliability was just barely acceptable ($\alpha = .75$) it can be seen from Table 4.2 that alpha cannot be significantly increased by deleting any items from the scale.

4.4 Complaint Disposition Scale

Another indicator of subjective reaction was provided by answers to Q.19 which asked about the person's disposition towards a number of complaint actions. "PLEASE SAY WHETHER OR NOT YOU WOULD LIKE TO DO ANY OF THESE THINGS IN RELATION TO THE RIFLE RANGE. FIRSTLY, DO YOU FEEL YOU WOULD LIKE TO SIGN A PETITION?..."

| | Item | Item-total correlation | Alpha if item deleted |
|----|---------------------------------|------------------------|-----------------------|
| a) | Conversation | .60 | .69 |
| b) | Listening to TV, radio or music | .50 | .72 |
| c) | Sleeping or resting | .49 | .72 |
| d) | Reading or studying | .66 | .66 |
| e) | Outdoor activities | .43 | .74 |
| f) | Other | .28 | .76 |

TABLE 4.2 Summary of Disturbance Scale

Notice that this question does not ask whether the person has taken or intends to take the various actions. Rather, it asks about complaint disposition, and is designed to assess the strength of the person's overall reaction to the noise from the rifle range.

The eight items were scored 0/1 to give a Likert scale with a range 0-8. This scale proved to be very reliable ($\alpha = .90$). As can be seen from the summary in Table 4.3, all items contribute to the scale insofar as alpha decreases if any item is deleted.

4.5 Symptom Scale

It was thought that Q.15 would provide a useful measure of reaction by tapping a number of symptoms which the respondent may attribute to the rifle range noise: "I WOULD LIKE TO KNOW WHETHER OR NOT THE RIFLE RANGE NOISE AFFECTS YOU IN ANY OF THE FOLLOWING WAYS. DOES IT EVER...STARTLE YOU OR MAKE YOU JUMP?..." The various items were scored 0/1 to form 0-6 Likert scale. However, the reliability was not acceptable ($\alpha = .58$) and could not be appreciably improved by deleting any of the items (See Table 4.4).

| | Item | Item-total correlation | Alpha if item deleted |
|----|-----------------------|------------------------|-----------------------|
| a) | Sign a petition | .73 | .88 |
| b) | Complain to officials | .80 | .87 |
| c) | Complain to M.P. | .81 | .87 |
| d) | Write a letter | .67 | .89 |
| e) | Attend a meeting | .70 | .89 |
| f) | Attend a rally | .65 | .89 |
| g) | Join a protest group | .64 | .89 |
| h) | Take legal action | .52 | .89 |

TABLE 4.3 Summary of Complaint Disposition Scale

| | Item | Item-total correlation | Alpha if item deleted |
|----|-------------------|------------------------|-----------------------|
| a) | Startle | .38 | .54 |
| b) | Frighten | .16 | .62 |
| c) | Irritable or edgy | .59 | .42 |
| d) | Headaches | .16 | .62 |
| e) | Tense or nervous | .47 | .51 |
| f) | Other | .29 | .59 |

TABLE 4.4 Summary of Symptom Scale

4.6 G Scale

The major indicator of subjective reaction is given by Questions 18 and 27 which were specifically designed to assess overall general reaction. Respondents were asked to give opinion thermometer ratings of "HOW MUCH YOU ARE AFFECTED OVERALL" (Q.18) and "HOW MUCH DISSATISFACTION YOU FEEL OVERALL" (Q.27). These two ratings were combined to form a two-item scale. The reliability was high as is indicated by the inter-item correlation ($r = 0.86$).

4.7 General Reaction (GR)

In order to derive the most accurate and reliable overall index of general subjective reaction it is necessary to use many different indicators. With any one indicator there could be inaccuracies arising from factors such as idiosyncratic responses given in the interview, variations in the interpretation of the wording of a question, and non-verbal cues given unintentionally by the interviewer. These inaccuracies are unavoidable in even the best social survey, but they will not lead to error if the estimate of a person's general reaction is based on the responses given in several different questions.

The measure of general reaction is GR which is a composite of the scores obtained on the various scales. The index GR was postulated to be given by:

$$GR = (G + x_1A + x_2D + x_3CD + C) / K$$

where

- G = Score on G scale (0-20)
- A = Score on Annoyance scale (0-40)
- D = Score on Disturbance scale (0-6)
- CD = Score on Complaint Disposition scale (0-8)
- C = Constant
- K = Constant for re-scaling 0-10
- x_i = Weighting factor

It should be noted that the Symptom scale was not included because of its low reliability. The weightings of the various scales in GR were used to take account of the fact that the scales vary in importance as indicators of general reaction. The weightings were derived from a multiple regression analysis of A, D and CD with G. In other words, the weightings depend on the strength of the association between the particular scale and the major indicator of general reaction, the G scale score. The equation obtained from the regression analysis is given below. It explains 85% of the variance in G.

$$G = .32A + .64D + .65CD + .42$$

Thus the equation for GR is given by:

$$GR = (G + .32A + .64D + .65CD + .42) / 4.22$$

4.8 Summary

General reaction (GR) is a single measure between 0 and 10 of an individual's overall subjective reaction to the rifle range noise. It is derived from the responses given in twenty different questionnaire items and provides the most accurate and reliable index of reaction. The ratings of 'affectedness' (Q.18) and 'dissatisfaction' (Q.27) contribute half to the GR score. The other half of GR comprises the weighted contributions of the annoyance ratings (Q.7k, Q.11e, Q.14 & Q.24), the reports of activity disturbances (Q.13) and reported feelings about complaint actions (Q.19). GR scores were calculated for 196 respondents, the remaining 5 cases had data missing for some of the twenty items. The frequency distribution of GR scores is given in Figure 4.1. It can be seen that most of the survey respondents obtained very low GR scores. The relationship of reaction to noise exposure will be examined in the following section.

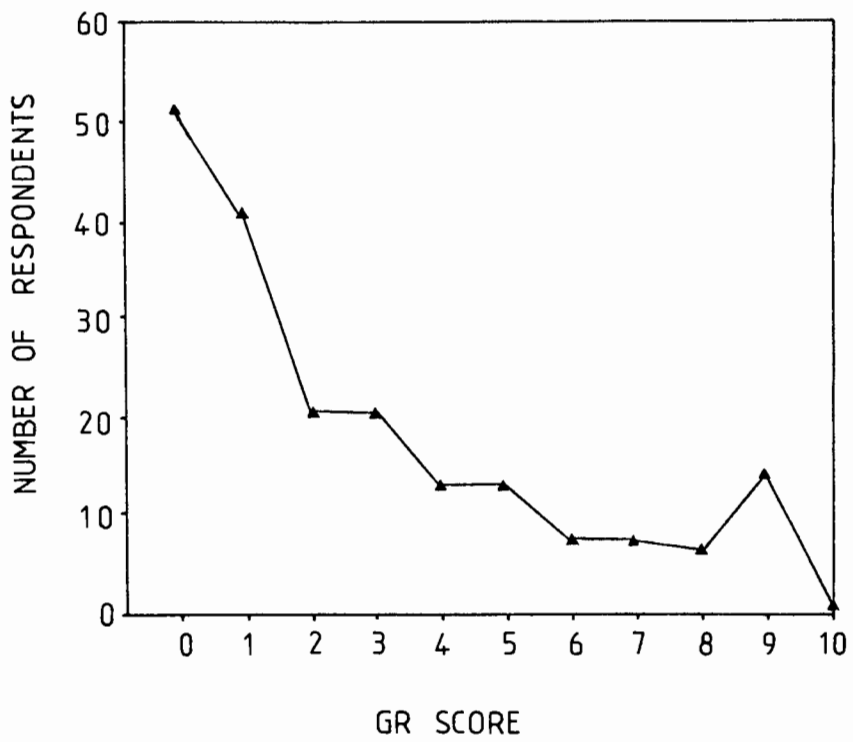


FIGURE 4.1 Frequency distribution of GR scores across the survey sample.

SECTION 5. DOSE-RESPONSE ANALYSIS

5.1 Individual Reaction

In a study of community noise reaction it is of fundamental importance to establish the relationship between noise exposure and subjective reaction, that is, the dose-response relationship. As was outlined in Section 3 there were eight different exposure measures calculated for each of the 201 dwellings in the survey.

The correlations between individual general reaction (GR) and the various exposure measures are shown in Table 5.1. Although the peak indices are slightly better correlated with GR, the correlations are not very different for all eight exposure measures. No one measure emerges as significantly better as a predictor of individual reaction. All of the exposure indices explain between 7.1% and 8.5% of the variation in GR. While these values are quite low, they are comparable to those obtained in previous research which has typically shown that factors other than noise exposure play an important role in determining individual reaction to noise (See also Section 6).

Which exposure index provides the most useful measure of noise exposure? Consider firstly, the four "Level" indices. These are based on the assumption that it is only the noisiest events that disturb people. In the present situation this is equivalent to asserting that individual reaction is a function of the noise level exceeded by n shots on x days. The values of 'n' and 'x' are based on assumptions about human perception of the "noisiest events". For example, if n=1 and x=1 the "Level" would be that of the loudest shot the individual hears in a year. The values of n:x used in deriving the four "level" indices were 50:10, 500:10, 50:30 and 500:30. Although it is possible that different values of n and x would give a more predictive index, it is clear from the correlations in Table 5.1 that the "Level" indices were no better than the others at explaining individual reaction. Because such indices are particularly difficult to derive there seems no point in using them to assess noise exposure.

| Index | ASEL | LSEL | APEAK | LPEAK | L _{50:10} | L _{50:30} | L _{500:10} | L _{500:30} |
|-------|------|------|-------|-------|--------------------|--------------------|---------------------|---------------------|
| r | .28 | .28 | .29 | .29 | .27 | .28 | .27 | .28 |

TABLE 5.1 Correlations of exposure indices with GR.

It is suggested that the most suitable exposure indices are ASEL and LPEAK. The LPEAK index refers to the unweighted peak sound pressure level averaged on an energy basis over a representative number of shots. This index is attractive because it is very simple to measure. However, a major drawback with LPEAK is that it is known to be inappropriate in the case of other impulsive noises which have much of their energy in the low frequency range where human hearing is relatively insensitive (e.g., explosions, artillery fire). It has been found that such noises can give very high peak readings of over 110dB and yet be completely inaudible to the human ear. However, this problem does not arise for the SEL index which measures the total energy in the impulse, particularly not for ASEL which takes account of the frequency-dependence of human hearing sensitivity by means of the A-weighting procedure. For this reason ASEL is preferred as a measure of impulsive noise despite the fact that it is a more complex measure than LPEAK. The ASEL index is defined as the level of a one second noise containing the same amount of A-weighted energy as the impulse. Impulses are averaged on an energy basis to give the value of ASEL. That SEL is a useful measure of impulsive noise is shown in research by Schomer (3).

Figures 5.1 and 5.2 plot mean reaction as a function of exposure measured in terms of ASEL and LPEAK. It can be seen that in both cases reaction (GR) increases with increasing exposure. This was confirmed by an analysis of variance which gave F values of 3.34 and 2.89 for ASEL and LPEAK, respectively ($p < .01$). Also, tests indicated that the exposure/reaction functions are not significantly non-linear in the two cases.

5.2 Community Reaction

Another way of expressing the dose-response relationship is in terms of the percentage of people who experience a certain level of reaction. This provides an indicator of community as distinct from individual reaction. In most previous studies community reaction has been expressed as the percentage "very annoyed". It is argued that this is based on a too-narrow concept of human noise reaction. It is more appropriate to refer to the percentage "seriously affected" using scores on the general reaction scale. But one must decide on a cut-off point on the GR scale which defines an individual's reaction as "seriously affected". In other words, what score out of 10 on GR should be used as the cut-off for determining whether a person is seriously affected by the rifle range noise?

It is proposed that the cut-off for "seriously affected" be set at GR = 8. Such a cut-off is defensible firstly in terms of the components of the GR scale itself. To score 8 on GR the 'average' respondent had to give opinion thermometer estimates of 8-out-of-10 for the ratings of "affectedness" and

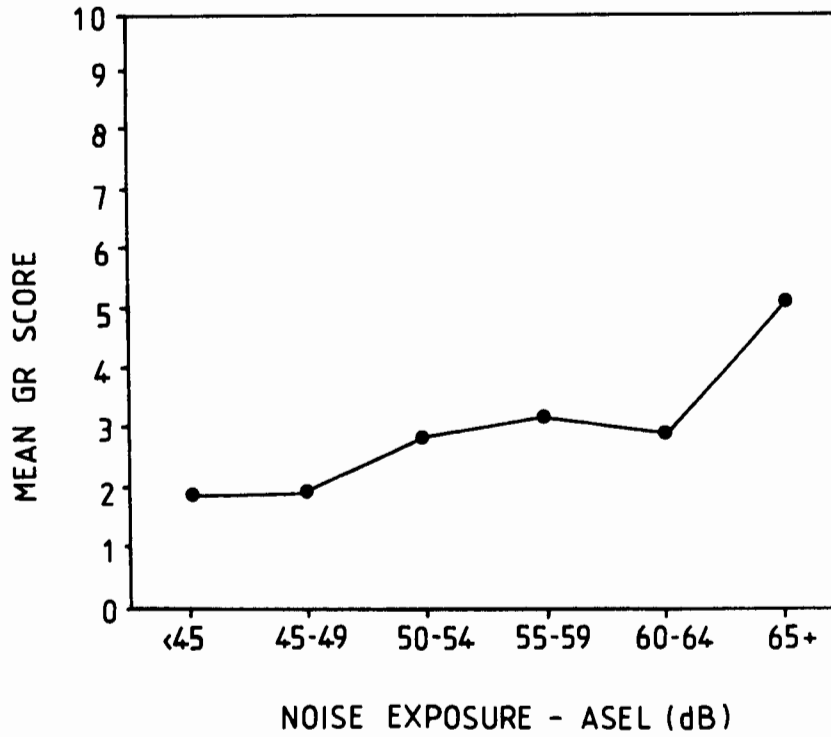


FIGURE 5.1 Mean general reaction (GR) score as a function of noise exposure in A-weighted sound exposure level (ASEL).

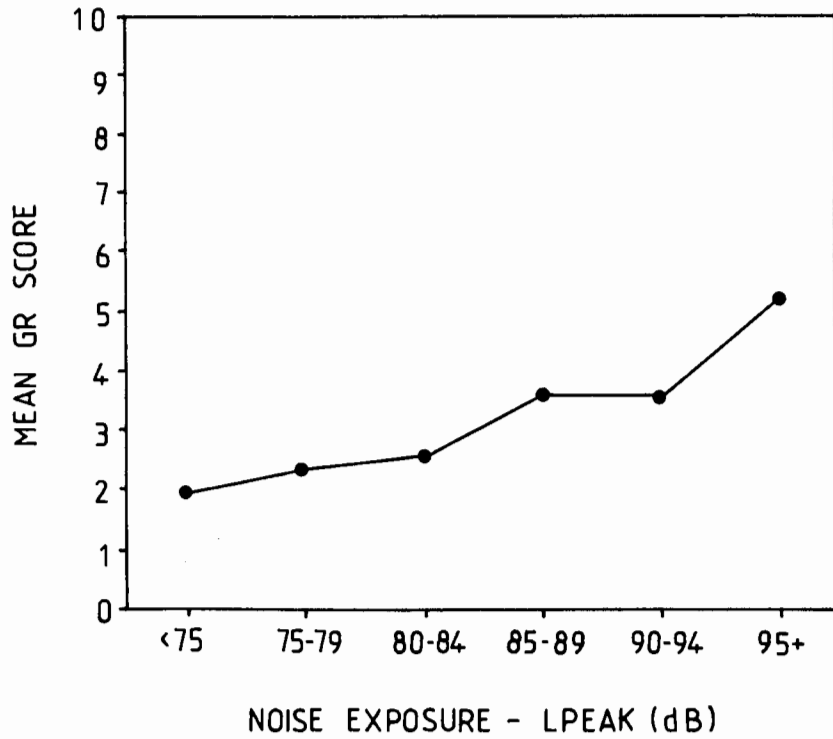


FIGURE 5.2 Mean general reaction (GR) score as a function of noise exposure in Unweighted peak sound pressure level (LPEAK).

"dissatisfaction" and also for the three ratings of annoyance. In addition, the respondent had to report being disturbed in a number of activities, as well as feeling disposed towards taking a number of complaint actions. It is suggested that the reporting of strong reactions over this wide range of questionnaire items justifies the description "seriously affected".

Approaching the question of a cut-off in another way, let us examine at what points on the GR scale the majority of respondents reported a variety of specific effects. Figure 5.3 shows the points at which 50% of respondents reported various reactions to the rifle range noise. Complete data on the percentage of respondents at each GR level for the relevant questions are contained in Figures III.1 to III.7 in Appendix III. From Figure 5.3 the proposed cut-off at GR = 8 appears quite appropriate considering for example, that at this point, more than 50% of respondents agreed with the statement "THE RIFLE RANGE COMPLETELY RUINS THIS NEIGHBOURHOOD". Agreement with such a strongly-worded statement surely implies that the person is "seriously affected". The 50% points for "HIGHLY ANNOYED" and "CONSIDERABLY ANNOYED" were 8.5 and 7.0 respectively, which also tallies with the proposed cut-off of 8.0. Note that the tendency for some respondents to avoid the top category on a verbal scale (cf. Q.24) would have led to an underestimation of the percentage "highly annoyed". It is argued that the cut-off of 8 on GR will provide an accurate assessment of community reaction.

Furthermore, it is proposed that a cut-off point of GR = 4 be used to define people who are "moderately affected". This cut-off is supported by a consideration of the components of the GR scale and by examination of the 50% points in Figure 5.3. For example, at 4.7 on the scale 50% of people began reporting activity disturbance because of the noise. Also, the 50% points for "MODERATELY ANNOYED" and "SLIGHTLY ANNOYED" fall to either side of GR = 4.

5.3 Dose-Response for ASEL and LPEAK

Using the cut-offs described above community reaction can be plotted as a function of exposure. Figures 5.4 and 5.5 show the percentages seriously and moderately affected in the various exposure zones measured in A-weighted sound exposure level (ASEL) and Unweighted peak sound pressure level (LPEAK). The zones are arbitrary categories of 5 dB; the actual numbers of respondents in each zone are given in Table 5.2. From Figures 5.4 and 5.5 it can be seen that the curves are essentially quite similar for ASEL and LPEAK, although it does appear that the seriously affected curve for LPEAK is more linear than that for ASEL. However, because the plotted percentages are based on relatively small numbers, it would not be valid to attach much significance to any minor differences apparent in the dose-response functions for the two exposure indices.

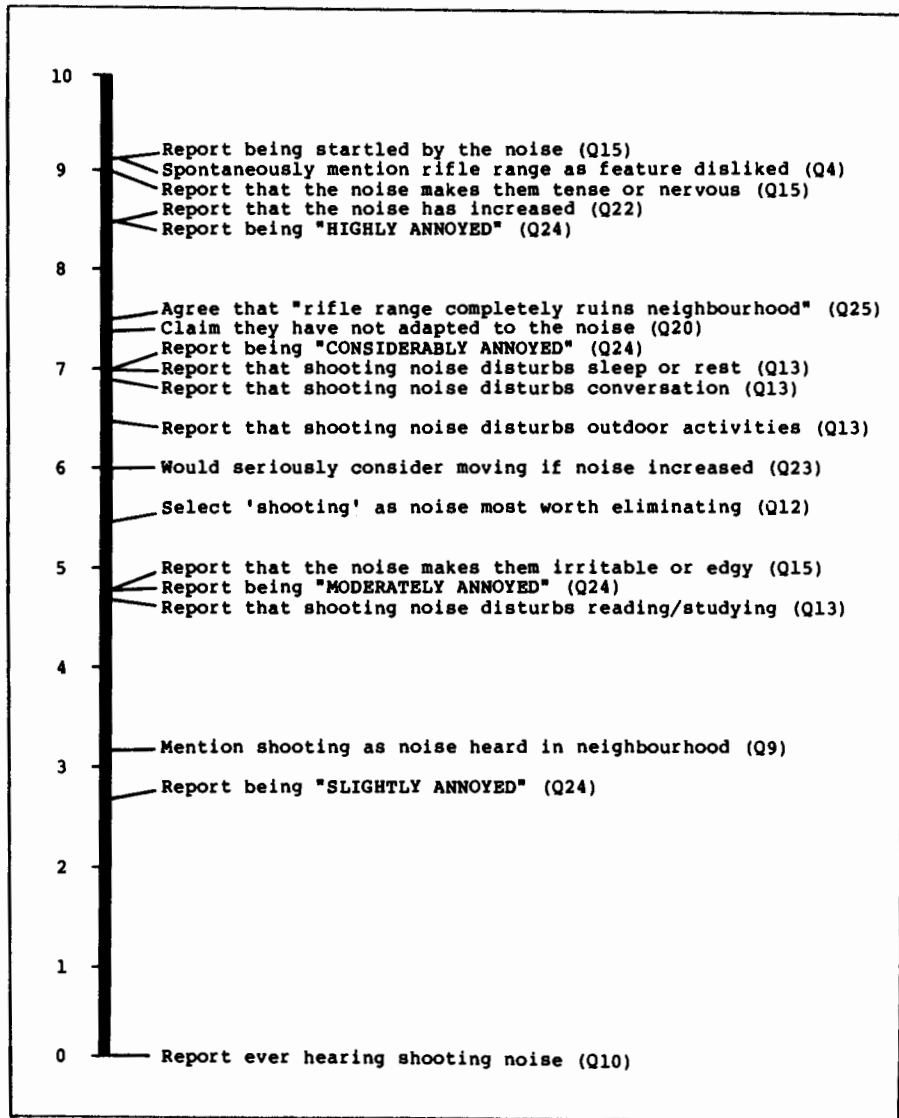


FIGURE 5.3 Points on the GR scale at which 50% of respondents...

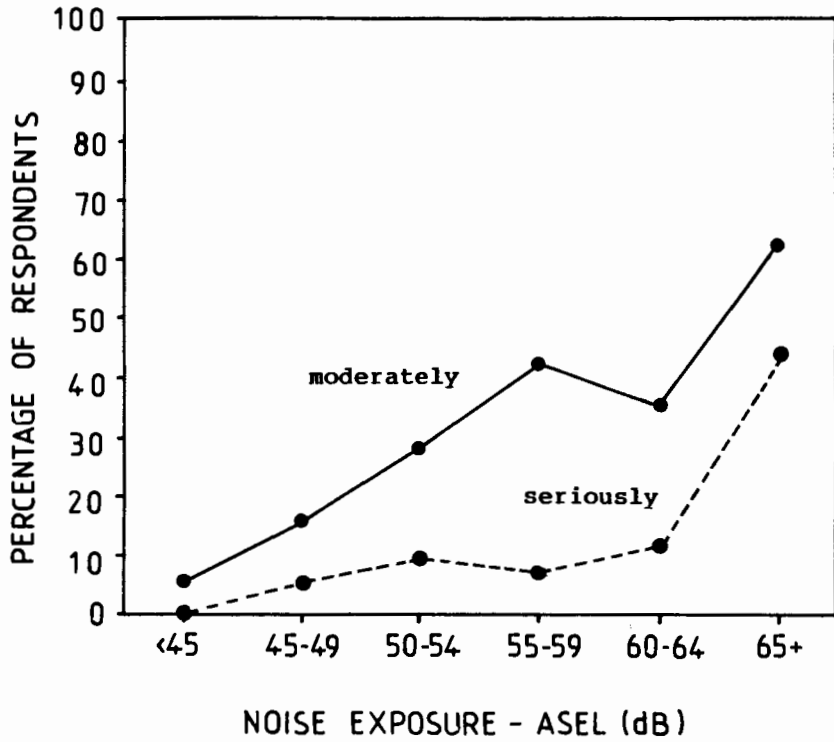


FIGURE 5.4 Percentage of respondents seriously affected (●----●) and moderately affected (●—●) as a function of noise exposure in ASEL.

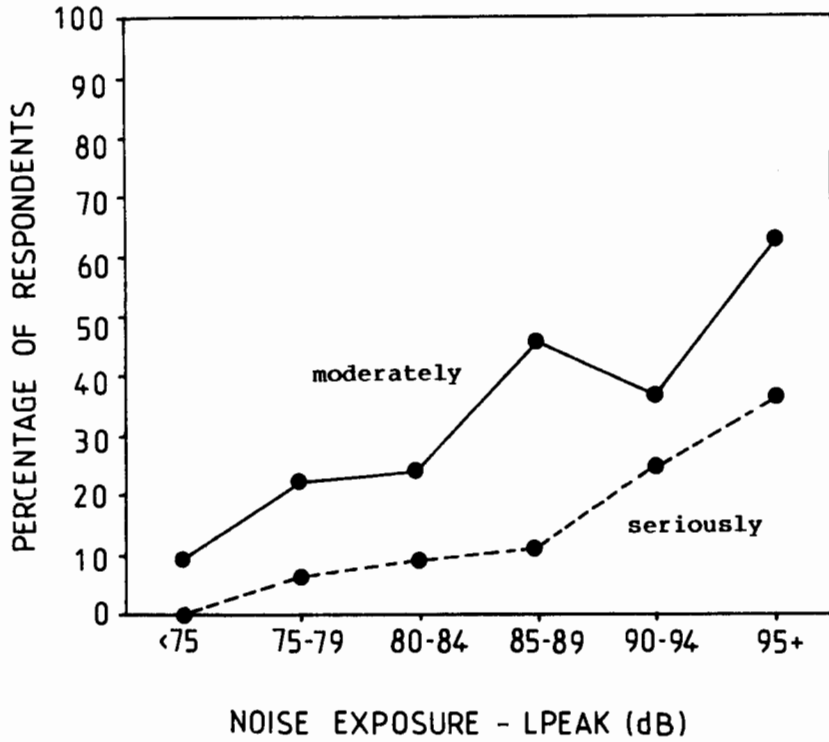


FIGURE 5.5 Percentage of respondents seriously affected (●---●) and moderately affected (●—●) as a function of noise exposure in LPEAK.

| ASEL Zone | No. of respondents | LPEAK Zone | No. of respondents |
|-----------|--------------------|------------|--------------------|
| <45 | 33 | <75 | 39 |
| 45-49 | 37 | 75-79 | 48 |
| 50-54 | 53 | 80-84 | 45 |
| 55-59 | 40 | 85-89 | 37 |
| 60-64 | 17 | 90-94 | 16 |
| 65+ | 16 | 95+ | 11 |

TABLE 5.2 Distribution of respondents across noise exposure zones.

It is not possible to say which of the two exposure measures provides the more accurate prediction of community reaction. The correlations with percentage seriously affected were $r=.95$ for LPEAK as compared with $r=.81$ for ASEL. This does not, however, necessarily indicate a superiority for LPEAK. The concept of correlation assumes a linear model. Thus, the higher correlation for LPEAK means that the dose-response function is more linear in the case of LPEAK than ASEL. But the relationship between community reaction and noise exposure might not be linear. Indeed, from previous research on a number of noise sources it appears that when reaction is expressed in percentage terms, the dose-response relationship is curvilinear rather than linear (cf. Shultz, 4).

5.4 Comparison with Swedish Study

The only previously published socio-acoustic study of community reaction to rifle noise is that reported by Sorensen and Magnusson (5). In this study interviews were conducted with 323 residents in nine areas around four shooting ranges in Sweden. The measure of individual reaction was a single question in which respondents were asked whether they were "very annoyed, rather annoyed, not very annoyed" or not at all annoyed. Community reaction was expressed as the percentage who said "very annoyed" in response to this question.

Noise exposure in the Swedish study was assessed in terms of the various readings available on a sound level meter: dB(A) Fast, dB(A) Peak, dB(A) Impulse, dB(C) Peak, dB(C) Impulse. Exposure estimates were not obtained for

individual dwellings but rather the dwellings in each of the nine areas were assigned the same exposure level based on readings from 10 shots.

The present study and the Swedish study both included A-weighted peak sound pressure level (APEAK) as one measure of noise exposure. Figure 5.6 compares the results of the two studies, and reveals a general correspondence. However, as was argued in Section 3.1 the A-weighted peak level is an artifact of the A-weighting filter in a sound level meter. It does not represent a real physical or psychological construct and, therefore, it is considered inappropriate as a measure of noise dose.

Because the C-weighting function is almost flat except at very low frequencies, it can be assumed that for rifle shots the dB(C) Peak levels are equivalent to Unweighted Peak levels. Thus, a comparison can be made between the LPEAKs in the present study and the Swedish study's dB(C) Peaks. The dose-response data using these measures are given in Figure 5.7. Again, the functions found in the two studies appear quite similar. Although there is some indication in Figures 5.6 and 5.7 of larger percentages in the case of the Australian responses at high exposure levels, this could well be due to differences in reaction measures between the two studies. Considering the many marked differences in methodology, to say nothing of cultural differences, the similarity between the results of the two studies is surprising.

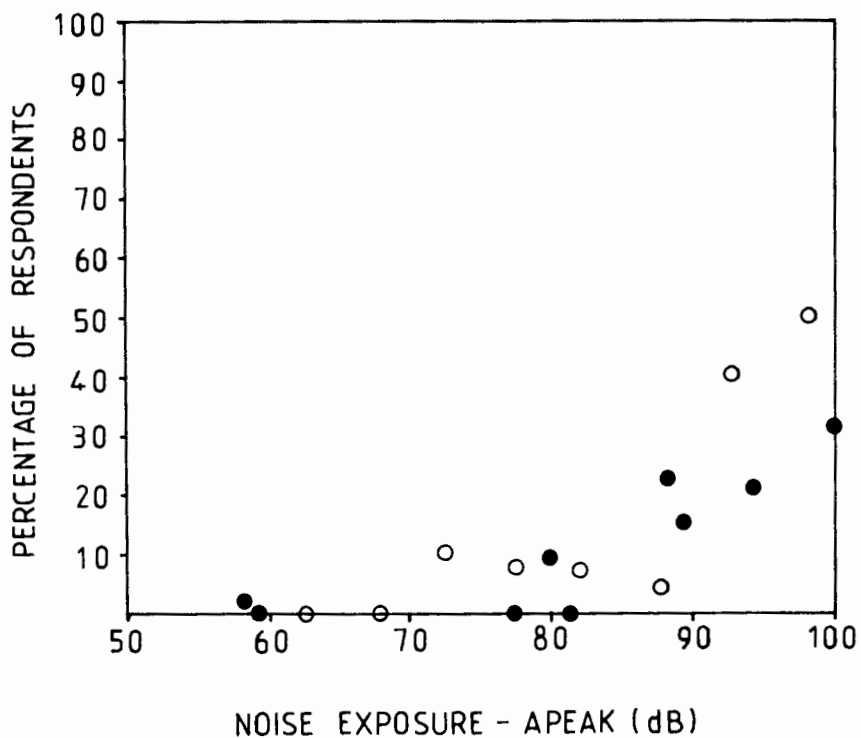


FIGURE 5.6 Comparison of present results (O % seriously affected) with the Swedish results (● % very annoyed) for exposure measured in APEAK.

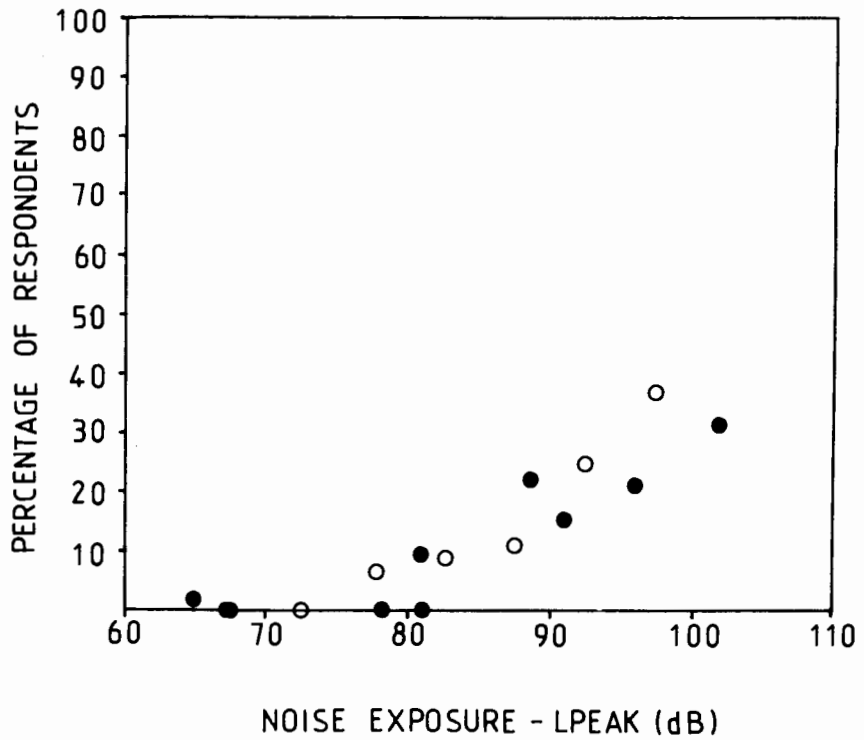


FIGURE 5.7 Comparison of present results (O % seriously affected) with the Swedish results (● % very annoyed) for exposure measured in LPEAK.

SECTION 6 MODIFIERS OF SUBJECTIVE REACTION

6.1 Introduction

As is typically found in studies of human reaction to noise the present correlations between exposure and individual reaction were rather low (less than $r = .30$). In fact, it was found that different individuals who experienced the same amount of noise from the rifle range could differ greatly in their reaction. Thus one person might be seriously affected by the noise while a neighbour with exactly the same exposure might be completely unaffected.

The reason for this wide variation is that human reaction to noise is modified by a number of psychological factors such as individual sensitivity and the person's attitudes towards the noise and the noise-makers. In a study of reaction to traffic noise, for example, Langdon (6) found that differences in noise sensitivity accounted for nearly five times as much of the variation in individual reaction as the amount of noise itself. Further, McKennell (7) reported that reaction to noise from Concorde aircraft depended more on the person's "level of patriotic feeling about the aircraft" than on the level of noise exposure.

6.2 Scaling of Modifying Variables

In the present study the questionnaire included items designed to measure a number of factors which could possibly modify subjective noise reaction, namely, satisfaction with the neighbourhood, susceptibility to annoyance, sensitivity to noise, and attitude towards the rifle range.

The items in Question 5 required respondents to give ratings of various neighbourhood features (e.g. public transport, shopping centres, etc.). A Likert scale of neighbourhood satisfaction comprising these nine ratings proved to be unreliable ($\alpha = .51$) and could not be improved by omitting any of the items. It was decided, therefore, to assess Neighbourhood Satisfaction by means of Question 2 in which respondents simply gave an overall rating of the neighbourhood.

In Question 7 respondents gave opinion thermometer ratings of the annoyance they felt in a number of everyday situations (e.g. being held up in traffic). Some of these situations concerned noise effects (viz. items c, f, h, n, q) and the ratings of these were used to form a 0-50 Likert scale of Noise Sensitivity ($\alpha = .75$). (Note that item k was used in GR). High scores on the scale (40+) indicate that the person is quite annoyed by a number of noises and suggests high sensitivity. Scores of 20 or less would suggest that the person has low sensitivity to noise.

The remaining items in Question 7 (viz. a, b, d, e, g, i, j, l, m, o, p, r) comprised a scale designed to measure Annoyance Susceptibility ($\alpha = .86$). The rationale was that if people gave high ratings for a majority of the items they are probably of such a temperament that they are easily annoyed.

Question 25 consisted of a series of attitude statements with which respondents rated their agreement or disagreement. The statements were chosen so that they did not reflect reactions to the noise but rather attitudes towards and beliefs about the range, the sport of shooting, the shooters, government authorities, complainants etc. Note that statement 25d expresses a reaction rather than just an attitude - "The rifle range completely ruins this neighbourhood" - it was not included in the scale. Statements 25g and 25n were omitted because they were poorly correlated with the total scale score. Both positively and negatively worded statements were used in order to control for response bias. For scaling purposes, however, responses on the positive statements were re-coded to give a scale of Negative Attitude. The eleven items were scored: 4 = strongly agree, 3 = agree, 2 = undecided, 1 = disagree, 0 = strongly disagree. Thus, a scale score of 33 or more indicates negative attitudes, and 11 or less indicates positive attitudes. The scale was quite reliable ($\alpha = .87$).

6.3 Relationship with GR

The correlations between the various potential modifiers and reaction (GR) and exposure (ASEL) are shown in Table 6.1. Clearly, both Neighbourhood Satisfaction and Annoyance Susceptibility are unrelated to subjective reaction with the correlations virtually zero. Negative Attitude, on the other hand is highly correlated with reaction ($r = .78$). Thus, some 60% of the variation in individual reaction is explained by attitude towards the rifle range. This is in marked contrast with noise exposure which accounts for less than 10% of the variance in reaction. It is important to note, however, that Negative Attitude is not itself significantly related to exposure ($r = .11$). This means that it is not the amount of noise that determines whether a person has positive or negative attitudes. Further, it suggests that attitude which explains much of reaction is not simply another measure of noise-induced reaction.

Noise Sensitivity is also significantly correlated with GR but explains only a small proportion of the variance (4.4%). Interestingly, there was a small but significant negative correlation between sensitivity and exposure, suggesting that the more noise sensitive individuals tend not to live in areas exposed to high noise levels.

| | Negative Attitude | Sensitivity | Neighbour- hood Satisfaction | Annoyance Susceptibility |
|--------------------|----------------------|-----------------|------------------------------------|-----------------------------|
| Reaction (GR) | .78 (p<.001) | .21 (p<.01) | -.0001 (NS) | .07 (NS) |
| Exposure (ASEL) | .11 (NS) | -.13 (p<.05) | -.06 (NS) | -.07 (NS) |

TABLE 6.1 Correlations between exposure, reaction and the various modifying variables.
(Significance levels shown in brackets).

Multiple regression analysis showed that 66% of the variance in individual general reaction can be explained by Attitude, Sensitivity and exposure in the following equation (R = .81):

$$GR = .28 \text{ Attitude} + .08 \text{ ASEL} + .17 \text{ Sensitivity} - 10.6$$

6.4 Discussion

What are the implications of the present finding that Attitude explains seven times as much of the variance in GR as noise exposure? Firstly, it does not mean that an 'anti-range' attitude rather than the noise itself causes people to be annoyed. Rather, the extent to which someone is affected by the noise is modified by that person's attitude. This point is dramatically illustrated in Figure 6.1 which plots the dose-response regression lines for the sub-groups of respondents with positive, neutral and negative attitudes. Respondents with positive attitudes towards the range and the shooters are almost completely unaffected regardless of the amount of noise. By contrast, those with negative attitudes are considerably affected even at moderate exposure levels, and their reaction rises sharply as exposure increases.

The interaction seen in Figure 6.1 is further evidenced by the fact that there was a very high correlation (r = .81) between individual GR scores and the product of the attitude and exposure variables. That is, some 65% of the GR variance was explained by the interactive term Negative Attitude X ASEL. It is clear, therefore, that while the rifle noise is the primary cause, its effect is modified by attitude such that individuals with the same exposure are affected to different degrees depending on their attitudes towards the range.

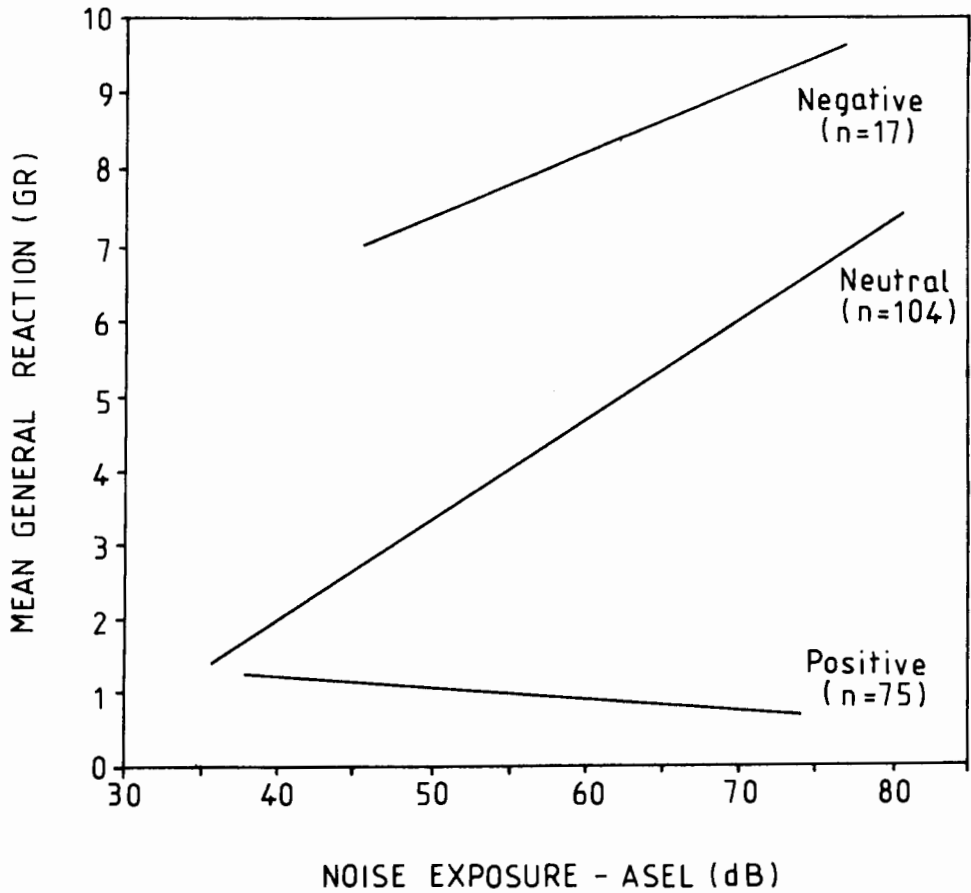


FIGURE 6.1 Dose-response regression lines for respondents with positive, neutral versus negative attitudes.

Noise sensitivity also serves to modify the effect that the noise has on an individual, although to a lesser extent than attitude. The correlation between GR and the interactive term Noise Sensitivity X ASEL was $r = .30$. Figure 6.2 shows how the dose-response relationship varied for respondents with high, medium and low scores on the sensitivity scale. The modifying function of noise sensitivity is shown by the differing slopes of the regression lines.

To summarize, we have seen that to explain how much an individual will be affected by the noise from Hornsby Rifle Range, consideration must be taken of factors other than the noise itself. Noise sensitivity and especially attitudes towards the range serve to modify the effect of the noise. The relationship between these modifying variables and other variables such as age, sex, education etc. will be examined in the following section.

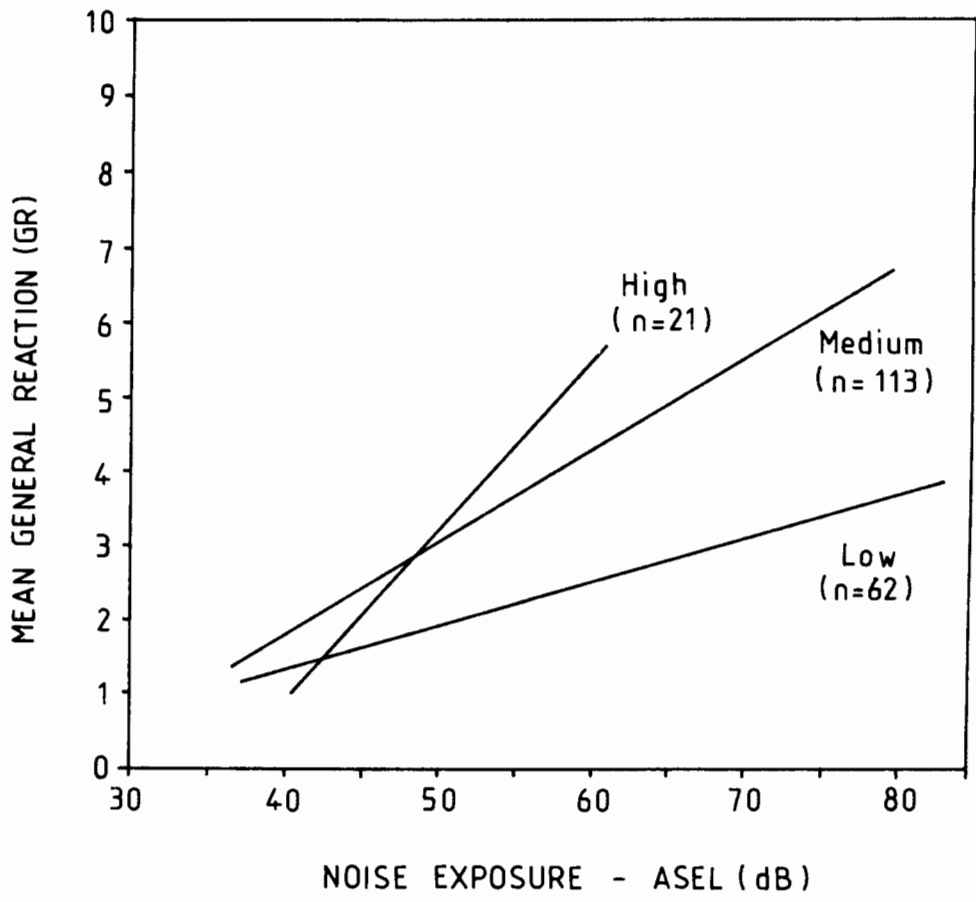


FIGURE 6.2 Dose-response regression lines for respondents with high, medium versus low noise sensitivity.

SECTION 7 OTHER RESULTS

7.1 Effect of Number of People in Household

It was mentioned in Section 2.5 that the ratio of the number of males in the survey sample to the number of females is smaller than would be expected in a random sample of the population. This is due to the fact that the proportion of males in a household is not independent of the number of people in the household. In particular, there tend to be fewer males than expected in single-person households. If other variables also depend on the number of people in the household, this could cause similar errors in interpretation of these variables. For example, if people in single-person households tended to have higher scores than others on the GR scale of overall reaction the mean GR scores for the survey sample would be greater than those for a random sample of the population.

Analyses of variance were performed to test the effect of number of people in the household on GR, Negative Attitude and Sensitivity. In no case was the effect statistically significant ($F = 0.63, 0.48$ and 1.06 respectively). Estimates of values of these basic variables for the population around the rifle range can therefore be made directly from data obtained in the survey sample (cf. Section 8.1).

7.2 Other Variables Affecting General Reaction

Data was collected in the interview schedule concerning a number of variables apart from the basic scale described above. Most of these supplementary variables serve to describe the respondent demographically. They consist of age (Q.28), sex, length of residence (Q.1), occupation (Q.29), income (Q.31), education (Q.30) and home ownership (Q.32). The results of Q.32 must be considered unreliable for a number of reasons. Only six respondents reported that they rented their homes - a number which is too small to provide useful data. Estimates of the value of a house varied widely between externally similar houses. It was felt that many people were not in touch with current property values. Also, after the survey, interviewers commented that many respondents did not seem to appreciate the distinction between "own" and "buying". For these reasons, answers to Q.32 will not be discussed further.

Of the other demographic variables, length of residence and occupation proved to be significantly related to GR at the 0.05 level. Results of all tests are shown in Tables 7.1 - 7.6

| Age (years) | Mean GR | Standard Deviation of GR | Number |
|-------------|---------|--------------------------|--------|
| 18 - 29 | 2.85 | 2.91 | 35 |
| 30 - 39 | 3.54 | 3.02 | 61 |
| 40 - 49 | 2.58 | 2.82 | 28 |
| 50 - 59 | 2.62 | 2.64 | 33 |
| 60 - 69 | 2.22 | 2.48 | 22 |
| 70 + | 2.03 | 2.76 | 17 |

F = 1.31 (df = 5/190, NS)

TABLE 7.1 Effect of Age on GR

| Sex | Mean GR | Standard Deviation of GR | Number |
|--------|---------|--------------------------|--------|
| Male | 3.24 | 2.89 | 82 |
| Female | 2.57 | 2.79 | 114 |

F = 2.67 (df = 1/194, NS)

TABLE 7.2 Effect of Sex on GR

| Length of Residence (years) | Mean GR | Standard Deviation of GR | Number |
|-----------------------------|---------|--------------------------|--------|
| < 1 | 4.30 | 3.13 | 17 |
| 1 - 2 | 3.47 | 2.82 | 13 |
| 2 - 5 | 3.67 | 3.06 | 28 |
| 5 - 10 | 2.88 | 2.33 | 34 |
| > 10 | 2.26 | 2.74 | 102 |
| All of Life | 4.48 | 5.87 | 2 |

F = 2.58* (df = 5/190, P<.05)

TABLE 7.3 Effect of Length of Residence on GR

| Occupation Category | Mean GR | Standard Deviation of GR | Number |
|---------------------|---------|--------------------------|--------|
| Professional | 3.77 | 2.95 | 45 |
| White Collar | 2.07 | 2.53 | 48 |
| Blue Collar | 2.93 | 2.89 | 45 |
| Home Duties | 2.71 | 2.82 | 58 |

F = 2.90* (df = 3/192, P<.05)

TABLE 7.4 Effect of Occupation on GR

| Gross Family Income | Mean GR | Standard Deviation of GR | Number |
|---------------------|---------|--------------------------|--------|
| < \$ 5,000 | 1.98 | 2.74 | 28 |
| \$ 5,000 - \$10,000 | 2.11 | 2.14 | 19 |
| \$10,000 - \$15,000 | 3.05 | 2.78 | 45 |
| \$15,000 - \$20,000 | 3.28 | 3.09 | 35 |
| \$20,000 - \$25,000 | 3.54 | 3.00 | 23 |
| > \$25,000 | 3.20 | 3.06 | 24 |

F = 1.31 (df = 5/168, NS)

TABLE 7.5 Effect of Income on GR

| Level of Education | Mean GR | Standard Deviation of GR | Number |
|--------------------|---------|--------------------------|--------|
| 1-3 yrs primary | .10 | 0.00 | 1 |
| 4-6 yrs primary | 1.27 | 1.21 | 11 |
| 1-4 yrs secondary | 3.08 | 3.09 | 89 |
| 5-6 yrs secondary | 2.61 | 2.57 | 53 |
| 1-2 yrs tertiary | 2.11 | 2.35 | 12 |
| 3 + yrs tertiary | 3.81 | 2.98 | 27 |

F = 1.87 (df = 5/187, NS)

TABLE 7.6 Effect of Level of Education on GR

Table 7.3 shows that recent in-movers tend to have higher overall reaction scores than others, perhaps indicating that some "tolerance" is acquired to the noise over a long period. However this is not reflected in responses to Q.20 ("Do you think you have become used to the rifle range noise..."), which were not significantly related to length of residence ($\chi^2 = 9.1$, d.f. = 5, NS).

Another explanation is that individuals with high overall reaction to the noise will tend to move from the area quickly. This is supported by responses to Q.23 ("Have you ever seriously considered moving from this neighbourhood because of the rifle range noise?"). The relationship between these responses and GR is shown in Table 7.7.

Table 7.4 suggests that professionals tend to have higher GR scores than other occupation categories. It is interesting to note that although the effects of income and education on GR were not significant in an analysis of variance, a correlational analysis showed significant effects of both variables at the .05 level, with GR tending to increase both with income ($r = 0.17$) and with level of education ($r = 0.11$). This is in line with the observed effect of occupation assuming that professionals tend to be higher than average in income and education levels.

However the above results should be treated with some caution, as they are only marginally significant, and spurious results can arise when a large number of significance tests are performed. Moreover, even if it is accepted that there is a tendency for individuals with a higher socio-economic level to have higher GR scores, this effect is very small. None of the variables occupation, education and income explain more than 3% of the variation in GR. Length of residence explains approximately 2% of the variation in GR. This compares with 60% explained by Negative Attitude and 4.4% by Noise Sensitivity.

A potential determinant of the way people respond to noise relates to their knowing in advance about the existence of the noise. Question 21 asked respondents whether they knew about the rifle range before they moved to the area, and if they did

| Response to Q.23 | Mean GR | Standard Deviation of GR | Number |
|------------------|---------|--------------------------|--------|
| Yes | 7.65 | 1.84 | 9 |
| No | 2.62 | 2.68 | 187 |

F = 31.01 (df = 1/194, P < .001)

TABLE 7.7 Relationship between GR and responses to Q.23.

know about it, whether the noise was different from what they had expected. Because people may be unreliable at recalling information from the distant past, it was decided to analyse the responses of those who had moved within the previous two years. Those respondents who said either that they did not know about the range or that they found the noise greater than they had expected, had a mean GR score of 5.8 as compared with 1.2 for those who knew about the rifle range noise in advance ($F = 39.58$, $df = 1,28$, $P < .001$). This difference in reaction is not due to differences in noise exposure between the two groups of respondents ($F = 0.79$, NS). Clearly, people are much more likely to be unaffected by the noise if they know about it in advance.

7.3 Other Variables Affecting Modifiers

It is reasonable to suppose that the socio-economic variables which appear to be related to overall reaction may have this influence via an effect on Negative Attitude or, less plausibly, on Sensitivity. This was tested by analyses of variance in a similar way to the analysis described in the previous section. The results are shown in Tables 7.9 - 7.14, where NEGAT represents the score on Negative Attitude rescaled 0-10.

| Age (yrs) | Mean NEGAT | Standard Deviation | Number |
|-----------|------------|--------------------|--------|
| 18-29 | 4.64 | 1.62 | 35 |
| 30-39 | 5.47 | 1.98 | 63 |
| 40-49 | 4.53 | 1.95 | 29 |
| 50-59 | 5.02 | 1.68 | 33 |
| 60-69 | 4.12 | 1.30 | 23 |
| 70+ | 4.67 | 2.04 | 18 |

$F = 2.59^*$ ($df = 5/195$, $p < 0.05$)

TABLE 7.8 Effect of age on Negative Attitude

| Sex | Mean NEGAT | Standard Deviation | Number |
|--------|------------|--------------------|--------|
| Male | 5.05 | 1.98 | 83 |
| Female | 4.78 | 1.74 | 118 |

F = 1.04 (df = 1/199, NS)

TABLE 7.9 Effect of sex on Negative Attitude

| Length of Residence (yrs) | Mean NEGAT | Standard Deviation | Number |
|---------------------------|------------|--------------------|--------|
| <1 | 5.54 | 1.68 | 18 |
| 1-2 | 4.94 | 2.01 | 13 |
| 2-5 | 5.58 | 2.13 | 29 |
| 5-10 | 5.17 | 1.77 | 35 |
| >10 | 4.49 | 1.69 | 104 |
| All of Life | 4.75 | 3.89 | 2 |

F = 2.51 (df = 5/195, P<0.05)

TABLE 7.10 Effect of Length of residence on Negative Attitude

| Occupation Category | Mean NEGAT | Standard Deviation | Number |
|---------------------|------------|--------------------|--------|
| Professional | 5.39 | 1.95 | 46 |
| White Collar | 4.40 | 1.80 | 48 |
| Blue Collar | 4.76 | 1.91 | 45 |
| Home Duties | 5.00 | 1.68 | 62 |

F = 2.48 (df = 3/197, NS)

TABLE 7.11 Effect of occupation on Negative Attitude

| Gross Family Income | Mean GR | Standard Deviation | Number |
|---------------------|---------|--------------------|--------|
| < \$ 5,000 | 4.41 | 1.90 | 29 |
| \$ 5,000 - \$10,000 | 4.09 | 1.23 | 20 |
| \$10,000 - \$15,000 | 4.76 | 1.71 | 45 |
| \$15,000 - \$20,000 | 5.19 | 1.83 | 35 |
| \$20,000 - \$25,000 | 5.72 | 2.05 | 25 |
| > \$25,000 | 5.29 | 2.17 | 24 |

F = 2.62* (df = 5/172, P<0.05)

TABLE 7.12 Effect of income on Negative Attitude

| Level of Education | Mean NEGAT | Standard Deviation | Number |
|--------------------|------------|--------------------|--------|
| 1-3 yrs primary | 2.00 | 0.00 | 1 |
| 4-6 yrs primary | 4.46 | 1.02 | 12 |
| 1-4 yrs secondary | 4.91 | 1.93 | 92 |
| 5-6 yrs secondary | 4.68 | 1.53 | 53 |
| 1-2 yrs tertiary | 4.31 | 1.33 | 12 |
| 3+ yrs tertiary | 5.82 | 2.27 | 28 |

F = 2.41* (df = 5/192, P<0.05)

TABLE 7.13 Effect of level of education on Negative Attitude.

Although the effect of age on Negative Attitude is significant at the 0.05 level, it is difficult to see any pattern in the results and therefore to understand the relationship. The same may be said for the effect of length of residence although there is some tendency for Negative Attitude to decrease with increasing length of residence. Of the three socio-economic variables occupation, income and education, the effects of income and

education are significant at the 0.05 level, while the effect of occupation is not. The existence and direction of the effects of income and education are consistent with the tendency for higher socio-economic levels to be associated with higher scores of overall reaction. Income and education each explain approximately 4.5% of the variation in Negative Attitude. There is thus no reason to suspect that socio-economic variables affect GR scores other than via an effect on Negative Attitude.

None of the variables age, sex, occupation, income and education showed a significant relationship with Noise Sensitivity (respectively $F = 2.03$, $df = 5/190$; $F = 0.15$, $df = 1/194$; $F = 0.31$, $df = 3/192$; $F = 1.00$, $df = 5/168$; $F = 1.18$, $df = 5/187$). However length of residence does appear to be related to Noise Sensitivity (see Table 7.14), recent in-movers tending to be more noise-sensitive. Both this result and the relation between Negative Attitude and length of residence could be explained by the operation of a "self-selection" procedure, whereby individuals who are highly noise-sensitive or who have strong negative attitudes to the rifle range tend to move from the area quickly. This hypothesis is supported by responses to Q.23 ("Have you ever seriously considered moving from this area because of the rifle range noise?") in the case of Negative Attitude, but not in the case of Noise Sensitivity. (Tables 7.15 and 7.16).

| Length of Residence (yrs) | Mean Sensitivity | Standard Deviation | Number |
|---------------------------|------------------|--------------------|--------|
| <1 | 5.93 | 2.06 | 18 |
| 1-2 | 5.20 | 1.79 | 13 |
| 2-5 | 5.88 | 1.97 | 28 |
| 5-10 | 5.41 | 2.47 | 35 |
| >10 | 4.56 | 2.25 | 100 |
| All of Life | 3.00 | 2.55 | 2 |

$F = 2.87$ ($df = 5/190$, $P < 0.05$)

TABLE 7.14 Effect of length of residence on Noise Sensitivity rescaled 0-10.

| Response to Q.23 | Mean NEGAT | Standard Deviation | Number |
|------------------|------------|--------------------|--------|
| Yes | 8.14 | 1.42 | 9 |
| No | 4.74 | 1.72 | 192 |

F = 34.15 (df = 1/199, P<.001)

TABLE 7.15 Relationship between responses to Q.23 and Negative Attitude.

| Response to Q.23 | Mean Sensitivity | Standard Deviation | Number |
|------------------|------------------|--------------------|--------|
| Yes | 5.00 | 2.44 | 9 |
| No | 5.05 | 2.26 | 187 |

F = 0.01 (df = 1/194, NS)

TABLE 7.16 Relationship between responses to Q.23 and Noise Sensitivity.

7.4 'Neutral' and 'Prompted' Annoyance Ratings

As part of the design of the interview schedule, one rating of annoyance due to noise from the rifle range (Q.7k) was made before the respondent was aware that the interview was to focus on rifle range noise. A second rating (Q.11e) was made when the respondent was aware that the interview was concerned with noise in general. A third rating (Q.14), although somewhat different in form, was made when the respondent was aware of the main focus on rifle range noise. Comparison of responses to these questions (which form part of the scale of annoyance) should indicate the degree to which respondents, consciously or unconsciously, altered their ratings according to their perception of the survey's purpose.

Figure 7.1 shows that there is little difference in patterns of response to all three questions with the exception that Q.14 elicited more "0" responses than Q.11(e) and Q.11(e) more than Q.7(k). The reverse is the case for "10" responses. These differences are reflected in the mean responses, which are 4.43 for Q.7(k), 3.45 for Q.11(e) and 3.03 for Q.14. These results do not support the conjecture that respondents may

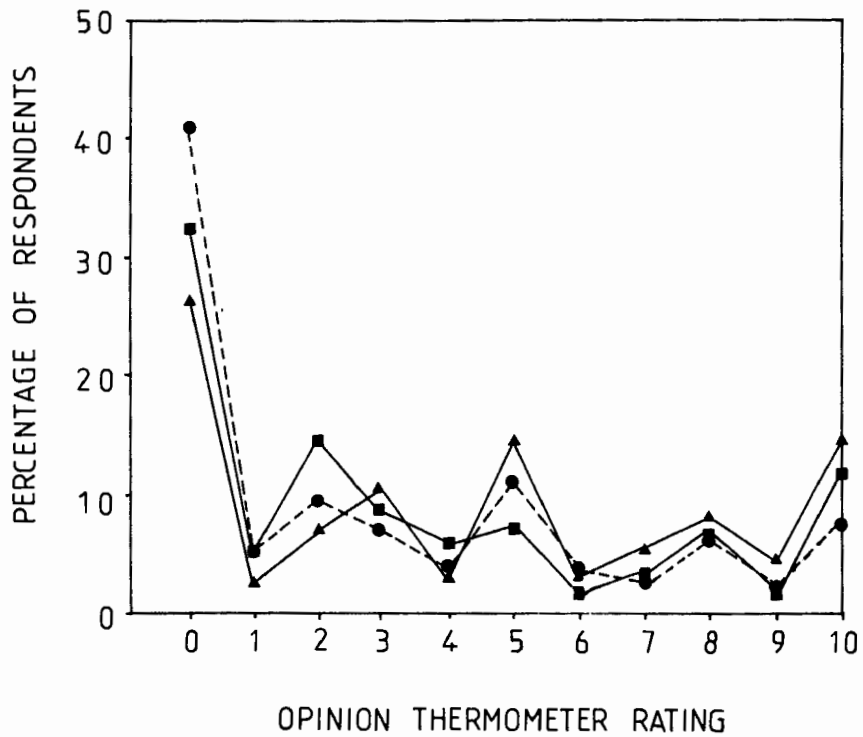


FIGURE 7.1 Distribution of ratings given in the three questions on annoyance (Q.7k ▲—▲ ; Q.11e ■—■ ; Q.14 ●---●).

inflate their responses when they become aware of the survey's purpose, and, in fact, suggest that they may actually deflate their responses.

However, it should be pointed out that respondents who answered "No" to Q.10(e) (i.e. who reported that they never hear the noise of shooting in the neighbourhood) were assumed to have zero rating in Q.11(e) (annoyance due to noise from shooting). It could be that some respondents, in answering Q.10(e), did not mean that they literally never hear the noise, and may have given "1" or "2" response to Q.11(e). Similarly, respondents giving a "0" rating to Q.11(e) were assumed to have a "0" rating for Q.14. Similar arguments apply, with even more force, in this case.

It should also be remembered that these questions are not asking for exactly the same rating, although all could be expected to form a part of the overall annoyance reaction. Thus, the most that can be said is that this data shows no evidence of systematic differences in annoyance ratings between "neutral" and "prompted" questions, that is, no evidence of response bias.

7.5 Respondents' Descriptions of the Noise

Answers to Q.16A indicated that the most bothersome aspects of the noise were "the high-pitched crack made by the shot" and "the sound of many shots fired rapidly". These were mentioned by 44% of the respondents who were asked the question. "The echo made by the sound" was mentioned by 34% of these respondents. As could be expected, there is a strong relationship between answers to Q.16.A(a)-(e) and overall reaction, respondents with higher GR scores being more likely to answer that they are bothered by these aspects of the noise (cf. Figure III.7). There is also a significant relationship between ASEL and answers to all these questions, with the exception of Q.16A(d) ("Are you bothered by the variation in the time gaps between the shots?")

In response to the open question about the sound of the shooting (Q.16B), 7 people mentioned the "amount", "intensity" or "obtrusiveness" of the noise, 6 mentioned the suddenness of the onset of shooting and 5 the length of time for which shooting goes on. Thirteen respondents gave various other replies, including 3 who mentioned that they did not approve of the use of firearms on principle.

The period which most respondents wished to have free of rifle noise was Sunday morning, which was chosen in Q.17A by 42% of the people who were asked the question. Sunday afternoon was chosen by 30% of these respondents, indicating that people tend to value freedom from noise on Sundays more highly than on Saturdays (18%).

7.6 Other Comments

Responses to Q.26 are listed in Table 7.17. Suggestions relating to the noise are, restrictions on times of firing (8 respondents), restrictions on the rifles used or the range of shooting (10 respondents) and building or improving sound barriers (12 respondents), 29 respondents indicated that they were concerned about safety conditions around the range. A total of 39 respondents made comments generally favourable toward the range as it is currently used.

| | Number of Respondents |
|---|-----------------------|
| No comments | 77 |
| Let things stay as they are | 33 |
| Other comments - generally favourable to range | 6 |
| The range should be moved | 32 |
| Times of firing should be restricted | 8 |
| Types of rifles or ammunition used should be restricted | 7 |
| Distance of shooting should be restricted | 3 |
| Sound barriers should be built or improved | 12 |
| Safety conditions should be improved | 29 |
| Other comments - generally unfavourable to range | 9 |

TABLE 7.17 Respondents' additional comments from Question 26. (Note that some responses are paraphrased for classification)

SECTION 8. GENERAL DISCUSSION

8.1 Extent of the Noise Problem at Hornsby

Using the calculation procedures outlined in Section 3 it is possible to obtain contours which define the noise exposure around Hornsby Rifle Range. The contours for A-weighted sound exposure level (ASEL) and Unweighted peak sound pressure level (LPEAK) are shown in Figures 8.1 and 8.2 respectively.

The contours have been drawn without any corrections for the shielding effects of topography and buildings. Note, however, that these corrections were made in estimating the exposure at each of the survey dwellings in the present dose-response analysis. Perhaps the most significant feature of the noise exposure contours is the way they fan out from the back firing position on the range. Thus dwellings in Meredith Avenue to the north are exposed to much more noise than those in Maranta Street to the east even though the latter are much closer to the noise source. This occurs because of the highly directional nature of the sound propagating from the rifles. The direction of a dwelling in relation to the line of fire is a much more important determinant of noise exposure than distance from the range.

The noise contours in Figure 8.1 were super-imposed on maps which located each of the 520 houses in the survey area. Counts were made of the numbers of dwellings in each exposure zone. Given that the average number of persons per survey household was 3.18 an estimate can be made of the number of people living within each zone. And using the percentages from the dose-response analysis we can estimate the number of people affected by the noise from Hornsby Rifle Range. Table 8.1 lists the estimated numbers seriously and moderately affected (Refer to Section 5.2 for definitions). As can be seen from the table there is an estimated total of 154 people who can be considered seriously affected, and a total of 471 who are at least moderately affected by the noise.

8.2 Implications for Land-Use Planning

While it would be desirable to have noise levels restricted so that no residents are seriously affected, this is not always possible. In order to derive a criterion level for land-use planning one must make a reasoned but nevertheless arbitrary decision.

A criterion based on an A-weighted sound exposure level of 50 dB would appear too low given that only 5.4% of respondents were found to be seriously affected (See Table 8.1). On the other hand, an ASEL of 65 dB is clearly too high as a criterion level with some 43.8% seriously affected. It is

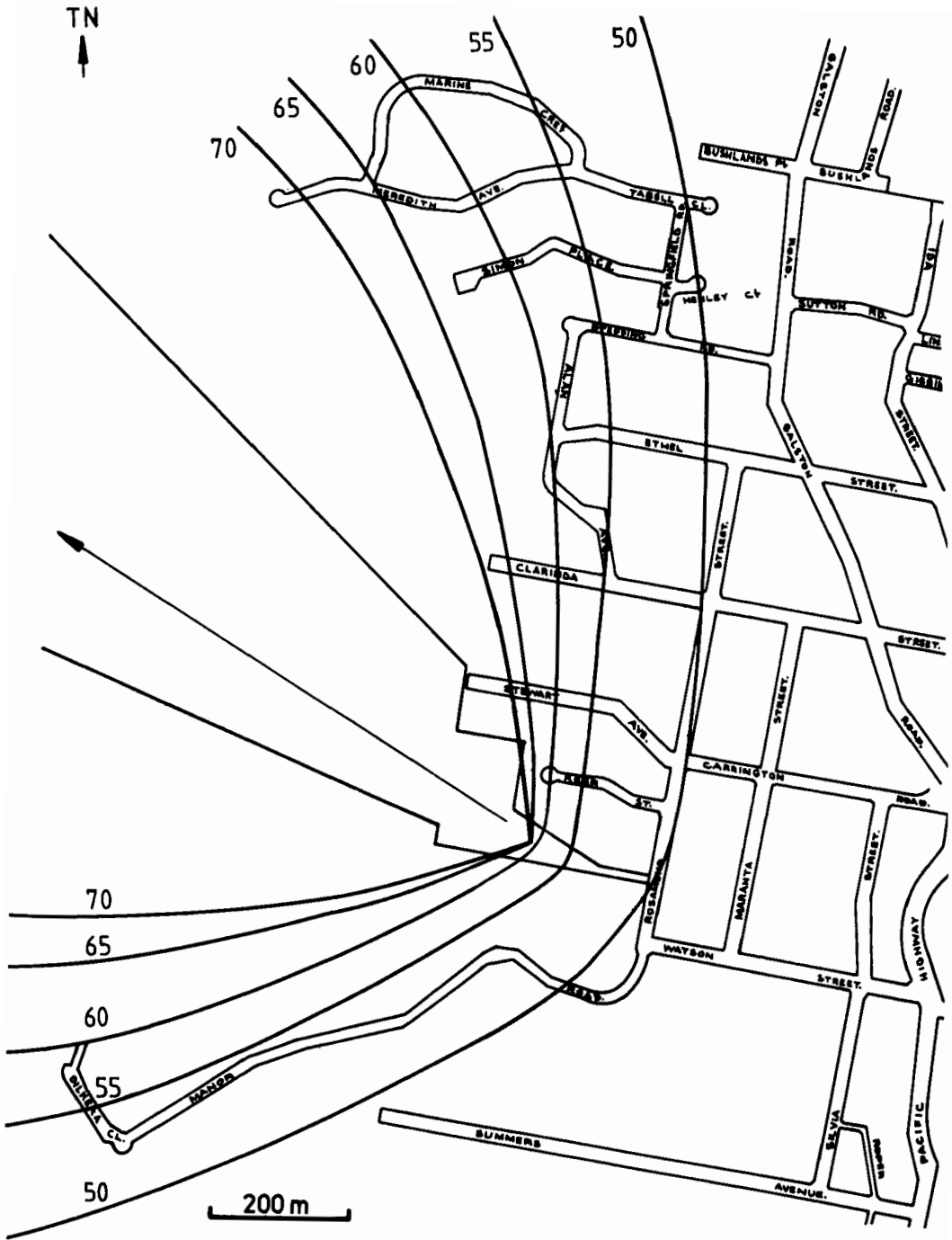


FIGURE 8.1 Noise contours around Hornsby Rifle Range (A-weighted sound exposure level - ASEL)

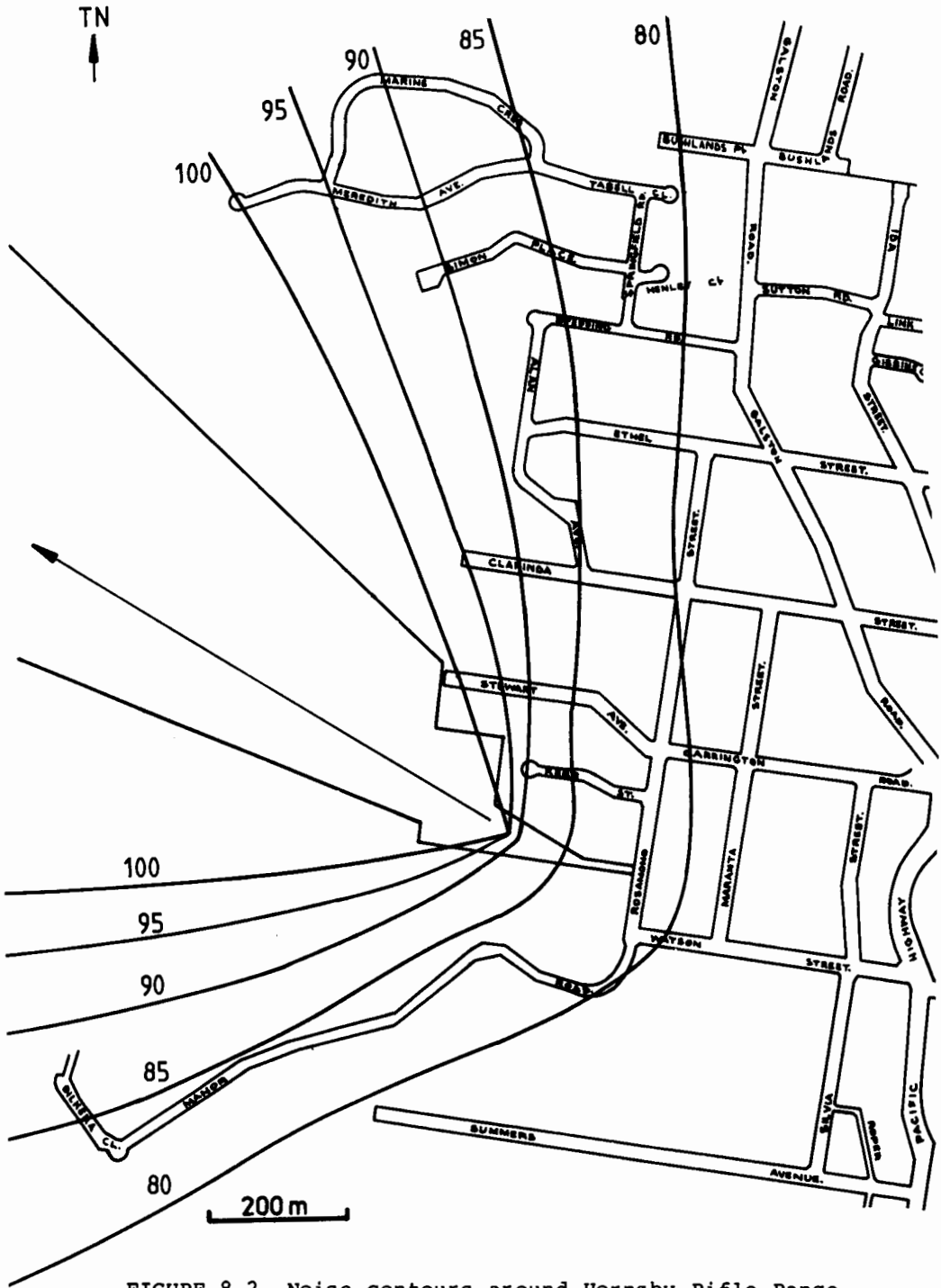


FIGURE 8.2 Noise contours around Hornsby Rifle Range
(Unweighted peak sound pressure level - LPEAK)

| ASEL | Number of Dwellings | Number of Persons | No. Moderately Affected | No. Seriously Affected |
|--------|---------------------|-------------------|-------------------------|------------------------|
| 45 | 90 | 286 | 17 (6.1) | 0 (0) |
| 45-49 | 92 | 293 | 47 (16.2) | 16 (5.4) |
| 50-54 | 134 | 426 | 121 (28.3) | 40 (9.4) |
| 55-59 | 113 | 359 | 153 (42.5) | 27 (7.5) |
| 60-64 | 55 | 175 | 62 (35.3) | 21 (11.8) |
| 65+ | 36 | 114 | 71 (62.5) | 50 (43.8) |
| TOTALS | 520 | 1653 | 471 | 154 |

TABLE 8.1 Estimated numbers of people seriously affected and moderately affected by noise from Hornsby Rifle Range. (Figures in brackets are percentages from dose-response functions in Figure 5.4).

proposed that a reasonable criterion would be 55 dB (ASEL). The corresponding criterion in the case of Unweighted peak sound pressure level would be 85 dB (LPEAK). Note that both levels are to be calculated by averaging on an energy basis over a representative number of shots.

If noise levels were restricted to the proposed criterion levels (ASEL 55 and LPEAK 85) it could be expected that fewer than 10% of the residents would be seriously affected by the noise (cf. Figures 5.4 and 5.5). This is in accordance with informal conventions adopted by overseas authorities who aim to restrict noise to levels that seriously disturb not more than 10% of the exposed population in residential communities.

One must be careful in generalizing from one study on rifle shooting to other impulsive noise situations. However, considering that there was wide variation in the spectra of the rifle noise recorded at different sites around Hornsby (cf. Figure 3.6), it is probable that the present findings are applicable to other small arms such as pistols and shotguns, assuming that their noise spectra are comparable.

There is some disagreement in the literature about the effect of the number of shots on subjective reaction. In the social study by Sorensen and Magnusson (5) the dose-response functions were no different for ranges with 28,000 and 71,000 shots per year. This suggests that above 28,000 the number of shots does not significantly influence the extent to which people are affected. However, laboratory experiments by

Fidell (2) indicated that human response increased with number and followed the energy principle. That is, doubling the number of shots was found to be subjectively equivalent to increasing the level by 3 dB. Until further research resolves this issue it seems reasonable for planning purposes to adjust the Hornsby-derived criterion by adding or subtracting 3 dB for each doubling or halving of the 150,000 shots per year in the present study.

Another factor that needs to be considered in evaluating the likely impact of a noise on a community is the time the noise occurs. In the case of Hornsby, the noise is confined to weekends and rarely extends beyond 5.00 pm. The criterion (ASEL 55/LPEAK 85) would need to be lowered if the noise extended into evening or night hours, but could probably be raised if the noise occurred on weekdays rather than weekends.

It is interesting to note that the criterion of 85 dB LPEAK corresponds with the CNR 90 criterion proposed in an earlier NAL report by Carter (8). The CNR or Composite Noise Rating is given by the equation:

$$\text{CNR} = (Y-A) + 10 \log N - K$$

where, Y = Unweighted Peak level (dB)

A = Correction for community adaptation

N = Number of shots per day

K = Correction for day vs. night.

If it is assumed that the Hornsby community is 'moderately' adapted to the rifle range noise, and that the night-time correction applies for weekends, the equation becomes:

$$\text{CNR} = (Y-19) + 10 \log N - 2$$

If the shots at Hornsby are averaged out on a daily basis, the value of N is 421. Substituting in the equation we find that an LPEAK of 85 dB gives a CNR of 90.2 dB.

8.3 Noise Abatement Options

It has been shown that there are about 470 Hornsby residents whose lives are affected to an appreciable degree by the noise from the rifle range. Of these about 150 can be described as seriously affected by the noise. On the proposed criterion of 55 dB ASEL, it can be seen from Table 8.1 that approximately 200 dwellings in the area are exposed to unacceptable amounts of noise. There are a number of options available

for reducing the noise to levels more compatible with residential living.

Reduction in the number of shots. According to the energy principle, the amount of noise can be reduced by reducing the number of shots. Thus, to produce the equivalent of a 3 dB reduction in noise level there would have to be a halving of the number of shots fired. And a reduction of 5 dB (i.e., one noise contour - see Figures 8.1 and 8.2) would require that the number of shots be reduced from almost 3,000 per weekend as at present to 950. While this reduction would obviously be restrictive for the range users, it would mean that about 90 rather than 200 dwellings would be located within the ASEL 55 contour.

Reduction in noise levels. A second noise abatement option would be to reduce the intensity of the rifle noise reaching the surrounding houses. There is no point having the shooters use silencers on their rifles because much of the noise comes from the shock-wave generated by the bullet as it travels supersonically through the air. Nor is there much scope on an open range for barriers to attenuate or deflect the noise. It is relevant to note that as part of the conversion to metric firing distances, earth mounds about 3m high will be constructed along both sides of the range over the next few years. Although further noise measurements are planned, it is very unlikely that these mounds will significantly affect sound propagation or reduce noise levels in the community.

The noise levels in the residential area around Hornsby Rifle Range increase with the firing position. Because of the directional nature of the noise the levels are much higher when the shots are fired from the 700 yd. mark as compared with positions closer to the targets. The levels are lowest when the shooting is off 100 yds. It follows that the noise levels could be reduced if the range was shorter. Figure 8.3 shows how the ASEL 55 contour would be changed by shortening the range to either 600 m or 500 m. In deriving these contours the number of shots was not reduced, but all shots off the more distant positions were assumed to have been fired off either 600 m or 500 m. The number of dwellings within the ASEL 55 contour would be as follows:

| | | |
|----------------------------|---|---------------|
| Firing up to 800 yds | - | 200 dwellings |
| Firing restricted to 600 m | - | 140 dwellings |
| Firing restricted to 500 m | - | 70 dwellings |

From the usage data in Table 1.1 it is clear that in the year 1979/80 a large proportion of the range activity entailed shooting off more than 500 m. As with all noise abatement procedures, the benefits to the community must be weighed

against the inconvenience to the shooters.

Reduction in duration of the noise. Even without actually reducing the amount of noise one can reduce its psychological impact by reducing the time over which it occurs. Thus shooting which occurs over a four hour period would be less disruptive for most people than the same number of shots spread over eight hours. And a reduction in the number of shots would be of little value to the community unless the duration of the firing was also reduced.

One of the most important features of the noise from the point of view of community impact is the time of day it occurs. In particular, Sunday morning is a very 'sensitive' time. As was noted in Section 7.5 the survey results showed that Hornsby residents have a definite preference for Sunday morning as the period they most wanted to have free from rifle noise. This period was chosen by 42% of those questioned as compared with 30% who chose Sunday afternoon and only 18% who chose Saturday afternoon. Note that shooting at Hornsby occurs on only about 1 in 5 Sunday mornings but on almost every Saturday afternoon. It would be of great benefit to the residents if shooting was banned on Sunday mornings. Another option would be to restrict Sunday use of the range to the SSAA whose shooting from the 100 yd mark creates much less noise in the community than the NRA. While such restrictions may pose some organizational problems for the shooters, they would ensure that residents have peace and quiet on Sunday mornings and moderate amounts of noise on Sunday afternoons.

Another feature of the noise which determines its psychological impact is its unpredictability. Part of the problem about Sunday mornings is that the residents never know when or even if the shooting will start. Most people can adapt to noise when it is predictable. Considering that shooting noise is intrinsically unpredictable because of the almost random firing patterns of shooters firing at will, it may be desirable to at least regulate the starting and stopping times. A major advantage of restricting Sunday shooting to the SSAA in the afternoons would be to make the noise less unpredictable.

Knowledge about the range. While it is not a noise abatement procedure knowledge about the range can reduce community reaction. In the survey it was found that some 54% of respondents who answered Question 26 claimed they did not know about the range when they moved into the area. And 21% of those who did know said they found the noise worse than they had expected. As was shown in Section 7.3 these respondents were much more affected by the noise than those who knew what to expect. If potential buyers were made aware of the existence of the range, they would be able to judge for themselves whether they find the noise offensive. In areas around airports where the local government authorities inform buyers of noise affected properties there is apparently

no effect on prices. Although some individuals may decide against the purchase, the main effect would be that those who move into the high noise areas would not feel 'cheated', and would be less likely to be seriously affected by the noise.

Safety Conditions. Though not strictly noise related it is quite clear that concern about the safety of the range contributes to the reaction of the community. Although 54% of respondents agreed with statement 25e that the safety conditions were satisfactory, there were 29% who agreed that "The rifle range is a danger to children in this neighbourhood" (25j). Also, in Question 26 some 14% of respondents spontaneously mentioned safety conditions when asked about suggestions for improving the range. The barriers being constructed in the course of re-modelling the range should help to allay residents' fears about safety, though some insist that proper fencing is needed.

It must be stressed that the noise abatement procedures discussed above are presented as options. They have been evaluated as part of the scientific assessment of the noise problem around Hornsby Rifle Range. The issue of whether and how any or all of these procedures should be implemented is quite distinct from the present assessment.

SECTION 9. SUMMARY

The present socio-acoustic investigation was undertaken in order to assess the impact on the residential community of the noise from Hornsby Rifle Range. Personal interviews with 201 residents provided data on subjective reaction to the noise. The responses given in some twenty different questionnaire items including annoyance ratings and reports of activity disturbances were used to derive a composite measure of an individual's general reaction (GR). Scores of 8 and 4 on the 10 point GR scale were used to classify respondents as 'seriously' or 'moderately' affected.

Noise recordings at ten sites around the range were analyzed to estimate noise exposure. There were eight exposure indices calculated for each residence in the survey. Although all eight indices were found to be comparable as predictors of individual reaction, it appears that the most useful and theoretically defensible measures of rifle noise exposure are:

ASEL : A-weighted sound exposure level which measures the total energy in the impulse adjusted according to the frequency response of the human ear.

LPEAK : Unweighted peak sound pressure level, a measure of the maximum instantaneous sound pressure in the impulse.

The major findings from the present analysis can be summarized as follows:

- 1) Exposure level alone accounted for only 8.5% of the variance in individual reaction to the rifle range noise. (cf. Section 5.1).
- 2) The extent to which a person is affected by the noise was found to depend heavily on psychological factors such as noise sensitivity and attitude towards the rifle range. In fact, attitude explained seven times as much of the variation in GR as the noise level itself. (cf. Section 6.3).
- 3) While not significantly influenced by noise exposure, the individual's attitude serves to modify the reaction which is experienced as a result of the noise. (cf. Section 6.3).
- 4) The dose-response functions (exposure zone vs. percentage seriously affected) were similar for ASEL and LPEAK, although the latter appeared to be more linear. This was confirmed by the correlations: $r=.95$ (LPEAK), $r=.81$ (ASEL). (cf. Section 5.3).

- 5) There was considerable over-lap in the dose-response data for the present study as compared with the study by Sorensen and Magnusson (5), despite the fact that the two studies differed markedly in methodology. (cf. Section 5.4).
- 6) Demographic variables were found not to be major determinants of subjective reaction. Although there was some indication that socio-economic status influences GR, this appears to be because those in higher socio-economic levels tend to have more negative general attitudes. (cf. Section 7.3).
- 7) People who had recently moved to the area were found to be most affected by the rifle range. They were also more sensitive to noise in general, and more likely to have thought of moving away because of the rifle noise. Interestingly, however, recent in-movers were not any less likely to report having adapted to the noise. (cf. Section 7.2).
- 8) Respondents who claimed they did not know about the range before moving or who found the noise worse than they had expected, were more highly affected than those who knew about the noise in advance. (cf. Section 7.3).
- 9) There was no tendency for respondents to increase their annoyance ratings when they realized the survey was about the rifle range. (cf. Section 7.4).
- 10) Hornsby residents are most disturbed by rifle noise on Sunday mornings. Also, they find the high pitched crack and the rapidity of firing the most bothersome characteristics of the noise. (cf. Section 7.5).
- 11) It is estimated that in the community surrounding the rifle range, there are about 470 people who experience significant disturbance because of the noise. And of these about 150 can be considered seriously affected. (cf. Section 8.1).
- 12) Because of the directionality of rifle noise the exposure level at a particular point depends more on the angle to the line of fire than on the distance from the noise source. (cf. Section 8.1).

On the basis of the present dose-response data, it is suggested that a reasonable criterion level for land-use planning is 55 dB (ASEL) or 85 dB (LPEAK). It is at these levels that the percentage seriously affected starts to rise above the 10% margin regarded as the maximum acceptable for planning purposes (cf. Figures 5.4 and 5.5). Inside the proposed criterion contours (55/85) the total percentage of respondents seriously affected was 16% for ASEL and 19% LPEAK. Further research is needed to establish the generality of the

Hornsby data, particularly to determine the effect of different numbers of shots and times of firing.

There are a number of noise abatement options available to the relevant authorities in relation to the noise problem around Hornsby Rifle Range. The likely effects of these options have been discussed.

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APPENDIX I. THE QUESTIONNAIRE

| | | |
|---|--------------------|-------|
| 1. THE FIRST QUESTION IS: | | |
| HOW MANY YEARS YOU HAVE BEEN LIVING | Less than 1 year | 9.0% |
| AT THIS ADDRESS? | 1 - 2 years | 6.5 |
| | 2 - 5 years | 14.4 |
| | 5 - 10 years | 17.4 |
| | More than 10 years | 51.7 |
| | All of life | 1.0 |
| | Don't know | |
| 2. HOW WOULD YOU RATE THIS NEIGHBOUR- | | |
| HOOD OVERALL AS A PLACE TO LIVE? | Very good | 59.2% |
| IS IT VERY GOOD, FAIRLY GOOD, AVERAGE, FAIRLY BAD OR VERY BAD? | Fairly good | 31.8 |
| | Average | 7.5 |
| | Fairly bad | 0.5 |
| | Very bad | 0.5 |
| | Don't know | 0.5 |
| <u>(Show Card A)</u> | | |
| 3. WHAT ARE SOME OF THE THINGS YOU <u>LIKE</u> ABOUT LIVING | | |
| IN THIS NEIGHBOURHOOD? ... IS THERE ANYTHING ELSE | | |
| YOU WOULD CONSIDER AN ADVANTAGE OF LIVING AROUND | | |
| HERE? | Quiet | 41.8% |
| _____ | Safe | 0.5 |
| _____ | Other | 57.2 |
| _____ | Don't know | 0.5 |
| 4. WHAT ARE SOME OF THE THINGS YOU <u>DISLIKE</u> ABOUT LIVING | | |
| IN THIS NEIGHBOURHOOD? ... IS THERE ANYTHING ELSE YOU | | |
| WOULD CONSIDER A DISADVANTAGE OF LIVING AROUND HERE? | | |
| _____ | Rifle range noise | 10.0 |
| _____ | Other noise | 3.0 |
| _____ | Other response | 55.7 |
| | Don't know | 31.3 |

5. NOW I WOULD LIKE TO ASK YOU ABOUT SOME SPECIFIC NEIGHBOURHOOD FEATURES. USING THIS SCALE AGAIN (Show Card A) PLEASE GIVE A RATING FOR EACH ACCORDING TO WHAT YOU PERSONALLY THINK THIS NEIGHBOURHOOD IS LIKE. FIRSTLY, WOULD YOU RATE THIS NEIGHBOURHOOD AS VERY GOOD, FAIRLY GOOD, AVERAGE, FAIRLY BAD OR VERY BAD FOR PUBLIC TRANSPORT? ... WHAT ABOUT ...?

| | Very good | Fairly good | Average | Fairly bad | Very bad | DK |
|---------------------------|-----------|-------------|---------|------------|----------|------|
| a) PUBLIC TRANSPORT | 14.9% | 25.4 | 27.9 | 16.4 | 7.5 | 8.0 |
| b) SHOPPING CENTRES | 58.7 | 27.9 | 7.5 | 3.5 | 1.5 | 1.0 |
| c) PARKS & PLAYGROUNDS | 17.9 | 34.3 | 27.4 | 7.5 | 4.5 | 8.5 |
| d) ATTRACTIVENESS OF AREA | 44.8 | 29.9 | 24.4 | 0.5 | 0 | 0.5 |
| e) AMOUNT OF TRAFFIC | 20.9 | 15.9 | 28.9 | 17.4 | 15.9 | 1.0 |
| f) COUNCIL & WATER RATES | 13.4 | 19.9 | 49.3 | 7.5 | 3.0 | 7.0 |
| g) AMOUNT OF NOISE | 34.3 | 38.8 | 13.9 | 8.0 | 3.5 | 0.5 |
| h) SCHOOLS & COLLEGES | 33.3 | 37.8 | 16.4 | 2.0 | 0.5 | 10.0 |
| i) GENERAL SAFETY OF AREA | 21.4 | 36.3 | 29.9 | 10.4 | 1.5 | 0.5 |

6. THESE FEATURES ARE LISTED ON THIS CARD (Show Card B). PLEASE READ THROUGH THEM AND TELL ME WHICH ONE YOU WOULD MOST LIKE TO HAVE IMPROVED IN THIS NEIGHBOURHOOD.

Refer Q5

| a) | b) | c) | d) | e) | f) | g) | h) | i) | DK |
|-------|-----|------|-----|------|-----|-----|-----|------|-----|
| 19.9% | 2.5 | 12.9 | 9.0 | 19.9 | 9.5 | 9.0 | 2.0 | 10.0 | 5.5 |

7. THE NEXT QUESTION DEALS WITH EVERYDAY THINGS THAT MANY PEOPLE FIND ANNOYING, THINGS THAT GET ON THEIR NERVES. FOR EACH OF THE SITUATIONS I READ OUT WOULD YOU PLEASE USE THIS OPINION THERMOMETER TO GIVE A RATING BETWEEN 0 AND 10 OF HOW MUCH ANNOYANCE YOU FEEL (Show 0). FOR EXAMPLE, IF YOU FIND THE SITUATION VERY MUCH ANNOYING GIVE IT A HIGH RATING (SAY 9 OR 10), IF YOU FEEL MODERATE ANNOYANCE GIVE IT A RATING AROUND 5, AND IF YOU FEEL NO ANNOYANCE GIVE IT A LOW RATING AROUND 0. PLEASE BASE YOUR RATING ON YOUR OWN PERSONAL EXPERIENCE AND DISREGARD HOW OTHERS MIGHT FEEL.

FIRSTLY, HOW MUCH ANNOYANCE DO YOU FEEL ABOUT...?

(Record: 00 - 10 = Rating; 11 = Don't know; 12 = Never Experienced)

| | Mean | |
|---|------|--|
| a) BEING HELD UP IN TRAFFIC | 6.2 | |
| b) PEOPLE SMOKING IN A CLOSED ROOM | 6.0 | |
| c) BEING WOKEN UP BY A DOG BARKING | 4.7 | |
| d) BEING UNABLE TO FIND A PARKING SPACE | 6.6 | |
| e) PEOPLE TALKING WITH THEIR MOUTH FULL | 6.4 | |
| f) HEARING INTERFERENCE ON TV OR RADIO | 5.6 | |
| g) SOMEONE READING OVER YOUR SHOULDER | 4.9 | |
| h) TRYING TO CONCENTRATE IN NOISY SURROUNDINGS | 6.2 | |
| i) PEOPLE WHO NEVER STOP COMPLAINING | 7.4 | |
| j) SOMEONE PUSHING-IN AHEAD OF YOU IN A QUEUE | 7.7 | |
| k) THE SOUND OF SHOOTING | 4.4 | |
| l) BEING KEPT WAITING FOR AN APPOINTMENT | 5.7 | |
| m) POOR SERVICE IN A RESTAURANT | 6.6 | |
| n) BEING INTERRUPTED IN CONVERSATION BY TRAFFIC NOISE | 5.2 | |
| o) JUST MISSING A BUS OR TRAIN | 6.2 | |
| p) LITTER IN A PUBLIC PARK | 8.2 | |
| q) THE SOUND OF AN AIR-CONDITIONER | 3.7 | |
| r) FINDING A PUBLIC TELEPHONE OUT OF ORDER | 8.4 | |

8. (Offhandedly) BY THE WAY, HAD YOU HEARD ABOUT THIS SURVEY BEFORE

| | | |
|--|-----|------|
| | Yes | 4.5 |
| | No | 95.5 |
| | DK | 0 |

If yes: WHAT HAD YOU HEARD?

| | | |
|--|----------------|-----|
| | Rifle range | 0% |
| | Other response | 4.5 |

9. THIS SURVEY IS GENERALLY INTERESTED IN ALL NEIGHBOURHOOD CONDITIONS, BUT IN PARTICULAR WE ARE INTERESTED IN THE VARIOUS KINDS OF NOISE PEOPLE HEAR IN DIFFERENT AREAS OF AUSTRALIA. WHAT KINDS OF NOISE DO YOU HEAR IN THIS NEIGHBOURHOOD?...ARE THERE ANY OTHER KINDS OF NOISE YOU HEAR IN THIS AREA?

| | | |
|--|-------------------|-------|
| | Rifle range noise | 53.7% |
| | Other noise | 41.3 |
| | Dont know | 5.0 |

10. I HAVE A LIST OF NOISES HERE. WOULD YOU PLEASE TELL ME WHETHER OR NOT YOU EVER HEAR THE FOLLOWING NOISES IN THIS NEIGHBOURHOOD?

| | Yes | No | DK | Q.11 Annoyance |
|---------------------------|-------|------|-----|-------------------|
| a) TRAFFIC | 71.1% | 28.9 | | Mean 3.9 |
| b) LAWN MOWERS | 90.5 | 9.5 | | 3.1 |
| c) AIRCRAFT | 94.5 | 5.5 | | 3.2 |
| d) DOGS & CATS | 85.1 | 14.9 | | 4.0 |
| e) SHOOTING | 86.6 | 13.4 | | 4.0 |
| f) TRAINS | 42.3 | 57.7 | | 1.4 |
| g) NEIGHBOURS' TV/RADIO | 17.9 | 82.1 | | 3.0 |
| h) GARBAGE COLLECTION | 53.2 | 46.8 | | 3.5 |
| i) OTHER NOISES (Specify) | 31.3 | 68.2 | 0.5 | 5.6 |

11. USING THE OPINION THERMOMETER AGAIN, WOULD YOU PLEASE GIVE ME A RATING OF HOW MUCH ANNOYANCE YOU FEEL WHEN YOU HEAR EACH OF THESE NOISES. BASE YOUR RATING ON YOUR OWN PERSONAL EXPERIENCE.

(Read only those items that received a 'yes' response in previous question)

(Record: 00 - 10 = Rating; 11 = Don't know)

12. SUPPOSE YOU WERE ABLE TO ELIMINATE ONE OF THESE NOISES FROM THIS NEIGHBOURHOOD, WHICH ONE WOULD YOU MOST LIKE TO GET RID OF?

Refer Q10

| | | | | | | | | | |
|-------|-----|------|------|------|-----|-----|-----|------|------|
| a) | b) | c) | d) | e) | f) | g) | h) | i) | DK |
| 19.4% | 3.5 | 10.9 | 17.4 | 18.9 | 0.5 | 1.5 | 5.0 | 10.4 | 12.4 |

If a zero rating was given in the item on shooting (Q.11e) skip to question 25. Otherwise continue with next question.

| | |
|----------|-------|
| Skip | 32.3% |
| Continue | 67.7 |

13. YOU MENTIONED THE NOISE OF SHOOTING IN THE EARLIER QUESTION. I WOULD LIKE TO FIND OUT MORE ABOUT THAT. FOR EACH OF THE FOLLOWING ACTIVITIES PLEASE TELL ME WHETHER OR NOT YOU FIND THAT THEY ARE DISTURBED BY NOISE FROM THE RIFLE RANGE.

FIRSTLY, DO YOU FIND THAT THE NOISE DISTURBS CONVERSATION?

... WHAT ABOUT...?

| | <u>Yes</u> | <u>No</u> | <u>DK</u> |
|--------------------------------|------------|-----------|-----------|
| a) CONVERSATION | 11.9% | 88.1 | |
| b) LISTENING TO TV/RADIO/MUSIC | 11.4 | 88.6 | |
| c) SLEEPING OR RESTING | 19.9 | 80.1 | |
| d) READING OR STUDYING | 20.9 | 79.1 | |
| e) OUTDOOR ACTIVITIES | 20.4 | 79.6 | |
| f) OTHER (Specify)..... | 6.0 | 93.5 | 0.5 |

14. HOW MUCH ANNOYANCE DO YOU FEEL OVERALL BECAUSE OF
 DISTURBANCES CAUSED BY THE NOISE OF SHOOTING?
 PLEASE USE THE OPINION THERMOMETER TO GIVE A RATING
 OF YOUR ANNOYANCE.

(Record: 00 - 10 = Rating; 11 = Don't know)

Mean 3.0

15.A. I WOULD LIKE TO KNOW WHETHER OR NOT THE RIFLE RANGE
 NOISE AFFECTS YOU IN ANY OF THE FOLLOWING WAYS. DOES IT
 EVER...?

| | <u>Yes</u> | <u>No</u> | <u>DK</u> |
|--|------------|-----------|-----------|
| a) STARTLE YOU OR MAKE YOU JUMP | 10.0% | 90.0 | 0 |
| b) FRIGHTEN YOU | 3.0 | 97.0 | 0 |
| c) CAUSE YOU TO FEEL IRRITABLE OR EDGY | 23.9 | 76.1 | 0 |
| d) GIVE YOU HEADACHES | 3.5 | 96.0 | 0.5 |
| e) MAKE YOU BECOME TENSE OR NERVOUS | 10.0 | 89.1 | 1.0 |

B IS THERE ANY OTHER WAY THE NOISE AFFECTS YOU?

Office

16.A I WOULD LIKE TO FIND OUT WHAT IT IS THAT BOTHERS YOU
 ABOUT THE NOISE OF SHOOTING. PLEASE SAY WHETHER OR
 NOT YOU ARE BOTHERED BY ANY OF THE THINGS LISTED HERE
 (Show Card D) ARE YOU BOTHERED BY...?

| | <u>Yes</u> | <u>No</u> | <u>DK</u> |
|--|------------|-----------|-----------|
| a) THE HIGH PITCHED CRACK MADE BY THE SHOT | 29.9% | 70.1 | |
| b) THE VARIATION IN THE LOUDNESS OF THE SHOTS | 17.4 | 82.6 | |
| c) THE SOUND OF MANY SHOTS FIRED RAPIDLY | 29.9 | 69.7 | 0.5 |
| d) THE VARIATION IN THE TIME GAPS BETWEEN THE SHOTS | 12.4 | 86.6 | 1.0 |
| e) THE ECHO MADE BY THE SOUND | 22.9 | 77.1 | |

B IS THERE ANYTHING ELSE ABOUT THE SOUND OF THE
 SHOOTING THAT BOTHERS YOU?

Office

17.A SUPPOSE YOU COULD ELIMINATE THE RIFLE NOISE FROM ONE OF THE PERIODS LISTED HERE (Show Card E) WHICH PERIOD WOULD YOU MOST LIKE TO HAVE FREE FROM RIFLE RANGE NOISE?

| SATam | SATpm | SUNam | SUNpm | DK Skip |
|-------|-------|-------|-------|---------|
| 1.5% | 10.4 | 20.4 | 20.4 | 39.3 |

18. USING THE OPINION THERMOMETER WOULD YOU PLEASE RATE HOW MUCH YOU ARE AFFECTED OVERALL BY THE RIFLE RANGE NOISE.

(Record: 00 - 10 = Rating; 11 = DK)

Mean 2.8

19. I HAVE A LIST OF SOME OF THE THINGS PEOPLE DO TO HAVE CONDITIONS IMPROVED IN THEIR NEIGHBOURHOODS. PLEASE SAY WHETHER OR NOT YOU WOULD LIKE TO DO ANY OF THESE THINGS IN RELATION TO THE RIFLE RANGE. FIRSTLY, DO YOU FEEL YOU WOULD LIKE TO SIGN A PETITION? ... WHAT ABOUT ...?

| | <u>Yes</u> | <u>No</u> | <u>DK</u> |
|--|------------|-----------|-----------|
| a) SIGN A PETITION | 25.4% | 72.6 | 2.0 |
| b) COMPLAIN TO LOCAL OFFICIALS | 17.9 | 81.6 | 0.5 |
| c) COMPLAIN TO YOUR MEMBER OF PARLIAMENT | 15.4 | 84.6 | |
| d) WRITE A LETTER TO THE EDITOR | 10.0 | 90.0 | |
| e) ATTEND A MEETING OF NEIGHBOURS | 24.9 | 75.1 | |
| f) ATTEND A PROTEST RALLY | 10.0 | 90.0 | |
| g) BECOME A MEMBER OF A PROTEST GROUP | 8.0 | 92.0 | |
| h) TAKE SOME KIND OF LEGAL ACTION | 6.5 | 93.5 | |

| | | | |
|--|---|----------------|-------|
| 20 | DO YOU THINK YOU HAVE BECOME <u>USED TO</u> THE RIFLE RANGE NOISE IN THE TIME YOU HAVE BEEN LIVING IN THIS NEIGHBOURHOOD? | Yes | 53.2% |
| | | No | 13.9 |
| | | DK | 32.8 |
| <u>Omit next question (Q.21) if response to Q.1 was "all of life".</u> | | | |
| 21. | DID YOU KNOW ABOUT THE RIFLE RANGE NOISE IN THIS NEIGHBOURHOOD BEFORE YOU MOVED HERE? | Yes | 29.9% |
| | | No | 34.8 |
| | | DK | 35.3 |
| <u>If yes:</u> | WHEN YOU MOVED HERE DID YOU FIND THAT THE NOISE FROM THE RIFLE RANGE WAS DIFFERENT FROM WHAT YOU HAD EXPECTED? WAS IT MUCH MORE, A BIT MORE, ABOUT THE SAME, A BIT LESS OR MUCH LESS THAN YOU EXPECTED BEFORE YOU MOVED HERE? | Much more | 4.5 |
| | | A bit more | 6.0 |
| | | About the same | 14.9 |
| | | A bit less | 2.0 |
| | | Much less | 1.5 |
| | | DK | 71.2 |
| <u>(Show Card F)</u> | | | |
| | <u>If "more", or if "no" to first part:</u> | | |
| | DO YOU THINK YOU WOULD HAVE STILL MOVED HERE HAD YOU KNOWN HOW MUCH RIFLE RANGE NOISE THERE WOULD BE? | Yes | 41.3% |
| | | No | 5.0 |
| | | DK | 53.7 |
| 22. | HAS THE AMOUNT OF NOISE FROM THE RIFLE RANGE <u>CHANGED</u> OVER THE PAST FIVE YEARS (SINCE YOU MOVED HERE <u>if less than 5</u>)? IS IT MUCH MORE, A BIT MORE, ABOUT THE SAME, A BIT LESS OR MUCH LESS THAN IT WAS BEFORE? | Much more | 6.5% |
| | | A bit more | 10.0 |
| | | About the same | 33.8 |
| | | A bit less | 10.4 |
| | | Much less | 3.5 |
| | | DK | 35.8 |

| | | | |
|--|--|-----|-------|
| 23. HAVE YOU EVER SERIOUSLY CONSIDERED | | Yes | 4.5% |
| <u>MOVING</u> FROM THIS NEIGHBOURHOOD | | No | 95.5 |
| BECAUSE OF THE RIFLE RANGE NOISE? | | DK | |
| <u>If yes:</u> | | | |
| WHAT SORT OF REASONS DID YOU HAVE FOR DECIDING | | | |
| NOT TO LEAVE? | | | |
| ----- | | | |
| <u>If no:</u> | | | |
| DO YOU THINK YOU <u>WOULD</u> SERIOUSLY CONSIDER | | Yes | 16.4% |
| MOVING OUT OF THIS NEIGHBOURHOOD | | No | 78.1 |
| IF THE AMOUNT OF RIFLE RANGE NOISE | | DK | 5.5 |
| INCREASED IN THE FUTURE ? | | | |

| | | |
|--|------|------|
| 24. HOW WOULD YOU DESCRIBE YOUR GENERAL FEELINGS ABOUT THE | | |
| RIFLE RANGE NOISE? WOULD YOU SAY YOU ARE: | | |
| HIGHLY ANNOYED | | 5.0% |
| CONSIDERABLY ANNOYED | | 8.0 |
| MODERATELY ANNOYED | | 11.9 |
| SLIGHTLY ANNOYED | | 11.9 |
| NOT AT ALL ANNOYED | | 62.2 |
| (Show Card G) | (DK) | 1.0 |

| | | | | | | |
|--|------|------|------|------|------|-----|
| 25. I WOULD LIKE TO ASK ABOUT YOUR ATTITUDES TOWARDS HORNSBY | | | | | | |
| RIFLE RANGE. FOR EACH OF THE STATEMENTS I READ OUT WOULD YOU | | | | | | |
| PLEASE USE THIS SCALE (Show Card H) TO INDICATE WHETHER YOU: | | | | | | |
| STRONGLY AGREE, AGREE, ARE UNDECIDED, DISAGREE OR STRONGLY | | | | | | |
| DISAGREE. | | | | | | |
| | SD | D | U | A | SA | DK |
| a) THE RIFLE RANGE SHOULD BE MOVED | 9.0% | 25.9 | 12.9 | 30.3 | 21.9 | |
| TO AN AREA WHERE THERE ARE NO | | | | | | |
| HOUSES | | | | | | |
| b) SHOOTING IS A LEGITIMATE SPORT | 3.0 | 10.4 | 9.5 | 71.1 | 5.5 | 0.5 |

| | SD | D | U | A | SA | DK |
|--|------|------|------|------|------|------|
| c) THE GOVERNMENT DOES NOT CARE ABOUT THE EFFECT THE RIFLE RANGE HAS ON RESIDENTS. | 1.0 | 33.8 | 26.4 | 24.4 | 6.5 | 8.0 |
| d) THE RIFLE RANGE COMPLETELY RUINS THIS NEIGHBOURHOOD | 18.9 | 59.7 | 7.0 | 10.0 | 4.0 | 0.5 |
| e) THE SAFETY CONDITIONS AROUND HORNSBY RIFLE RANGE ARE QUITE SATISFACTORY | 4.5 | 9.0 | 15.9 | 48.3 | 6.0 | 16.4 |
| f) SHOOTERS HAVE A RIGHT TO USE HORNSBY RIFLE RANGE | 3.0 | 7.5 | 5.5 | 79.1 | 4.5 | 0.5 |
| g) IT IS NO USE COMPLAINING ABOUT THE RIFLE RANGE NOISE BECAUSE NO ONE WILL DO ANYTHING ABOUT IT | 4.0 | 44.8 | 17.9 | 22.9 | 4.0 | 6.5 |
| h) THE NOISE FROM THE RIFLE RANGE IS REALLY NOT MUCH OF A PROBLEM | 4.5 | 16.9 | 3.5 | 63.7 | 11.4 | 0 |
| i) PEOPLE WHO COMPLAIN ABOUT THE RIFLE RANGE ARE JUST TROUBLE-MAKERS | 10.0 | 46.8 | 14.9 | 22.4 | 5.5 | 0.5 |
| j) THE RIFLE RANGE IS A DANGER TO CHILDREN IN THIS NEIGHBOURHOOD | 4.0 | 52.7 | 10.4 | 21.9 | 7.0 | 4.0 |
| k) THE SHOOTERS HAVE NO CONCERN FOR PEOPLE LIVING IN THIS AREA | 4.5 | 51.2 | 16.9 | 14.9 | 3.5 | 9.0 |
| l) HORNSBY RIFLE RANGE SHOULD BE CLOSED DOWN WHATEVER THE INCONVENIENCE TO SHOOTERS | 14.4 | 54.2 | 10.0 | 12.9 | 7.0 | 1.5 |
| m) BECAUSE SHOOTING IS AN OLYMPIC SPORT, THE RANGE HELPS AUSTRALIA'S STANDING AS A SPORTING NATION | 3.5 | 12.9 | 18.4 | 56.2 | 5.0 | 4.0 |
| n) THE AUTHORITIES ARE TRYING TO FIND WAYS OF REDUCING THE NOISE FROM THE RIFLE RANGE | 1.5 | 11.9 | 29.4 | 32.8 | 1.0 | 23.4 |

26. ARE THERE ANY COMMENTS OF SUGGESTIONS YOU WOULD LIKE TO MAKE ABOUT THE RIFLE RANGE OR ABOUT HOW CONDITIONS MIGHT BE IMPROVED?

27. HOW DISSATISFIED ARE YOU WITH HAVING THE RIFLE RANGE IN THIS AREA? PLEASE USE THE OPINION THERMOMETER TO ESTIMATE HOW MUCH DISSATISFACTION YOU FEEL OVERALL?
 (Record: 00 - 10 = Rating; 11 = Don't Know) Mean 3.1

28. FINALLY, I NEED TO GET SOME BACKGROUND INFORMATION FOR STATISTICAL PURPOSES.

WOULD YOU PLEASE INDICATE YOUR AGE GROUP FROM THE CATEGORIES ON THIS CARD (Show Card I)

| | |
|-------------|-------|
| 18-29 yrs | 17.4% |
| 30-39 yrs | 31.3 |
| 40-49 yrs | 14.4 |
| 50-59 yrs | 16.4 |
| 60-69 yrs | 11.4 |
| Over 70 yrs | 9.0 |
| Refuse | 0 |

29. WHAT IS YOUR OCCUPATION?
 ----- Office

(Note sex of respondent)

| | |
|--------|-------|
| Male | 41.3% |
| Female | 58.7 |

30. FROM THIS CARD (Show Card J)

WOULD YOU PLEASE INDICATE WHAT WAS THE GROSS INCOME OF YOUR FAMILY LAST YEAR. THAT IS THE TOTAL INCOME BEFORE TAX AND OTHER DEDUCTIONS.

| | |
|---------------------|-------|
| Less than \$5,000 | 14.4% |
| \$5,000 - \$10,000 | 10.0 |
| \$10,000 - \$15,000 | 22.4 |
| \$15,000 - \$20,000 | 17.4 |
| \$20,000 - \$25,000 | 12.4 |
| More than \$25,000 | 11.9 |
| Refuse | 3.0 |
| DK | 8.5 |

| | | |
|---|----------------------|------|
| 31. FROM THIS CARD (Show Card K) PLEASE | 1 - 3 yrs. Primary | 0.5% |
| TELL ME WHAT IS THE HIGHEST LEVEL | 4 - 6 yrs. Primary | 6.0 |
| OF EDUCATION YOU HAVE COMPLETED? | 1 - 4 yrs. Secondary | 45.8 |
| | 5 - 6 yrs. Secondary | 26.4 |
| | 1 - 2 yrs. Tertiary | 6.0 |
| | 3 + yrs. Tertiary | 13.9 |
| | Refuse | 1.0 |
| | DK | 0.5 |

If Tertiary:

COULD YOU PLEASE TELL ME THE NAME OF THE TERTIARY
INSTITUTION YOU ATTENDED?

Office

| | | |
|--|---------|-------|
| 32. DOES YOUR FAMILY OWN THIS HOUSE, ARE YOU | Own | 46.3% |
| BUYING IT OR DO YOU RENT IT? | Buying | 49.8 |
| | Renting | 3.0 |
| | DK | 1.0 |

If own or buying:

ROUGHLY HOW MUCH WOULD YOU SAY THIS HOUSE
IS WORTH?

(Record: \$X,000 = Estimate; 000 = DK)

Mean: \$60,600

If renting:

HOW MUCH RENT DO YOU PAY PER WEEK FOR
THIS HOUSE?

(Record: \$X _____ = Amount; 000 = DK)

Mean: \$82

APPENDIX II. NOISE MEASUREMENT DATA

UNWEIGHTED SOUND EXPOSURE LEVEL (LSEL)

| SITE | DAY | ENERGY MEAN LEVEL | STANDARD ERROR | NUMBER OF SHOTS |
|------|-----|----------------------|-------------------|--------------------|
| 1 | 1 | 74.7 | 0.5 | 10 |
| | 2 | 72.5 | 0.7 | 10 |
| | 3 | 73.9 | 0.4 | 10 |
| | 4 | 68.1 | 0.8 | 8 |
| | 5 | 76.6 | 0.7 | 10 |
| | 6 | 73.9 | 1.4 | 10 |
| | 7 | 60.1 | 1.1 | 10 |
| 2 | 1 | - | - | 0 |
| | 2 | 49.1 | 0.3 | 4 |
| | 3 | 62.5 | 0.5 | 8 |
| | 4 | 51.0 | 0.8 | 8 |
| | 5 | 49.4 | 0.3 | 9 |
| | 6 | - | - | 0 |
| | 7 | 47.1 | 0.0 | 2 |
| 3 | 1 | 53.0 | 1.0 | 10 |
| | 2 | 56.6 | 0.8 | 9 |
| | 3 | 63.7 | 1.1 | 5 |
| | 4 | 50.0 | 1.2 | 8 |
| | 5 | 55.0 | 0.6 | 9 |
| | 6 | 54.6 | 0.0 | 2 |
| | 7 | 57.2 | 0.8 | 9 |
| 4 | 1 | 68.0 | 0.5 | 10 |
| | 2 | 61.1 | 0.8 | 6 |
| | 3 | 71.2 | 1.0 | 10 |
| | 4 | 64.5 | 1.5 | 10 |
| | 5 | 63.0 | 0.6 | 9 |
| | 6 | 59.4 | 1.0 | 10 |
| | 7 | 62.6 | 0.9 | 10 |
| 5 | 1 | - | - | 0 |
| | 2 | 52.6 | 1.1 | 7 |
| | 3 | - | - | 0 |
| | 4 | - | - | 0 |
| | 5 | 51.9 | 0.5 | 7 |
| | 6 | - | - | 0 |
| | 7 | 53.4 | 0.0 | 2 |

LSEL (Continued)

| SITE | DAY | ENERGY MEAN LEVEL | STANDARD ERROR | NUMBER OF SHOTS |
|------|-----|----------------------|-------------------|--------------------|
| 6 | 1 | 58.8 | 0.4 | 10 |
| | 2 | 63.3 | 0.8 | 10 |
| | 3 | 65.4 | 1.6 | 7 |
| | 4 | - | - | 0 |
| | 5 | 55.9 | 0.7 | 9 |
| | 6 | - | - | 0 |
| | 7 | 57.6 | 0.0 | 1 |
| 7 | 1 | 53.7 | 0.7 | 9 |
| | 2 | 60.0 | 0.3 | 8 |
| | 3 | 58.0 | 0.8 | 6 |
| | 4 | - | - | 0 |
| | 5 | 51.4 | 0.8 | 6 |
| | 6 | 46.9 | 0.6 | 7 |
| | 7 | 59.1 | 1.3 | 6 |
| 8 | 1 | - | - | 0 |
| | 2 | 50.9 | 0.4 | 10 |
| | 3 | - | - | 0 |
| | 4 | - | - | 0 |
| | 5 | - | - | 0 |
| | 6 | - | - | 0 |
| | 7 | - | - | 0 |
| 9 | 1 | 63.9 | 0.7 | 10 |
| | 2 | 54.6 | 0.6 | 9 |
| | 3 | 59.5 | 0.7 | 5 |
| | 4 | 39.6 | 0.0 | 2 |
| | 5 | 62.8 | 0.8 | 9 |
| | 6 | 54.4 | 0.9 | 10 |
| | 7 | 56.6 | 0.8 | 7 |
| 10 | 1 | 69.3 | 0.5 | 10 |
| | 2 | 58.7 | 0.7 | 10 |
| | 3 | 53.2 | 0.0 | 2 |
| | 4 | 49.7 | 1.4 | 6 |
| | 5 | 60.8 | 0.8 | 8 |
| | 6 | 60.3 | 1.0 | 10 |
| | 7 | 56.6 | 0.5 | 5 |

A-WEIGHTED SOUND EXPOSURE LEVEL (ASEL)

| SITE | DAY | ENERGY MEAN LEVEL | STANDARD ERROR | NUMBER OF SHOTS |
|------|-----|-------------------|----------------|-----------------|
| 1 | 1 | 73.8 | 0.6 | 10 |
| | 2 | 72.4 | 0.7 | 10 |
| | 3 | 74.0 | 0.4 | 10 |
| | 4 | 63.3 | 0.5 | 9 |
| | 5 | 75.4 | 0.5 | 10 |
| | 6 | 72.2 | 1.6 | 10 |
| | 7 | 56.8 | 1.0 | 10 |
| 2 | 1 | 52.4 | 0.5 | 8 |
| | 2 | 46.7 | 0.3 | 10 |
| | 3 | 61.5 | 0.5 | 8 |
| | 4 | 43.1 | 0.4 | 9 |
| | 5 | 45.2 | 0.4 | 9 |
| | 6 | - | - | 0 |
| | 7 | 43.7 | 0.0 | 2 |
| 3 | 1 | 51.5 | 0.9 | 9 |
| | 2 | 54.6 | 0.7 | 9 |
| | 3 | 58.3 | 0.6 | 10 |
| | 4 | 44.3 | 1.0 | 7 |
| | 5 | 48.8 | 0.7 | 10 |
| | 6 | 46.7 | 1.6 | 5 |
| | 7 | 52.7 | 0.9 | 9 |
| 4 | 1 | 67.1 | 0.6 | 10 |
| | 2 | 61.0 | 0.9 | 6 |
| | 3 | 69.5 | 0.8 | 9 |
| | 4 | 58.4 | 1.9 | 9 |
| | 5 | 59.4 | 0.7 | 9 |
| | 6 | 54.2 | 1.3 | 9 |
| | 7 | 58.7 | 0.9 | 10 |
| 5 | 1 | - | - | 0 |
| | 2 | 46.6 | 1.1 | 8 |
| | 3 | 51.5 | 0.9 | 8 |
| | 4 | - | - | 0 |
| | 5 | 48.7 | 1.2 | 7 |
| | 6 | - | - | 0 |
| | 7 | 46.2 | 1.5 | 7 |

ASEL (Continued)

| SITE | DAY | ENERGY MEAN LEVEL | STANDARD ERROR | NUMBER OF SHOTS |
|------|-----|----------------------|-------------------|--------------------|
| 6 | 1 | 52.4 | 0.5 | 10 |
| | 2 | 58.5 | 1.2 | 10 |
| | 3 | 62.4 | 1.7 | 8 |
| | 4 | - | - | 0 |
| | 5 | 49.2 | 0.8 | 8 |
| | 6 | 36.4 | 0.5 | 8 |
| | 7 | 50.2 | 1.3 | 9 |
| 7 | 1 | 51.2 | 1.0 | 10 |
| | 2 | 54.8 | 0.5 | 8 |
| | 3 | 54.9 | 0.8 | 6 |
| | 4 | - | - | 0 |
| | 5 | 47.5 | 1.2 | 8 |
| | 6 | 44.2 | 0.9 | 8 |
| | 7 | 53.6 | 1.8 | 8 |
| 8 | 1 | - | - | 0 |
| | 2 | 44.6 | 0.6 | 10 |
| | 3 | - | - | 0 |
| | 4 | - | - | 0 |
| | 5 | - | - | 0 |
| | 6 | - | - | 0 |
| | 7 | - | - | 0 |
| 9 | 1 | 60.5 | 0.4 | 10 |
| | 2 | 53.8 | 0.6 | 10 |
| | 3 | 54.4 | 0.7 | 7 |
| | 4 | 28.6 | 0.0 | 2 |
| | 5 | 58.0 | 0.9 | 9 |
| | 6 | 51.0 | 1.0 | 10 |
| | 7 | 52.3 | 0.9 | 7 |
| 10 | 1 | 67.4 | 0.5 | 10 |
| | 2 | 58.0 | 0.7 | 10 |
| | 3 | 49.6 | 0.7 | 9 |
| | 4 | 42.3 | 1.1 | 8 |
| | 5 | 56.7 | 1.2 | 7 |
| | 6 | 55.0 | 1.2 | 10 |
| | 7 | 51.4 | 0.5 | 6 |

UNWEIGHTED PEAK SOUND PRESSURE LEVEL (LPEAK)

| SITE | DAY | ENERGY MEAN LEVEL | STANDARD ERROR | NUMBER OF SHOTS |
|------|-----|-------------------|----------------|-----------------|
| 1 | 1 | 103.5 | 0.9 | 10 |
| | 2 | 102.0 | 1.1 | 10 |
| | 3 | 100.5 | 0.6 | 10 |
| | 4 | 95.8 | 1.0 | 9 |
| | 5 | 107.1 | 0.5 | 10 |
| | 6 | 103.3 | 1.7 | 10 |
| | 7 | 86.8 | 1.3 | 10 |
| 2 | 1 | 79.4 | 1.2 | 8 |
| | 2 | 71.4 | 0.4 | 10 |
| | 3 | 87.8 | 0.9 | 8 |
| | 4 | 72.7 | 0.9 | 9 |
| | 5 | 70.3 | 0.5 | 9 |
| | 6 | - | - | 0 |
| | 7 | 75.7 | 0.0 | 2 |
| 3 | 1 | 78.1 | 1.4 | 10 |
| | 2 | 84.7 | 0.5 | 10 |
| | 3 | 90.1 | 0.8 | 9 |
| | 4 | 73.9 | 0.6 | 8 |
| | 5 | 80.7 | 0.5 | 10 |
| | 6 | 71.5 | 0.0 | 2 |
| | 7 | 81.3 | 1.2 | 9 |
| 4 | 1 | 94.5 | 0.8 | 10 |
| | 2 | 87.0 | 1.3 | 6 |
| | 3 | 96.7 | 1.1 | 10 |
| | 4 | 91.0 | 1.7 | 10 |
| | 5 | 88.0 | 1.0 | 9 |
| | 6 | 87.5 | 1.0 | 10 |
| | 7 | 90.1 | 1.0 | 10 |
| 5 | 1 | 70.9 | 0.0 | 1 |
| | 2 | 77.0 | 1.2 | 8 |
| | 3 | 80.8 | 1.0 | 8 |
| | 4 | - | - | 0 |
| | 5 | 78.1 | 0.4 | 7 |
| | 6 | - | - | 0 |
| | 7 | 79.1 | 2.3 | 3 |

LPEAK (Continued)

| SITE | DAY | ENERGY MEAN LEVEL | STANDARD ERROR | NUMBER OF SHOTS |
|------|-----|----------------------|-------------------|--------------------|
| 6 | 1 | 81.0 | 0.6 | 10 |
| | 2 | 86.3 | 1.1 | 10 |
| | 3 | 95.1 | 2.0 | 8 |
| | 4 | - | - | 0 |
| | 5 | 83.6 | 0.8 | 10 |
| | 6 | - | - | 0 |
| | 7 | 85.4 | 2.3 | 3 |
| 7 | 1 | 81.3 | 0.9 | 10 |
| | 2 | 85.8 | 0.6 | 8 |
| | 3 | 85.7 | 1.4 | 6 |
| | 4 | - | - | 0 |
| | 5 | 79.0 | 1.0 | 8 |
| | 6 | 72.7 | 1.1 | 7 |
| | 7 | 84.6 | 2.3 | 8 |
| 8 | 1 | - | - | 0 |
| | 2 | 73.6 | 1.1 | 10 |
| | 3 | - | - | 0 |
| | 4 | - | - | 0 |
| | 5 | - | - | 0 |
| | 6 | - | - | 0 |
| | 7 | - | - | 0 |
| 9 | 1 | 88.5 | 0.8 | 10 |
| | 2 | 78.0 | 0.8 | 10 |
| | 3 | 84.8 | 1.1 | 7 |
| | 4 | 60.6 | - | 2 |
| | 5 | 90.7 | 1.3 | 9 |
| | 6 | 81.8 | 1.0 | 10 |
| | 7 | 82.8 | 1.2 | 7 |
| 10 | 1 | 97.4 | 0.6 | 10 |
| | 2 | 84.5 | 1.4 | 10 |
| | 3 | 78.3 | 1.6 | 4 |
| | 4 | 75.4 | 1.8 | 8 |
| | 5 | 89.2 | 1.0 | 10 |
| | 6 | 89.7 | 1.2 | 10 |
| | 7 | 82.6 | 0.8 | 6 |

A-WEIGHTED PEAK SOUND PRESSURE LEVEL (APEAK)

| SITE | DAY | ENERGY MEAN LEVEL | STANDARD ERROR | NUMBER OF SHOTS |
|------|-----|----------------------|-------------------|--------------------|
| 1 | 1 | 104.9 | 1.1 | 10 |
| | 2 | 103.1 | 1.2 | 10 |
| | 3 | 101.4 | 0.6 | 10 |
| | 4 | 92.9 | 0.5 | 9 |
| | 5 | 105.4 | 0.6 | 10 |
| | 6 | 103.0 | 1.6 | 10 |
| | 7 | 82.8 | 1.2 | 10 |
| 2 | 1 | 74.1 | 0.9 | 8 |
| | 2 | 68.1 | 0.7 | 10 |
| | 3 | 86.9 | 1.0 | 8 |
| | 4 | 64.8 | 0.6 | 8 |
| | 5 | 67.5 | 0.6 | 9 |
| | 6 | - | - | 0 |
| | 7 | 69.8 | 0.0 | 2 |
| 3 | 1 | 75.9 | 1.3 | 10 |
| | 2 | 82.8 | 1.2 | 10 |
| | 3 | 86.2 | 1.0 | 10 |
| | 4 | 68.6 | 0.6 | 8 |
| | 5 | 77.2 | 1.2 | 10 |
| | 6 | 65.7 | 2.0 | 6 |
| | 7 | 77.5 | 1.1 | 9 |
| 4 | 1 | 94.3 | 0.8 | 10 |
| | 2 | 87.1 | 1.3 | 6 |
| | 3 | 95.2 | 0.8 | 10 |
| | 4 | 87.8 | 2.1 | 10 |
| | 5 | 84.3 | 1.5 | 9 |
| | 6 | 82.4 | 1.6 | 10 |
| | 7 | 85.7 | 1.0 | 10 |
| 5 | 1 | 60.6 | 0.5 | 10 |
| | 2 | 72.0 | 1.2 | 8 |
| | 3 | 77.7 | 1.6 | 8 |
| | 4 | - | - | 0 |
| | 5 | 73.8 | 0.2 | 7 |
| | 6 | - | - | 0 |
| | 7 | 72.4 | 1.9 | 8 |

APEAK (Continued)

| SITE | DAY | ENERGY MEAN LEVEL | STANDARD ERROR | NUMBER OF SHOTS |
|------|-----|----------------------|-------------------|--------------------|
| 6 | 1 | 73.9 | 0.7 | 10 |
| | 2 | 82.6 | 1.6 | 10 |
| | 3 | 94.4 | 2.3 | 8 |
| | 4 | - | - | 0 |
| | 5 | 78.7 | 0.7 | 10 |
| | 6 | 60.1 | 0.4 | 10 |
| | 7 | 77.2 | 1.9 | 9 |
| 7 | 1 | 79.4 | 1.3 | 10 |
| | 2 | 81.1 | 0.6 | 8 |
| | 3 | 82.3 | 1.3 | 7 |
| | 4 | - | - | 0 |
| | 5 | 75.7 | 1.5 | 8 |
| | 6 | 71.6 | 1.4 | 8 |
| | 7 | 80.2 | 2.1 | 9 |
| 8 | 1 | - | - | 0 |
| | 2 | 69.0 | 1.0 | 10 |
| | 3 | - | - | 0 |
| | 4 | - | - | 0 |
| | 5 | - | - | 0 |
| | 6 | - | - | 0 |
| | 7 | - | - | 0 |
| 9 | 1 | 83.3 | 0.8 | 10 |
| | 2 | 72.3 | 1.2 | 10 |
| | 3 | 80.3 | 1.0 | 7 |
| | 4 | 52.0 | 0.0 | 2 |
| | 5 | 87.4 | 1.5 | 9 |
| | 6 | 79.8 | 1.4 | 10 |
| | 7 | 79.0 | 1.3 | 7 |
| 10 | 1 | 95.5 | 0.8 | 10 |
| | 2 | 84.2 | 1.5 | 10 |
| | 3 | 70.8 | 0.7 | 9 |
| | 4 | 68.4 | 1.2 | 8 |
| | 5 | 83.2 | 1.3 | 10 |
| | 6 | 87.7 | 1.5 | 10 |
| | 7 | 80.9 | 1.0 | 6 |

APPENDIX III. FURTHER DATA ON GR

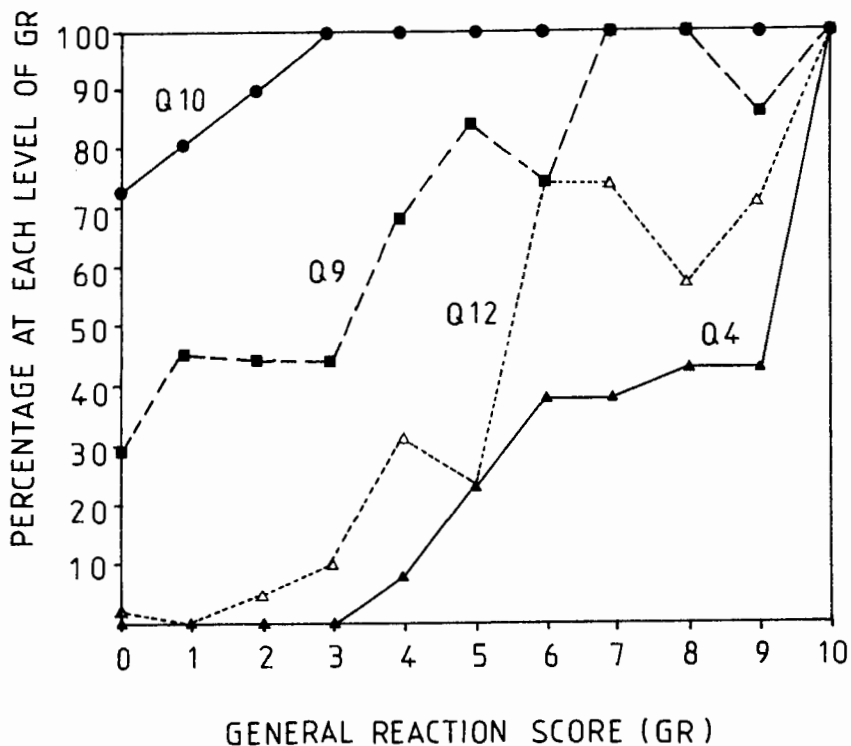


FIGURE III.1 Percentage of respondents at each GR level who report disliking the range (Q.4), mention shooting as noise heard (Q.9), report ever hearing noise of shooting (Q.10), select shooting as noise most worth eliminating (Q.12).

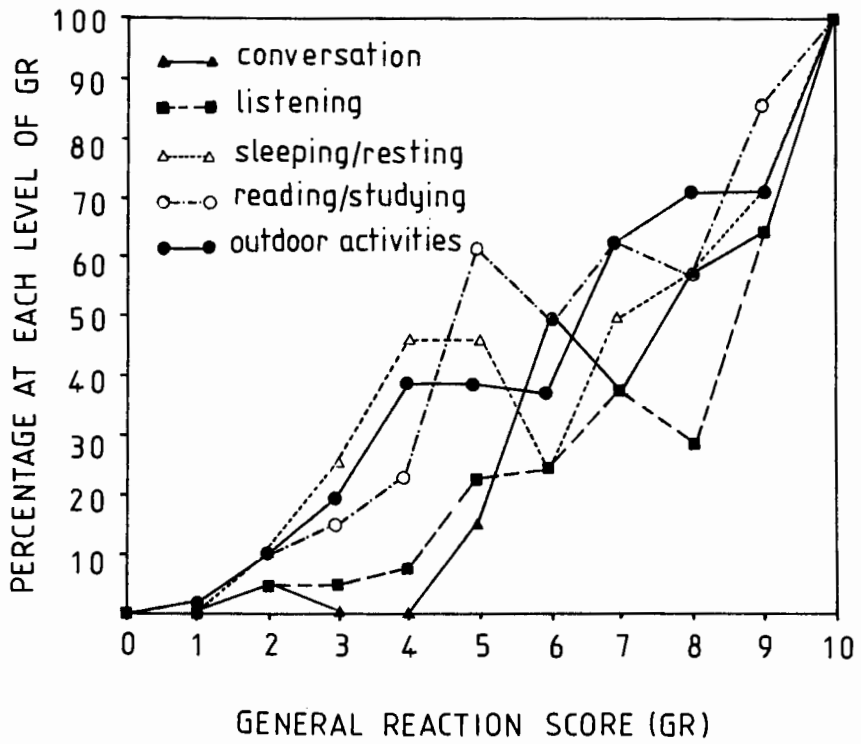


FIGURE III.2 Percentage of respondents at each GR level who report the various activity disturbances in Q.13.

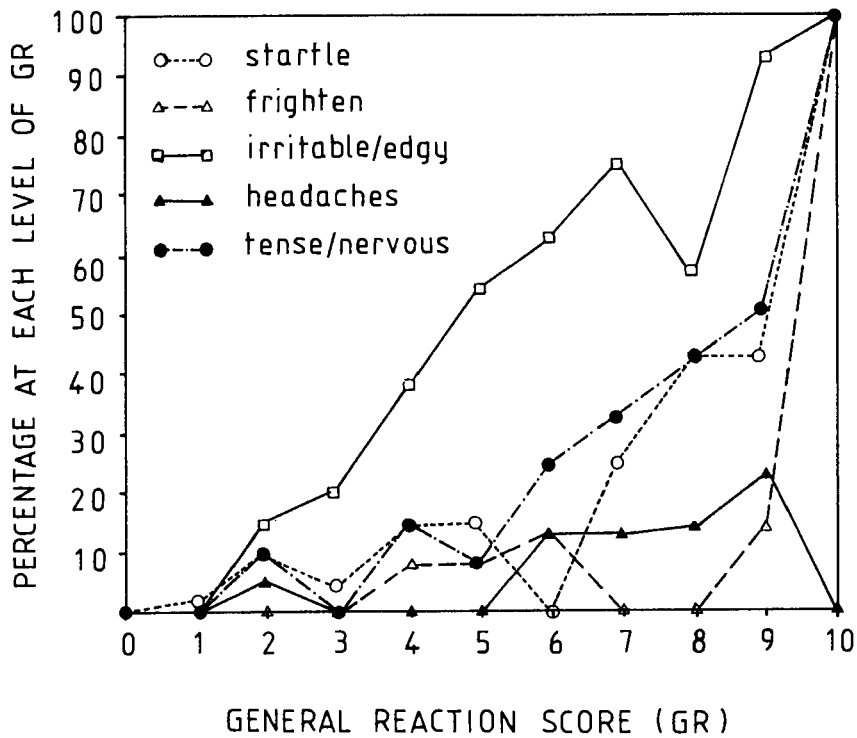


FIGURE III.3 Percentage of respondents at each GR level who report being affected in various ways (Q.15).

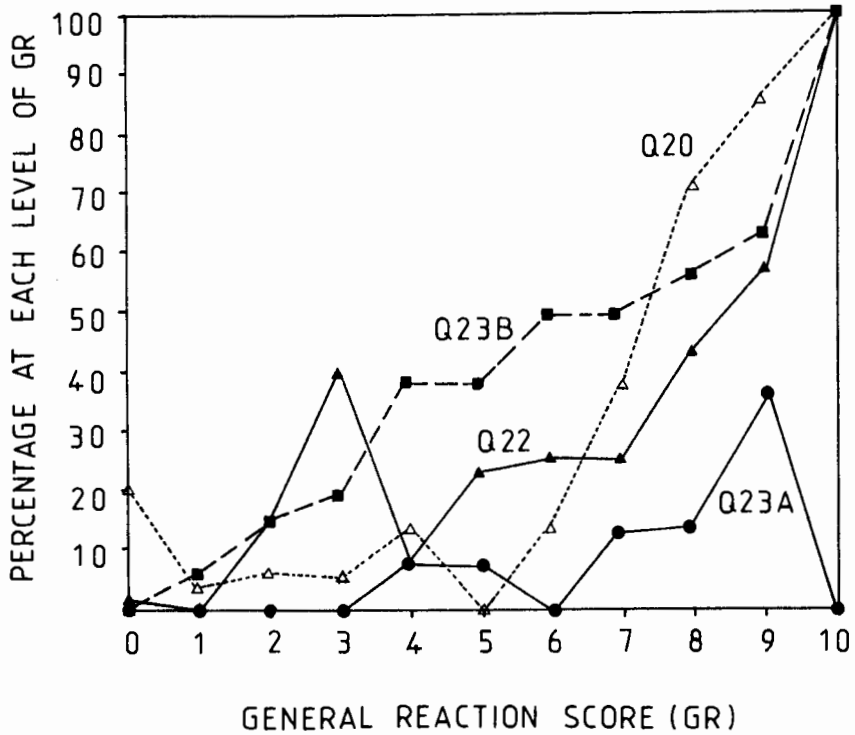


FIGURE III.4 Percentage of respondents at each GR level who said they have not adapted to the noise (Q.20), that the noise has increased (Q.22), that they have considered moving (Q.23A), or that they would consider moving if the noise increased (Q.23B).

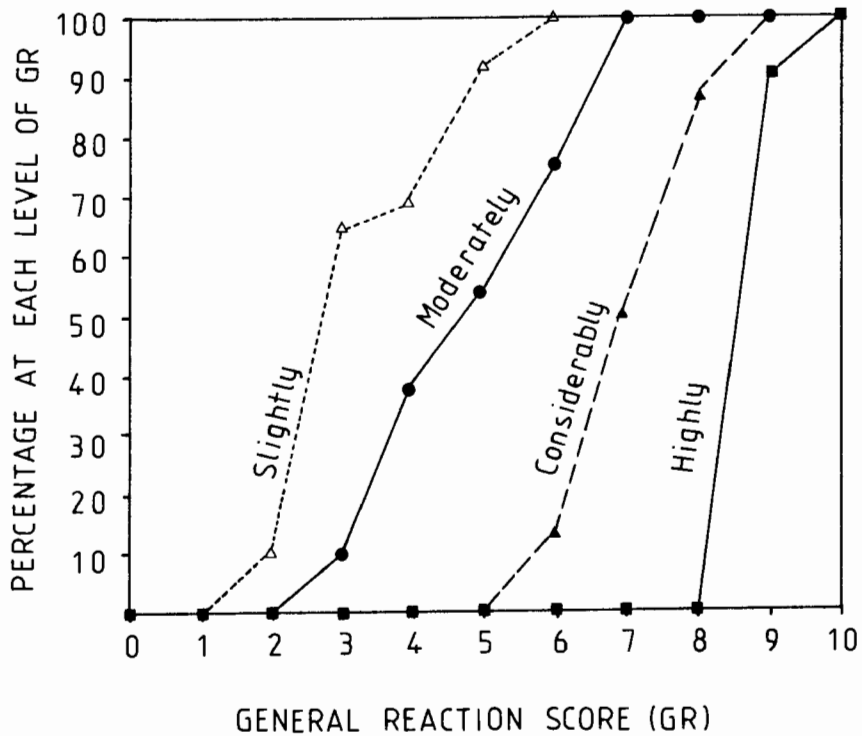


FIGURE III.5 Percentage of respondents at each GR level who selected the various annoyance categories in Q.24.

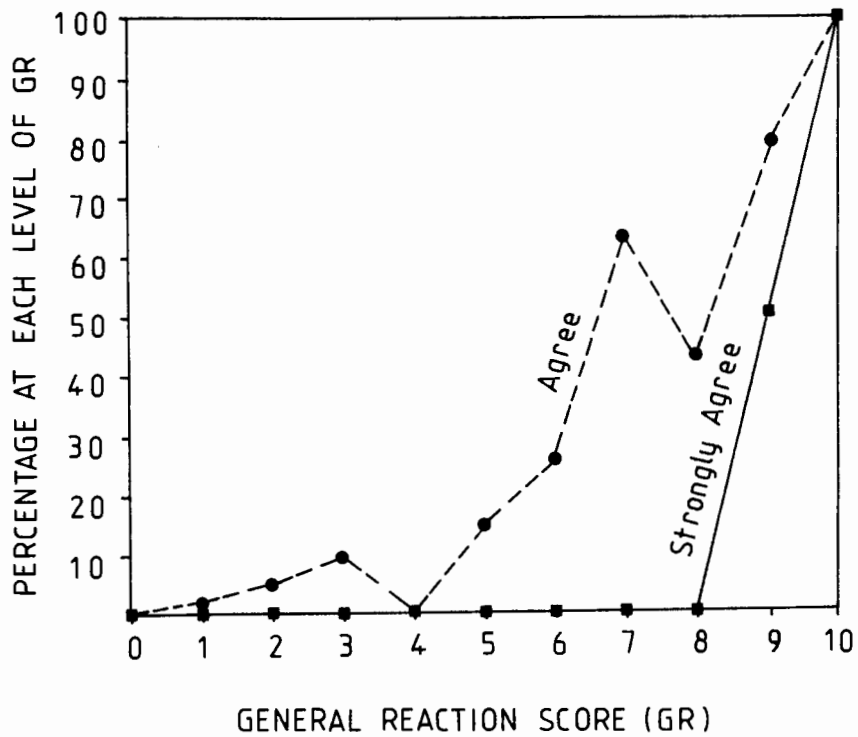


FIGURE III.6 Percentage of respondents at each GR level who agreed or strongly agreed with the statement: "THE RIFLE RANGE COMPLETELY RUINS THIS NEIGHBOURHOOD" (Q.25d).

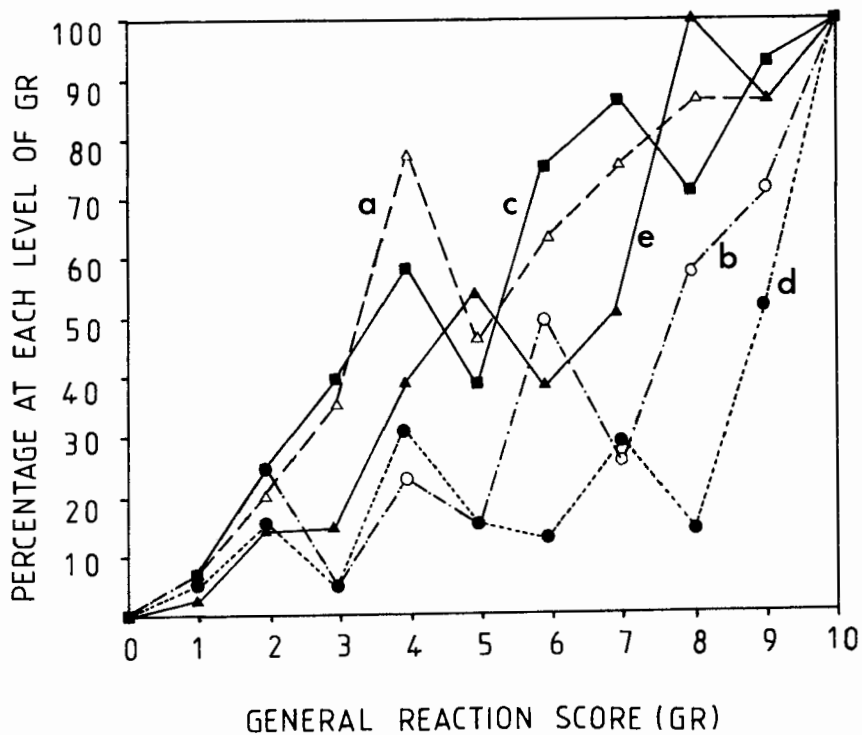


FIGURE III.7 Percentage of respondents at each GR level who said they were bothered by various aspects of shooting noise (Q.16A): a) high pitched crack, b) variation in loudness, c) rapid firing, d) time variations, e) echo.

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N.A.L. REPORT No. 67, FEBRUARY 1977

**A METHOD FOR EVALUATING COMMUNITY RESPONSE TO NOISE FROM
MILITARY FIRING RANGES**

by

N. L. Carter

SYDNEY, AUSTRALIA

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SUMMARY

A modified Composite Noise Rating (CNR) method is described for evaluating community reaction to noise from military firing ranges. The method should also be applicable to noise from quarry blasting and other detonations.

INTRODUCTION

In November 1972 the National Acoustic Laboratories were asked to evaluate the annoyance to surrounding communities caused by weapon noise from the Mount Stuart military firing ranges, near Townsville, North Queensland. Noise measurements were made in the form of photographs of acoustic waveforms fed to the screen of a cathode ray oscilloscope, frequency modulated tape recordings and sound level meter (SLM) readings. The SLM measurements were made in the dBA (hold) mode. Maps of the area were obtained and interviews carried out with some of the nearby residents (Carter, et al., 1973).

It became apparent that no method was available for evaluating these measurements and an attempt was made to devise one. In doing so it was considered important to keep the method simple, to require relatively elementary instrumentation and to relate the method where possible to previous work in the field of community reaction to noise. It had also to be applicable to other types of impulse noise and be capable of further validation in new instances of community reaction to impulse noise.

This report describes the method used, a simple modification of one version of the Composite Noise Rating (CNR).

THE COMPOSITE NOISE RATING

The Composite Noise Rating (CNR) is a single number calculated from (a) measurement and analysis of single noise events, e.g., aircraft flyovers from a specific aircraft type; and (b) the number of such events (flyovers) occurring during one typical day. The CNR value is then entered in a graph drawn from a collation of 'case history' data on the reactions of communities to noise. The probable reaction of communities to the introduction of a new noise into their environment, or the reaction of future planned communities to noise can then be estimated (Kryter, 1970).

A general description of the CNR method is to be found in Kryter (1970), pages 436, 437, 439. Its main features are - (a) CNRs from different types of aircraft can be added logarithmically to give a CNR for e.g., the total operations of an airport; (b) a penalty 'weighting' (of 10dB units) is given to each aircraft noise event occurring between 10pm and 7am; and (c) it can be used with any single number method of describing the noise from individual flyovers expressed in logarithmic (dB) units.

These properties of the CNR method are evident from the following procedure for calculating CNR using the EPNdB (Effective Perceived Noise Decibels) as the method of expressing the noisiness of single aircraft flyovers (after Kryter (1970)).

$$\text{CNR} = \left\{ \left[\left[\text{EPNL}_1 + 10 \log_{10} O_1 \right] \mid + \mid \left[\text{EPNL}_2 + 10 \log_{10} O_2 \right] \mid + \mid \dots \mid + \mid \left[\text{EPNL}_n + 10 \log_{10} O_n \right] \right] - 12 \right\} \mid + \mid \left\{ \left[\text{EPNL}_{1p} + 10 \log_{10} O_{1p} \right] \mid + \mid \left[\text{EPNL}_{2p} + 10 \log_{10} O_{2p} \right] \mid + \mid \dots \mid + \mid \left[\text{EPNL}_{np} + 10 \log_{10} O_{np} \right] \right\} - 2 \dots (1)$$

where $O_1 \dots O_n$ are numbers of occurrences of sounds of EPNLs 1 through n during the hours of 7am to 10pm and $O_{1p} \dots O_{np}$ are occurrences of sounds of EPNLs 1 through np during the hours of 10pm to 7am. $\mid + \mid$ means addition

on $10 \log_{10}$ antilog basis (see below).

Put in words, the successive steps in the calculation of CNR are as follows:

1. Add arithmetically to the EPNL of each given value (i.e., each aircraft type flyover), $10 \log_{10}$ of the number of times that value (flyover type) occurs per day (i.e., between 7am and 10pm).
2. Sum on a $10 \log_{10}$ antilog basis* the results of step 1 for all flyover types (EPNL values) occurring between 7am and 10pm and subtract 12 from this sum.
3. Sum on a $10 \log_{10}$ antilog basis the results of step 1 carried out for flyovers occurring between 10pm and 7am and subtract 2 from the sum.
4. Sum on a $10 \log_{10}$ antilog basis the results of steps 2 and 3. The result is a CNR in units of EPNdB. As stated previously, other units of individual noise measurement or assessment can be used.

Having calculated the CNR in the above manner, an estimate of probable community reaction can be made from Figures 1 and 2, again after Kryter (1970). Figure 1 summarises some data relating CNR to community reaction to noise. Figure 2 gives a smoothed curve which may be used for predictive purposes or perhaps evaluate existing community activity in response to noise.

MODIFICATION OF CNR FOR WEAPON NOISE

It is customary to distinguish between gunfire noise and e.g., that due to subsonic jet flyovers by the term 'impulse' as opposed to 'steady state' noise. There are no rigorous physical definitions of these terms but to the ear there is an obvious distinction in the time domain, associated in the case of impulse noise with a very fast rate of onset, high peak to average (or rms) sound pressure level, and very brief overall duration of a few milliseconds (a little longer when the noise is reflected from objects in the immediate vicinity of the listener, e.g., parts of a weapon, walls, etc.). Sonic booms from supersonic aircraft, the sounds of drop forges, quarry blasting, fireworks are other examples of impulse noise.

A previous and we believe influential extension of the CNR to impulse type noise was proposed by Kryter (1969). In that paper the author summarised the results of experiments in which people were asked to compare the noisiness of aircraft flyovers (measured in peak PNdB) to actual and simulated sonic booms (measured in terms of peak overpressure - (dB linear, peak)). From these results he suggested the use of some simple measurements

* By 'sum on a $10 \log_{10}$ antilog basis' is meant: divide the respective values by 10, take their antilogarithms and add them, then multiply the logarithm (to the base 10) of this sum by 10.

of sonic boom equivalent in their 'subjective' noisiness to measurements of subsonic aircraft flyovers. The result was a reasonable attempt to predict the future reaction of large numbers of Americans to daily flyovers of supersonic airliners, a contentious issue at that time. (Kryter found that some millions of people could be expected to be disturbed by this noise and even if he was in error by an order of magnitude in his estimates, it was obvious that the social repercussions within the U.S. would have been considerable).

Kryter's starting point in extending the CNR to sonic booms was human judgement data (Kryter, 1969, p.364), indicating the equivalent noisiness of sonic booms (measured in peak SPL) and subsonic aircraft noise (measured in peak PNdB). No exact equivalent can be expected but on average a number of residents of Edwards Air Force Base, California, when asked to compare sonic booms from actual 'staged' B-58 flyovers with subsonic jet flyovers, rated a sonic boom at 1.7 psf equal in 'noisiness' (equally intrusive or disturbing of normal domestic activities) to subsonic jet noise measured at 109 PNdB. These residents were of course very used to both subsonic jet flyover noise and sonic booms and were presumably dependents of service personnel or connected occupationally with the U.S. Air Force. Kryter cites other data indicating that 'unadapted' civilians used to subsonic aircraft noise but not sonic booms rate a sonic boom from a B-58 aircraft at 1.7 psf equal in noisiness to subsonic jet noise measured at 119 PNdB.

In the simplest form in which a metric of the PNdB type is used, the formula for CNR is as follows:

$$\text{CNR} = \text{PNdB} + 10 \log N - 12 \dots\dots\dots(2)$$

where CNR = Composite Noise Rating,

PNdB = the calculated or measured peak PNdB (PNdB calculated from the highest octave band values reached during the overflight. See the note below on the meanings of different PNdB Units).

N = Number of noise events per day, all events taking place between 7am and 10pm (The constant 2 applies to CNRs calculated on events outside this time).

Thus Kryter estimated that a sonic boom of about 1.9 psf will be subjectively equal, after adaptation resulting from several years of exposure to sonic booms, to subsonic aircraft noise of 110 PNdB (all measurements made outdoors) implying, for one sonic boom a day, a CNR of 98 (CNR = 110 - 10 log 1 - 12). Since a CNR from 100 to 110 represents a level at which vigorous legal and other community reaction take place, the situation (one sonic boom per day at 1.9 psf) was regarded as marginal even for 'adapted' communities.

A further extension to this line of reasoning to cover community reaction to impulse noise generated on the ground appealed to us for the following reasons. First, it is simple and requires only one type of measurement of weapon noise, i.e., dB (linear, peak). Second, the reasoning behind it is publicly identifiable - there are no mysterious steps which would prevent others from arriving at the same CNR as ourselves, given similar data. Some assumptions are made but they are defensible and specifiable, so that particular parts of the method might be modified or even rejected on the basis of future data without rejecting the whole approach and having to start again. Third, a distinction is made between daytime (7am to 10pm) and night time

operations (10pm to 7am), important because firing ranges are sometimes used after 10pm. Fourth, CNRs from different noise sources and source locations (and day and night) can be summed. This is an advantage if the combined effects of noise from several firing points have to be assessed, or the noise from both the firing weapon and the impact of its projectile are audible at the same noise sensitive location. In principle also, CNRs from vehicles, aircraft and fixed installations could be calculated and added to the CNR from firing ranges to give a 'total CNR' to estimate the overall effect of noise from a defence facility on nearby communities.

The first step in developing a CNR procedure appropriate to military firing ranges was to consider the linear peak levels and PNdB levels, which we would regard as equivalently 'noisy'. From the paper by Kryter already referred to and other results on human judgement data (von Gierke and Nixon, 1972) we set up the following equivalents, which also convert the psf (pounds per square foot overpressure) values into dB (linear, peak) values.

- 1.7 psf = 132dB (linear, peak) = 119 PNdB for communities
'non adapted' to impulse noise,
- 1.7 psf = 132dB (linear, peak) = 113 PNdB for communities
'moderately adapted' to impulse noise, and
- 1.9 psf = 134 dB (linear, peak) = 110 PNdB for communities
'adapted' to impulse noise.

The numerical differences between the dB (linear, peak) values given above and PNdB values suggested the following substitutions for PNdB values in the CNR equation.

- (Y - 13) for 'non adapted' communities
- (Y - 19) for 'moderately adapted' communities
- (Y - 24) for 'adapted' communities

Where Y is the dB (linear, peak) value of the impulse noise. Thus, to this point, the equation for CNR becomes

$$\text{CNR} = (Y - 13) + 10 \log N - 12 \dots\dots\dots(3)$$

for 'non adapted' communities exposed (daily, see below) to impulse noise between the hours of 7am to 10pm.

There are several obvious objections to this procedure. However, we think these can be met to some extent without beginning on refinements which must be rather futile at this stage of our experience with the method, in view of the serious limitations on accurate prediction of community response (due to lack of knowledge of e.g., topographical, meteorological (Cook et al, 1962) and sociological variables) evident in the broad relationships between CNR and community response derived by Kryter and adapted in Figures 1 and 2.

The first of these objections is that noise from a weapon fired outdoors has only one peak, whereas the sonic boom has two quite distinguishable peaks (one positive, one negative) separated by about 100 milliseconds. Data on the effect of repeating an impulse on overall loudness suggests that this would raise the total loudness by the equivalent of 3dB (Carter, 1965). However, it is also true that the rise time (the time elapsing between onset of the impulse and its peak level) of weapon noise is typically somewhat less than that of the sonic boom by several milliseconds. In this range of values of rise time, loudness (and noisiness) is estimated to increase by the equivalent of one dB for each millisecond reduction in rise time (Zepler and Harel, 1965; Carter, 1966, 1972; May, 1971). These two effects should therefore cancel out, but even so the predominating effect of peak level of the impulse over other parameters on loudness means that minor discrepancies due to differences between weapon noise and sonic booms in rise time and overall duration will be relatively unimportant.

The other objections which may be raised to our use of CNR in the form given above is that CNR assumes 'daily exposures for a period of at least several months' (Kryter 1970, p.436). The several months part of this statement is taken care of in the 'adaptation' component, but there is no data of which we are aware on the effect of reducing the number of days per week or month that the noise is encountered. In the absence of anything better, we made the assumption that this, like number of exposures per day, would add logarithmically according to the proportion of working days per month or year the range was used, i.e., if the series of noises occurred on only one-half of the working days the value $10 \log 0.5$ was added to the right hand side of equation (3). If this proportion is called T, our CNR would be:

$$\text{CNR} = (Y - 13) + 10 \log N + 10 \log T - 12 \dots\dots(4)$$

for 'non adapted' communities.

Military ranges also frequently require that volleys of single shots or simultaneous bursts from up to eight machine guns are fired. To account for this variation and in line with published data on the effect of repetition rate on the loudness of impulses we also added one other term to the CNR equation. This is $10 \log R$, where R is the number of rounds fired in each noise 'event' e.g., 8 in the case of single shots from eight SLRs, or 64 in the case of 8 M60 machine guns each firing an eight round burst.

The final equation we suggest for CNR is

$$\text{CNR} = (Y - 13) + 10 \log N + 10 \log T + 10 \log R - 12 \dots\dots(5)$$

for 'non adapted' communities exposed to noise from a single firing range, the firing taking place within the hours 7am to 10pm.

Given the equation above, the CNR for a location exposed to N events each of YdB (linear, peak), etc., can be calculated. The extent to which an excessive CNR value can be lowered by reducing N, T, etc., can be studied. However for planning purposes it may be desired to superimpose criterion CNR contours on a map of the area around the firing ranges. Locations outside these contours could then be regarded as suitable for residential use, those inside the contours as unsuitable for such use.

To do this the CNR value would be set at say, 90 and equation (5) solved for Y. The distance from the firing point at which the noise equals YdB (linear, peak) would also define the radius of a circle centred at the firing point, corresponding to the equal CNR 90 contour.

This use of CNR requires that accurate measurements be made of the propagation of the noise outdoors, preferably in the actual locale of the firing range being studied and under known, typical meteorological conditions. For one set of firing ranges we arrived at the following equations.

$$Y = 111.75 - 44.2 \log d \dots\dots\dots(6)$$

for grenade ranges,

$$Y = 88.08 - 26.14 \log d \dots\dots\dots(7)$$

for ranges using machine guns, and

$$Y = 82.34 - 33.61 \log d \dots\dots\dots(8)$$

for ranges where rifles are fired singly or in small groups. d is the radius in thousands of yards of a circular CNR contour corresponding to the assumed CNR value.

NOTE 1:

The Perceived Noise Decibels (PNdB) metric exists in several slightly different forms (see Kryter, 1970, chapter 8). In all of them the (aircraft) noise is analysed into octave (or half or third octave) bands, the level in each band converted to psychophysical units called Noys and these values summed according to a formula. The present paper has invoked three forms of the PNdB. These are:

(1) Peak PNdB, calculated from the highest value of the respective octave band sound pressure levels occurring during the overflight;

(2) EPNdB (Effective Perceived Noise Decibels), which integrates a number of 'momentary' PNdBs, separated by 0.5 second, in a flyover and adds an onset correction proportional to the duration of sound preceding the greatest of these 'momentary' PNdBs (the Maximum PNdB);

(3) Maximum PNdB (PNdB Max) - the highest PNdB level reached during an overflight.

Peak PNdB was used to derive the equivalent noisiness of impulse noises and subsonic aircraft overflights, whereas EPNdB was the basis for the computation of the CNRs in Figure 1 (Kryter, 1970).

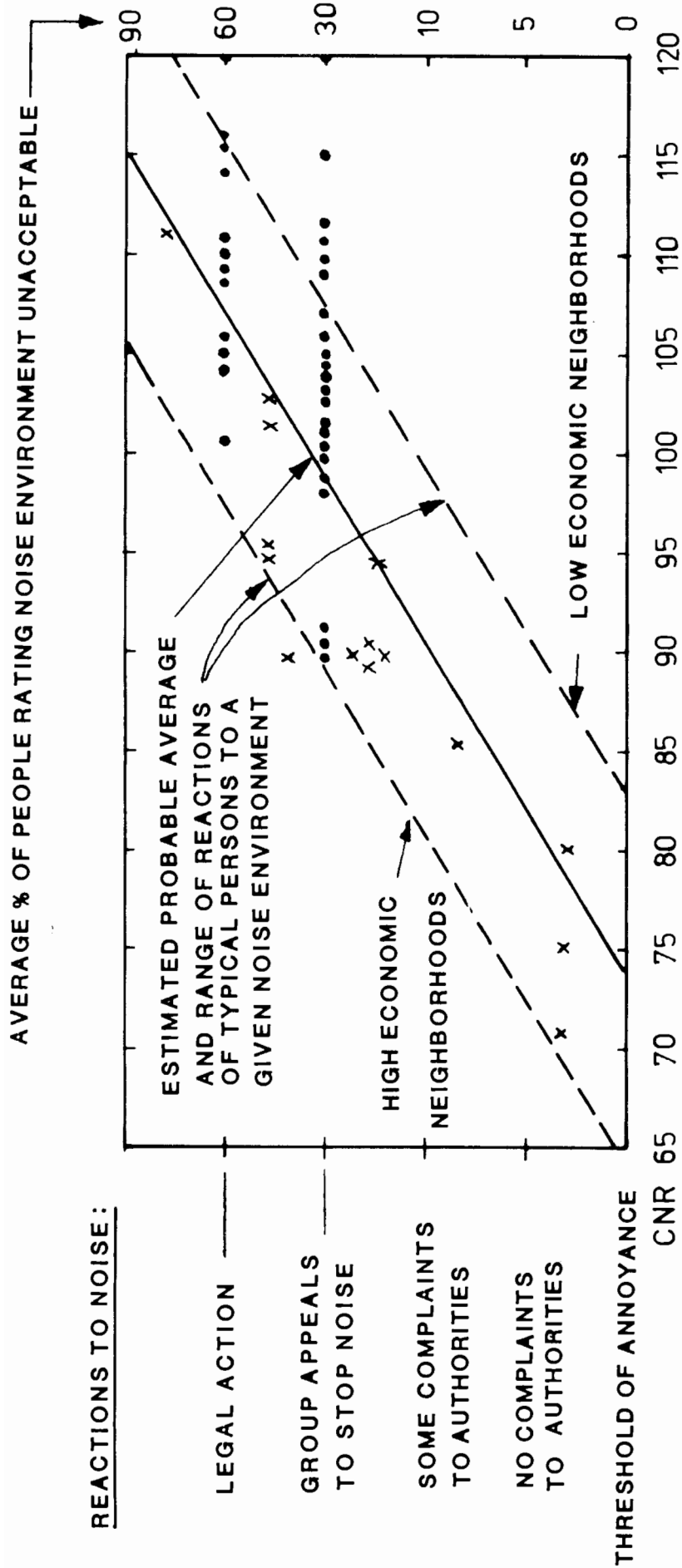
In the absence of EPNdB measures for e.g., the Edwards Air Base flyovers, it cannot be stated with confidence the amount of error in the CNRs that this discrepancy might lead to. However since EPNdB integrates a number of PNDBs, it might not be very different from the Maximum PNDB. This in turn is generally only 1-3 PNDB less than the Peak PNDB (Kryter, 1970) so we are looking at an overestimate of about that amount in using the present modified CNR for impulse noise, a small error in relation to the effect of e.g., meteorological and socioeconomic conditions in real life situations (Cook et al., 1972).

NOTE 2:

The predictive value of our modified CNR method remains to be proved but several recent applications of it to military and civilian firing ranges and a military demolition range have shown that it gives results in accord with commonsense and the views of experienced acousticians. It is an objective method and provided it is applied conservatively in land use planning, should avoid most of the problems encountered heretofore in respect of annoyance caused by impulse noise. The method refers only to air blast but previous work (Cook et al 1962; Kringel 1960) indicates that this is the predominating source of community annoyance, structural damage and annoyance due to ground shock appearing only as a secondary and very rare effect from much greater explosive charges.

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X AND • REPRESENT ACTUAL CASE HISTORY FINDINGS FOR COMMUNITIES

FIGURE 1. Relation between CNR and (a) community reactions to noise (left hand ordinate); (b) the percentage of people finding the noise unacceptable (right hand ordinate). The range of CNR for given community reactions is less than shown if the high and low socioeconomic groups are plotted separately (after Kryter, 1970).

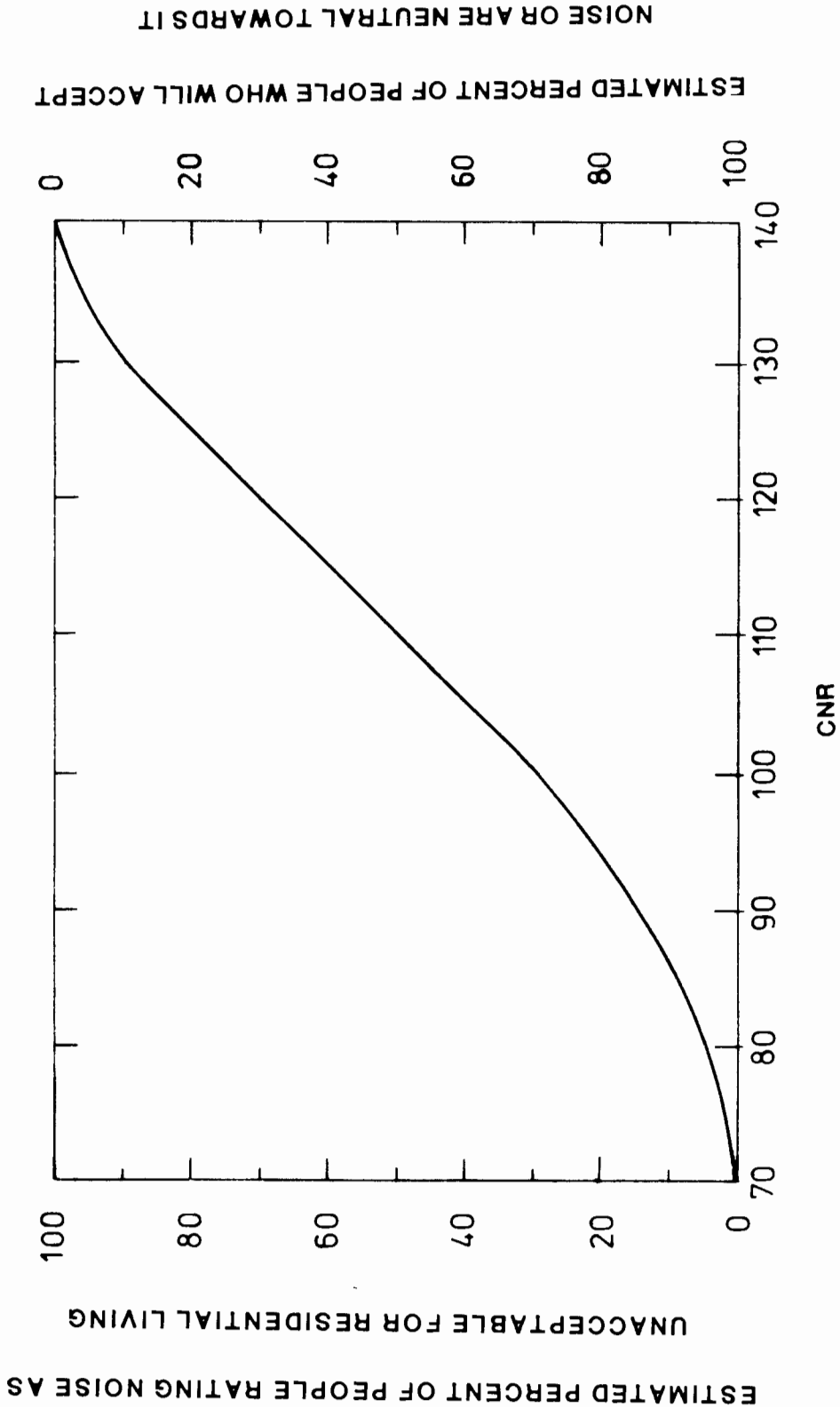


FIGURE 2. Estimates of attitudes to be expected from non-fear provoking noise in residential areas, by CNR (after Kryter, 1970).

CLAY TARGET SHOOTING

GUIDANCE ON THE CONTROL OF NOISE



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PREFACE

This guidance has been produced by the Chartered Institute of Environmental Health (CIEH) having commissioned the services of the Building Research Establishment Ltd (BRE) to provide editing support and the methodology of measurement. It describes how noise from clay target shooting can occur and provides advice on methods to minimise or prevent annoyance and intrusion. The guidance includes details of a recommended method for the measurement and subsequent assessment of clay target shooting noise produced by BRE and derived from research sponsored by the Department of the Environment (DOE), now the Department for Environment, Food and Rural Affairs (DEFRA).

FOREWORD

The management of the environmental impact of leisure activities is of growing importance, especially in rural areas. Positive actions are required if sustainable development of the countryside is to be achieved. During 1993, in response to growing complaints about noise from clay target shooting, the DOE reviewed the planning legislation applicable to such activities. Subsequently, it decided not to recommend changes but instead encouraged interested parties to develop a voluntary code of practice to control noise. More recently the Office of the Deputy Prime Minister (formerly the DTLR) having undertaken a “consultation on possible changes to the Use Classes Order and temporary uses provisions”, has announced no change in those provisions citing existing legislative provision being adequate to deal with problems that arise.

The environmental impact of leisure activities was also examined by the Environment Committee of the House of Commons during the 1994/95 parliamentary session. The Committee felt that the ability of people to enjoy all forms of leisure appropriate to the countryside should not be constrained unless there were pressing reasons for restricting particular activities. It commented that the planning system had an important role to play in minimising any adverse impacts, but acknowledged that the system was not in itself able to counter all pressures which might arise. The Committee felt that the planning system should provide a more positive approach to dealing with difficult activities by encouraging good management practice.

It was against this background that a consultation draft of this document was launched in November 1997. Comments on the consultation draft, and the findings of the BRE research, have been taken into account during the prolonged preparation of this revised guidance note; it now updates and supercedes that consultation draft.

The CIEH, representing the regulators, with technical support from BRE, has produced this guidance in order to help enforcement officers and other interested parties resolve the conflicts that often arise between shoot operators and their neighbours. It is intended that it should provide a basis for discussion and negotiation between all parties on measures that can be taken to control noise from clay target shooting.

The CIEH advocates consultation and discussion with all parties in relation to the control of noise and we believe that this document provides a strong basis for good local decisions to be reached.

Graham Jukes
Chief Executive
Chartered Institute of Environmental Health

January 2003

1. INTRODUCTION

This guidance is intended to be used by those with a regulatory interest in controlling noise from clay target shooting activities principally local authorities. It may also be helpful to clay target shoot operators, owners, managers, those wishing to organise *ad hoc* events and to those with other interests in the sport whether in a professional or recreational capacity.

Two forms of shooting ground or site are typically encountered, namely:

- i) those operating regularly by virtue of an express planning permission or established use.
- ii) those operating less frequently under the provisions of the Town and Country Planning (General Permitted Development) Order 1995, which, subject to certain constraints, currently permits up to 28 days usage per annum of given land without the need for an application to the Planning Authority. This may include locations used for “one-off” isolated events, such as may be organised for charity purposes.

The general principles expressed in this guidance will be of relevance at all forms of clay target shooting sites. Whilst following this guidance cannot confer immunity from legal proceedings, compliance may be helpful in demonstrating that the best practicable means has been applied in order to control noise from the activity. The guidance should help in striking an appropriate balance between the rights of those who wish to pursue leisure and sporting interests and the rights of those who seek the peaceful enjoyment of neighbouring land.

This guidance is divided into seven sections with eight appendices. It is intended to be of assistance, for example, in assessing the ways in which the management and pattern of use of a clay target shooting site may be adapted to minimise or prevent intrusive noise. Alternatively, where a new shooting location is being considered, the guidance can be used to determine what practical noise control measures should be applied. Further, it includes a standardised methodology for the measurement of noise from clay target shooting and suggested criteria that will assist with the assessment of the impact of clay target shooting noise at dwellings.

1.1 *Limitation in scope*

The scope of this guidance is limited to clay target (pigeon) shoots. It should not be taken as having any application to other outdoor shooting events or other gun club activities.

Most of the guidance is provided in a general way. This is because local circumstances differ and consequently more or less restrictive controls may be appropriate in certain cases. In particular, where a shooting ground or site has been used for several years without giving rise to complaints, there may be no need for changes. Where specific criteria (e.g. distances, times or noise levels) are given these have been derived from experience and are not intended as precise rules to be routinely applied to every shooting ground or site.

The guidance does not deal with safety issues in detail nor is it intended that it should override any restrictions or requirements that may be imposed under any statutory provisions.

2. PLANNING AND NUISANCE LEGISLATION

In general terms, local authorities have powers and duties that control the use and development of land, or activities, which may be in conflict with other users or which may create a nuisance.

The Town and Country Planning Act 1990, the Town and Country Planning (General Permitted Development) Order 1995, and the Environmental Protection Act 1990 are applicable to clay target shooting and are referred to below.

The general provisions of the Health and Safety At Work etc. Act 1974 are also relevant in relation to the duties and obligations of site operators, owners and users in respect of ensuring the health, safety and welfare of the general public as well as employees and those entering upon shooting grounds.

2.1 *Planning control*

Planning control is primarily concerned with the type and location of new development and with changes of use or the intensification of use of land. The Town and County Planning Act 1990 defines “development” as being “the carrying out of building, engineering, mining or other operations in, on, over or under land or the making of any material change in the use of any building or other land.”

Locally prepared Development Plans provide the main guidance to local authorities in making planning decisions and as such they provide the principal means of reconciling conflicts between development and the protection of the local environment. Development Plan proposals must be subject to a suitable and sufficient environmental appraisal, defined in Planning Policy Guidance Note 12 (PPG12 - DETR) as “the process of identifying, quantifying, weighing-up and reporting on the environmental and other costs and benefits of the measures which are proposed.”. Advice on development which may have a noise impact is contained in Planning Policy Guidance Note 24 (PPG24 - DETR).

Currently, clay target shooting may occur on land without the need for express planning permission. The Town and Country Planning (General Permitted Development) Order 1995 allows the activities set out in the table below to take place at up to the specified number of days during any calendar year without formal consent:

| Activity | In SSSIs | Elsewhere |
|------------------------------------|-----------------|------------------|
| Markets | 14 days | 14 days |
| Motor sports | Nil | 14 days |
| <i>Clay target shooting</i> | <i>Nil</i> | <i>28 days</i> |
| War games | Nil | 28 days |
| All others (including helicopters) | 28 days | 28 days |

Permitted temporary use of land – the ‘28 day rule’

A local planning authority can make a direction under Article 4 of the Town and Country Planning (General Permitted Development) Order 1995 withdrawing permitted development rights and requiring a planning application, however Appendix D of Circular 9/95 advises that such rights should be withdrawn only in exceptional circumstances. The circular explains that such action will rarely be justified unless there is reliable evidence to suggest that development is likely to take place which could damage an interest of acknowledged importance and which should therefore be brought within full planning control in the public interest. Any application for planning permission made necessary because of a direction under Article 4 must be considered on its merits in the normal way.

Clay target shooting sites that require planning permission may have quantitative limits on noise emission applied in the form of attached conditions. Planning conditions may also include, for example, restrictions on days and times of use, and may prevent any alterations to the structure, layout and orientation of shooting stands, screens etc. on the site without the prior consent of the planning authority. The guidance in this document may assist with drafting suitable planning conditions.

Irrespective of whether a clay target shooting site has full planning consent or is operating under the '28 day rule' it is possible that any new and permanent works, such as the erection of stands or noise barriers, will require planning permission.

2.2 *Statutory nuisance*

The Environmental Protection Act 1990 is the principal Act under which noise control will be applied to a shoot. Part III of the Act provides the legal basis for the prevention of the occurrence or recurrence of a statutory noise nuisance by a local authority or by a private individual.

If, in the opinion of the authority, a statutory nuisance exists from the operation of the shoot, the Act requires that a statutory notice be served upon the person responsible. The notice may constrain the operation of the shoot so that a noise nuisance no longer exists. Failure to comply with the requirements of such a notice is a criminal offence and upon conviction individuals are liable to a maximum fine of £5,000. If the shoot is operated as a business, then a maximum fine of £20,000 can be levied though defence of using the 'best practicable means' may be available.

More detailed information on the Environmental Protection Act and the concept of nuisance is provided in Appendix 1 and Appendix 2.

3. CLAY TARGET SHOOTING

3.1 *Introduction to the sport*

Clay target shooting is the sport of shooting at flying targets, known as clay pigeons or clay targets, with a shotgun. The terminology commonly used by shooters often relates to times past, when live pigeon competitions were held. Although such competitions were made illegal in 1921, a target is still called a 'bird', a hit is referred to as a 'kill' and the machine which projects the targets is known as a 'trap'.

Clay target shooting is currently enjoyed by a wide cross-section of the community as a leisure pursuit. It is also a governed and regulated competitive sport. The sport has grown quickly in recent years, under encouragement by the government for rural communities and farmers to diversify. Noise from the sport can cause disturbance and annoyance to others, even at a considerable distance from where shoots take place.

3.2 *Types of shoot*

In addressing the management of noise from clay target shooting it is essential to have an understanding of the different ways in which the sport may be practised. Different configurations of the sport may create their own problems on a site or require specific remedies.

Clay target shooting has at least 20 different forms of regulated competition called disciplines. These disciplines can be roughly categorised in three main groups: Trap, Skeet and Sporting. Some of the more common clay target shooting disciplines are Down the Line (DTL), English Skeet and English Sporting.

Some of these clay target shooting groups and disciplines are described in more detail in Appendix 3.

3.3 *Basic site requirements*

As the sport grows in popularity, so the demand for sites and facilities increases. Due to the nature of the sport, clay target shooting sites tend to be located in fairly remote rural areas. The main issues to consider when deciding upon a suitable location are the safety of the public and the potential disturbance from noise.

There will be different requirements for facilities and infrastructure at permanent shoots, temporary sites and special events. However, whatever the nature of the shoot it is essential to consider the effect the activity may have on occupiers of adjacent land.

The minimum area required for a new clay target shooting site is between 2 and 4 hectares (about 5 to 10 acres) with a minimum safety zone of 300 metres in front of the shooting stands in the general direction in which shooting takes place. Within this safety zone there must not be any places to which the public has access such as public highways, footpaths and bridleways, etc. Shooting close to overhead electrical and telecommunication cables must also be avoided.

As a general rule, where there are no other constraints, site operators will prefer shooting to be oriented towards the North to avoid interference from the sun.

The Trap and Skeet disciplines require an area of level ground with clear and unobtrusive backgrounds of uniform nature. The Sporting disciplines are best suited to wooded and undulating terrain and attractive natural features are always desirable, especially water, trees, hills etc.

Typical site facilities may include a shelter and refreshments area (e.g. clubhouse/marquee, etc), toilets, good access for motor vehicles to the site and adequate car parking facilities.

3.4 *Types of clay targets*

The targets used for the sport are usually in the shape of an inverted saucer made from a mixture of pitch and chalk designed to withstand being thrown from traps at very high speeds but at the same time being easily broken when hit by just a few very small lead alloy pellets shot from a gun.

There are several types of targets which are used for the various disciplines. However, only the standard 110mm target is used in all of the trap and skeet disciplines. Sporting shoots feature the full range of targets (except ZZ) to provide the variety which is the hallmark of the discipline.

The main types of clay targets are described in the figure below.

| |
|--|
| <p>STANDARD: The most commonly used target of all, must be 110 (\pm 1) mm overall diameter and 25- 26 mm in thickness.</p> <p>MIDI: Same saucer shape as the standard but with a diameter of only 90mm.</p> <p>MINI: As its name indicates, this is like a flying “Aspirin” at only 60mm in diameter and 20mm in thickness.</p> <p>BATTUE: A very thin, flat, wafer of a target of about 100mm diameter which flies very fast and falls off very suddenly.</p> <p>RABBIT: A standard sized (but thicker) flat target in the shape of a wheel designed to run fast along the ground.</p> <p>ZZ (HELICE): This is a plastic, standard sized target attached to the centre of a 2-blade propeller of different colour designed to zig-zag in flight in a totally unpredictable manner.</p> |
|--|

Types of clay targets

3.5 *Traps*

These are purpose made, spring loaded devices specially designed to launch the different types of targets through distances of up to 100 metres. They vary from the very simple, hand cocked, hand loaded and hand released types to the highly sophisticated, fully automatic variety which can hold up to 400 targets in their own magazine and are electrically operated and released by remote control, either by the pressing of a button or by an acoustic system activated by the shooter’s voice. Target speeds and trajectories can be easily modified and varied to suit the discipline or type of shooting required.

3.6 *Guns*

A shotgun, as defined by law, is a smooth barrelled gun, not being an airgun, with a barrel length of 24 inches or more and not exceeding 2 inches in diameter. For formalised clay target events, the maximum permitted bore of shotguns is 12, equivalent to 0.729 inches (18.5 mm). Barrel lengths vary from 26 to 32 inches.

Any type of gun of up to 12 gauge is capable of being used to shoot clay targets but there are three main types of shotgun which are suitable for clay shooting as described below.

3.6.1 Over-Under

By far the most popular used by regular participants in the sport, this gun has its two barrels one above the other, usually with just a single trigger which can be selected to fire either barrel first. Within this type there are three sub-groups of specification i.e. trap, skeet and sporting. Trap guns are generally heavier and longer barrelled (normally 30" or 32") designed to shoot slightly above the point of aim. Skeet guns are usually lighter and faster handling with barrel length from 26" to 28", while Sporting models most often come with barrel lengths of 28", 30" and 32", according to preference.

3.6.2 Semi-Automatic

This is a single barrelled gun capable of firing several rounds in quick succession, but which requires the shooter to press the trigger for each shot. The current shotgun law requires these guns to be limited to a maximum capacity of 3 cartridges. Due to their firing mechanism they are fairly easy to handle and their low recoil makes them particularly popular.

3.6.3 Side-by-Side

The original and traditional game shooting gun, with its barrels placed alongside each other in a horizontal plane, is generally a lighter gun with double triggers. Few side-by-sides are used for clay target-shooting.

3.7 Cartridges

One of the many roles that the governing bodies have to fulfil is the setting of technical rules for the conduct of competitions in the various disciplines under their jurisdiction. These include, amongst many others, defining the technical specifications of the cartridges to be used. Cartridges may have differing specifications based on target range, speed and breakability of target.

4. USING SITE LOCATION TO MINIMISE NOISE IMPACT

In order completely to avoid any likelihood of noise annoyance it will be necessary to locate the shoot so that the sound of gun fire, and any other sound associated with the shoot, is inaudible at all noise sensitive premises. Owing to the nature of the sound involved, however, the chances of finding such a location are remote.

The decision on where to locate a shoot will probably be the most important decision taken and therefore should include careful consideration of all the factors involved in order to minimise noise impact. A number of physical factors, including minimum separation distances, local topography, source directionality and the location of any noise sensitive premises should shape this decision. These factors are discussed in this section.

In addition to the physical factors, other factors such as permanency, frequency of use, intensity of use and whether the site is a new site or an existing site will have a bearing on the noise impact of the shoot. These factors are discussed in Section 5.

4.1 *Minimum safety zone*

Shoot organisers should have a large scale plan (1:10,000) showing the location of all shooting stands and all known public highways, footpaths, bridleways, waterways and other public rights of way in the vicinity. Further advice on the location of public rights of way can normally be obtained from the local authority department (which may be part of the district or county council) responsible for their maintenance and protection.

Organisers should note that the public have a right to use such highways, footpaths, bridleways and waterways unfettered and must ensure the safety of users and must avoid any likelihood of falling shot or clays becoming a danger to the public.

No shooting should take place in the direction of any public right of way (or any building with public access) that is within 300 metres of the shooting position.

In order to warn members of the general public that some shooting noise may be experienced, all footpaths, bridleways, waterways and all other areas or buildings where the public may have access within 1 kilometre radius of the shoot are recommended to have prominent signs displayed by the organisers indicating the existence of the shoot.

4.2 *Noise buffer zone*

As mentioned above, a minimum safety zone of 300 metres in the general direction of shooting should always be provided for safety reasons. However, a much larger buffer zone will be required to protect noise sensitive premises and other noise sensitive areas.

The size of noise buffer zone required will depend on local circumstances and on the level of shooting noise transmitted to noise sensitive areas. The advice given below is based on experience and is intended to offer practical guidance on the typical size of a noise buffer zone, rather than precise enforceable distances.

Where shooting takes place on mainly flat open land in the absence of significant sound reflecting media (e.g. rock faces, major roadways, woodland areas, substantial pools or lakes, large buildings), a noise buffer zone of at least 1.5 kilometres in the general direction of shooting and not less than 1 kilometre in the rearward arc is advisable. Preferably there should be no line of sight between the noise source and any noise sensitive areas. Where substantial topographical features interrupt the line of sight, reduced separation distances may be acceptable. Shooting should nevertheless not normally take place with separation distances of less than 1 kilometre in the direction of shooting except under very exceptional circumstances which have been fully discussed and agreed with the local authority and any affected residents.

It should also be noted that, under normal circumstances, as the noise buffer zone decreases in size, so the frequency and duration of events may also need to be decreased.

4.3 *Topography*

Topographical features such as hills, embankments, cuttings and depressions can, on occasion, afford substantial protection against noise due to the physical screening effect they offer and the interruption of line of sight between the noise source and noise sensitive premises. Therefore, where such topographical features are present the siting and orientation of a shooting ground should seek to take advantage of them. Care needs to be taken, however, to ensure that a topographical feature does not worsen the situation. For example, the sound of gunfire can be reflected off acoustically hard surfaces such as rock faces, sides of valleys, lakes, ponds, disused buildings etc., thus increasing noise levels or causing echoes which appear to increase the number of shots being fired. In these circumstances an improvement in the situation may be obtained by shooting away from such topographical features.

Useful sound attenuation can be obtained where shooting takes place below normal ground levels, for example by utilising quarries. However, in such circumstances particular attention will need to be given to the internal features of the quarry to ensure that acoustic echoes are not produced.

When shooting is to take place in the proximity of prominent hills or valleys, an individual assessment of likely sound propagation will normally be required. In these circumstances early discussion with an acoustic consultant is recommended.

4.4 *Directionality*

The propagation of sound from a shotgun is directional with the noise “footprint” around a firing point being roughly pear shaped - noise levels in the direction of shooting being much greater than noise levels at the same distance to the sides and rear. Shooting high into the air will also cause a wide dispersion of sound. The propagation of sound from a shotgun is a complex process and simple noise predictions (e.g. based on the inverse square law) can produce erroneous results.

Since the propagation of sound from a shotgun is directional, the general shooting orientation should normally be away from the location of noise sensitive premises. This consideration may have to override any preferred orientation to avoid shooting into the sun. Shooting organisers should use careful selection of shooting positions and orientation in order to minimise impact on noise sensitive premises.

4.5 *Noise sensitive premises and other noise sensitive locations*

Noise sensitive premises typically include residential properties, churches, offices, hospitals, nursing homes, schools, and colleges. The proximity of such noise sensitive premises and any other noise sensitive areas should always be a prime concern when considering suitable site locations.

In addition, farm buildings, particularly those housing young animals, may also be considered to be noise sensitive premises in some situations. The sound of gunfire may be distressing to wild and domestic animals during certain periods (e.g. mares in foal, ewes at lambing). Alternative views have been expressed about whether or not wild birds and animals adjust to the sound of gunfire.

Given the potential sensitivity of wild and domestic animals and birds at sites adjacent to or included within shoot areas, it is advisable that shoot organisers or their representatives discuss with the owner(s) of surrounding land and with wildlife preservation bodies or nature conservation officials the particular times when animals are likely to be unusually sensitive, and arrange for a temporary suspension or reduction in activities as necessary.

4.6 *Prevailing weather conditions*

Wherever possible, prevailing local atmospheric conditions should be taken into account when determining shoot location and orientation. This is because atmospheric conditions have a major influence on sound propagation and, under certain conditions, can significantly increase distances over which sound are audible.

Prevailing winds in the direction of noise sensitive areas should be an important consideration and certain sites may need to have special restrictions applied for certain wind directions and strengths. If other circumstances permit, it would be advisable to arrange for the general shooting direction to be orientated towards the prevailing wind as this will reduce the total distances over which sound travels.

4.7 *Presence of tree belts.*

In general trees offer little sound attenuation unless the tree belts are sufficiently deep as to give some sound reduction due to the distance involved. Trees can also be responsible for undesirable echoes and sound scattering effects. If it is felt, in a particular location, that a deep dense belt of trees may offer attenuation, this will require a thorough evaluation over varying weather conditions before final decisions are made and any conditions set.

5. USING SITE MANAGEMENT TO MINIMISE NOISE IMPACT

Good site management can go a long way to alleviating complaints or, better, preventing them from arising in the first place. Shoot organisers are strongly advised to consult with the relevant local authority departments (particularly Environmental Health and Planning departments) before setting up a new shoot and when making changes to an existing shoot. Adjacent local authorities should liaise effectively with one another where there is a possibility that the noise may impact across administrative boundaries.

The following paragraphs give examples of ways of using site management to minimise the impact of noise from clay target shooting.

5.1 Site information sheet

Basic information about the operation of the site should be contained in a written document. The document should be made available to the local authority, police and local residents so that if complaints are made or, if it is necessary for the authorities to visit the site, it is clear who they need to speak to in order to deal with issues raised. A copy of the document should always be available on site. An example site information sheet suitable for this purpose is included at Appendix 4.

5.2 Liaison with local residents

It is extremely important that shoot organisers maintain a positive relationship with their immediate neighbours, both landowners and local residents. Many complaints can be avoided simply by keeping neighbours informed of activities on the site. It is also important that having informed residents of plans, they are not changed without good reason. In particular, residents should always be advised as soon as possible, and at least 28 days in advance, of any planned major event.

It is also advisable, where appropriate, that the Clerk of the Parish Council is briefed since residents who want to find out information, particularly in rural communities, are likely to approach the Clerk in the first instance.

5.3 Restriction in times of operation

A restriction in the times of operation of the shoot is a particularly useful control over the noise impact. However, any such restrictions must be justifiable and must take into account the likelihood of excessive noise at noise sensitive premises. It is difficult to give guidance that is applicable to all situations as restrictions may need to vary depending, for example, on the season and upon the frequency and duration of use as well as the level and potential effect of the noise. A restriction in times of operation should always be applied in the light of local circumstances and following consultation between the local authority, the shoot operator and affected persons.

If the shoot is located where there are no noise sensitive premises within approximately 2 kilometres and/or complaints have not been received about a site and are not anticipated, then constraints on shooting times are unnecessary. There may however be ancillary noisy activities connected with the shoot, for example noise associated with motor vehicle access

which may affect noise sensitive premises and which may require separate restrictions even though the shooting noise itself may not cause a problem.

Where justified complaints of noise have been received or are anticipated by the local authority, or where noise levels are measured or predicted to exceed the levels given in Section 6 of this guidance, then restricting shooting to the following times may provide a suitable remedy:

(i) Mondays to Fridays: 09.00 to 18.00 with a maximum cumulative duration of 4 hours

(ii) Saturdays: 10.00 to 18.00 with a maximum cumulative duration of 3 hours

(iii) Sundays: 10.00 to 14.00 with a maximum cumulative duration of 3 hours

On those sites where shooting occurs on more than 28 days within any calendar year it may, in some circumstances, be appropriate to further restrict the times of operation and/or the number of days per week and/or weeks per year that shooting may take place.

Restrictions may also need to be applied on Christmas day, Remembrance Sunday and Bank Holidays, or for other religious or special public days of significance to the community surrounding the shoot.

In order to protect noise sensitive areas it is recommended that any 'major event' should not be staged more frequently than once in any 28 day period. A 'major event' might be a regional, national or international competition, or any other event which might attract in excess of 50% more participants than would normally use the shoot. In such cases, notification to surrounding occupiers of land and to the local authority should be regarded as essential and additional measures to reduce the impact on noise sensitive premises should normally be taken.

5.4 *Number of shooting stands.*

The number of shooting stands in use at any one time may be a significant factor in the overall shooting noise levels. Restrictions on the number of shooting stands in use at any one time may be necessary to reduce noise impact. Each shoot will need to be individually assessed and stand numbers discussed between the shoot operators and local authority.

5.5 *Number of entrants.*

Restrictions on the maximum number of entrants or the maximum number of rounds of 25 for each entrant at an event may also be useful in reducing the noise impact. Each shoot will need to be individually assessed and the number of entrants discussed between the shoot operators and local authority.

5.6 *Use of low noise cartridges.*

Shotgun cartridges available in gunshops are used for clay target shooting. Certain limitations as to the shot size and the weight of the shot load are enforced by the sports controlling bodies for use in events. Different types of cartridge may produce a different noise footprint and restrictions to specific cartridge type may be of use in the control of noise from the shoot. Subsonic 'lower noise' cartridges with observed feet per second velocity of 850 - 1000 are less noisy in the direction of fire than 'game' or 'clay' cartridges. However, competitive shoots does not use subsonic cartridges.

5.7 *Use of noise barriers.*

On permanent grounds and sites where problems of noise intrusion are experienced, the provision of purpose built noise barriers to redirect, absorb and screen sound may offer a solution. The effectiveness of a barrier will depend upon its length, height, construction mass, sound absorption properties and position relative to the noise source and receptor. When considering the use of a noise barrier, the following general principles apply:

- a) Locate barriers as close to the noise source as is possible
- b) Barrier structures should have an acoustically “soft” finish (e.g. soil, sand, straw baling, proprietary sound absorption products) on surfaces facing the noise source.
- c) The effective height of barriers can be enhanced, for the Sporting disciplines, if the shooting position is located in a trench or dugout whereby gun muzzles project only slightly above ground level.
- d) As a working approximation, the length of a barrier should be at least five, and preferably ten, times its height.
- e) Individual barriers should preferably be arranged around two or more sides of a given shooting stand to form an enclosure.
- f) Where individual barriers or enclosures are utilised on a shooting ground or site, substantial peripheral embankments can provide further useful sound attention.

It should be noted that most permanent noise barriers will normally require planning permission from the Local Authority. Therefore, prior to the provision of any structures or barriers consultations should always be held with the relevant Environmental Health and Planning departments. The performance of any barrier is influenced by the local topography and this will need to be considered when predicting the effect of any barrier or bund. The design and construction of some forms of noise barrier may require specialist advice from an acoustic consultant and an engineer.

5.8 *Weather conditions*

Local weather conditions can affect the propagation of sound. It has already been stated that prevailing wind direction should be taken into account when determining site location and shoot orientation. Effective site management will also involve responding to the weather conditions on a particular day, for example, a strong wind may elevate noise levels downwind, and a dense hard covering of snow will provide an acoustically “hard” surface which will cause reflection of sound waves and hence raise noise levels.

Where weather conditions on a particular day are so severe as to cause increased noise levels at noise sensitive premises and the layout of the shoot cannot be altered to take this into account, the shoot organiser should give consideration to cancellation of the event.

6. NOISE MEASUREMENT AND ASSESSMENT

6.1 *Measurement and Assessment*

Measurement and social survey work completed by BRE during 1997 and papers presented at the IOA conference during that year provides a basis for guidance on acceptable noise limits to be applied in the vicinity of residential premises. The guidance measures noise from clay target shooting using the Shooting Noise Level (SNL) index. Both the index and the measurement method are described in more detail in Appendix 5.

The BRE research suggests that there is no fixed shooting noise level at which annoyance starts to occur. Annoyance is less likely to occur at a mean shooting noise level (mean SNL) below 55 dB(A), and highly likely to occur at a mean shooting noise level (mean SNL) above 65dB(A). The likelihood of annoyance at levels within this range will depend upon local circumstances and some of the factors that may need to be considered are given in Appendix 5.

The research work by BRE found that there was a need for further study of the effect of background noise on annoyance due to shooting. BRE found no effect from background noise in their data but most of the measurements were made in situations where the shooting noise levels were well in excess of background. Closer examination of sites with relatively higher background levels is necessary before the role of background noise in relation to annoyance can be better understood.

To quote directly from the research conclusions:

“For a given exposure level, community annoyance was found to vary significantly between shoots, but no particular shoot characteristics or socio-demographic variables were seen to be associated with the degree of annoyance. There is some suggestion in the data that different sensitivities exist in different communities and that this affects annoyance, but the causes of differing sensitivities are not clear.

At shooting noise levels below the mid 50’s dB(A) there is little evidence of significant levels of annoyance at any site, whereas for levels in the mid to high 60’s, significant annoyance is engendered in a majority of sites. For levels in between however, the extent of the annoyance varies considerably from site to site. Thus a level of, say, 60 dB(A) may be deemed acceptable at one site, but not at another.”

It should be stressed that noise ‘annoyance’ is not the same as noise ‘nuisance’ and that the assessment of whether the noise experienced at noise sensitive premises is a nuisance will be a judgement based on a number of factors (including those given in Appendix 2). However, the level of noise experienced will usually be an important factor in any assessment of noise nuisance due to clay target shooting and it is intended that the methodology included at Appendix 5 will allow agreement to be reached on setting appropriate noise limits.

6.2 *Information and Advice*

6.2.1 Shooting Associations

There is a recognised controlling body for the sport in the UK. Clubs which are affiliated to that body are required to abide by conditions pertinent to the good rule and governance of the sport. Such associations publish a wide range of informative leaflets addressing health and safety issues and the provision of site facilities. Information about such bodies can be accessed readily through the internet.

6.2.2 Local Authorities

Local Authorities should be able to provide a wide range of advice and information to shoot organisers to help them to conduct their undertaking within the law and with the minimum of inconvenience to others. This advice is generally available free of charge, but if a charge is payable this will be confirmed in advance.

Local Authorities, usually through their Environmental Health departments, will be able to advise on all matters relating to noise control, food hygiene, sanitation and health and safety. Planning departments will advise on matters relating to planning permission and land use. Information may also be available on conservation and wildlife bodies through Leisure departments or Countryside sections. County or Unitary Councils will be able to advise on highways, footpaths, bridleways etc. The Police should be contacted for advice on firearms licensing.

6.2.3 Environmental and Conservation Bodies

Shoot organisers will be able to obtain considerable information about the area immediately surrounding their shooting ground from local environmental and conservation bodies. They will be able to advise on the sensitivity of the natural environment and any constraints that are placed upon an area because of environmental or conservation considerations.

In the first instance shoot organisers should contact the local branch of the organisation. Where there is no local branch, contact should be made with either the national or regional headquarters.

Further details of useful sources of information are given in Appendix 6.

APPENDICES

- APPENDIX 1*** - Extracts from the Environmental Protection Act 1990 - Part III
Statutory Nuisances Noise
- APPENDIX 2*** - The Concept of Nuisance
- APPENDIX 3*** - Clay Target Shooting Disciplines
- APPENDIX 4*** - Example Site Information Sheet
- APPENDIX 5*** - Measurement of Clay Target Shooting Noise
- APPENDIX 6*** - Sporting Environmental and Conservation and Advisory Bodies
- APPENDIX 7*** - Bibliography
- APPENDIX 8*** - Acknowledgements

APPENDIX 1**Extracts from the Environmental Protection Act 1990 - Part III/Noise Act 1996****Statutory Nuisances: Noise****Section 79**

- (1) The following matter constitutes a “statutory nuisance” for this part of the Act -
- g noise emitted from premises so as to be prejudicial to health or a nuisance, with the exception of premises occupied on behalf of the Crown for naval, military or air force purposes etc.
- (2) and it shall be the duty of every local authority to cause its area to be inspected from time to time to detect any statutory nuisances which ought to be dealt with under section 80 (summary proceedings for statutory nuisances), and where a complaint of a statutory nuisance is made to the local authority by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint.
- (7) “noise” includes vibration;
- “premises” includes land, and any vessel unless powered by steam reciprocating machinery.

Section 80

- (1) Where a local authority is satisfied a nuisance exists, or is likely to occur or recur, in the area of authority, the local authority shall serve a notice (“an abatement notice”) imposing all or any of the following requirements -
- (a) requiring the abatement of the nuisance or prohibiting or restricting its occurrence or recurrence;
- (b) requiring the execution of such works, and the taking of such other steps, as may be necessary for any of those purposes, and the notice shall specify the time or times within which the requirement of the notice are to be complied with.
- (2) The Abatement Notice shall be served -
- (a) on the person responsible for the nuisance; or
- (c) where the person responsible for the nuisance cannot be found or the nuisance has not yet occurred, on the owner or occupier of the premises.
- (3) The person served with the notice may appeal against the notice to a Magistrates’ Court within the period of twenty one days beginning with the date on which he/she was served with the notice.
- (4) If a person on whom an Abatement Notice is served, without reasonable excuse, contravenes or fails to comply with any requirements or prohibition imposed by the notice, he/she shall be guilty of an offence.
- (5) Except in a case falling within subsection (6), a person who commits an offence under subsection (4) shall be liable on summary conviction to a fine not exceeding level 5 on the standard scale (£500) together with a further fine of an amount equal up to one tenth of that level for each day on which the offence continues after the conviction.
- (6) A person who commits an offence under subsection (4) on industrial, trade or business premises, as defined in section 79 (7), shall be liable on summary conviction to a fine not exceeding £20,000.
- (7) In any proceedings for an offence under subsection (4) in respect of a statutory nuisance it shall be a defence to prove that the best practical means, as defined in section 79 (9), were used to prevent, or counteract the effects of, the nuisance.

NOTE: The defence of best practicable means in subsection (7) is only available where the nuisance arises on industrial, trade or business premises.

Section 81

- (1) Where more than one person is responsible for a statutory nuisance section 80 shall apply to each of those persons whether or not what any one of them is responsible for would by itself amount to a nuisance.
- (2) Where a statutory nuisance which exists or has occurred within the area of a local authority, or which has affected any part of that area, appears to the local authority to be wholly or partly caused by some act or default committed or taking place outside the area, the local authority may act under section 80 as if the act or default were wholly within that area, except that any appeal shall be heard by a Magistrates’ Court having jurisdiction where the act or default is alleged to have taken place.
- (3) Where an Abatement Notice has not been complied with the local authority may, whether or not they take proceedings for an offence under section 80 (4), abate the nuisance and do whatever may be necessary in execution of the notice.

Noise Act 1996**Section 10**

- (7) The power of a local authorityto abate....a statutory nuisance....includes power to seize and remove any equipment which it appears to the authority....has been used in the emission of the noise in question.

- (8) A person who wilfully obstructs any person exercising any powers conferred under...subsection (7) is liable on summary conviction to a fine not exceeding level 3 on the standard scale.

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- (1) where a person is convicted of a noise offence the court may make....a "forfeiture order"....
- (4) A forfeiture order operates to deprive the offender of any rights in the equipment to which it relates.]
- (4) Any expenses reasonably incurred by a local authority in abating, or preventing the recurrence of; a statutory nuisance under subsection (3) may be recovered by them from the person by whose act or default the nuisance was caused and, if that person is the owner of the premises, from any person who is for the time being the owner thereof; and the court may apportion the expenses between persons whose acts or defaults the nuisance is caused in such manner as the court consider fair and reasonable.
- (5) If a local authority is of opinion that proceedings for an offence under section 80 (4) above would afford an inadequate remedy in the case of any statutory nuisance, they may take proceedings in the High Court for the purpose of securing the abatement, prohibition or restriction of the nuisance, and the proceedings shall be maintainable notwithstanding the local authority have suffered no damage from the nuisance.

Section 82

- (1) A Magistrates' Court may act under this section on a complaint made by any person on the grounds that he/she is aggrieved by the existence of a statutory nuisance.
- (2) If the Magistrates' Court is satisfied that the alleged nuisance exists, or that although abated it is likely to recur on the same premises, the court shall make an order for either or both of the following purposes:-
- (a) requiring the defendant to abate the nuisance, within a time specified in the order, and to execute any works necessary for that purpose;
- (b) prohibiting a recurrence of the nuisance, and requiring the defendant, within a time specified in the order to execute any works necessary to prevent the recurrence;
- and may also impose on the defendant a fine not exceeding level 5 on the standard scale. (£500)
- (4) Proceedings for an order under subsection (2) shall be brought -
- (a) except in a case falling within (b) or (c) below, against the person responsible for the nuisance;
- (c) where the person responsible for the nuisance cannot be found, against the owner or occupier of the premises.
- (5) Where more than one person is responsible for a statutory nuisance, subsections (1) to (4) shall apply to each of those persons whether or not what any one of them is responsible for would by itself amount to a nuisance.
- (6) Before instituting proceedings for an order under subsection (2) against any person, the person aggrieved by the nuisance shall give to that person such notice in writing of his intention to bring the proceedings as is applicable to proceedings in respect of a nuisance of that description and the notice shall specify the matter complained of.
- NOTE: The notice of bringing proceedings in respect of a statutory noise nuisance shall be not less than three days.
- (8) A person who, without reasonable excuse, contravenes any requirement or prohibition imposed by an order under subsection (2) shall be guilty of an offence and liable on summary conviction to a fine not exceeding level 5 (£500) on the standard scale together with a further fine of an amount equal to one-tenth of that level for each day on which the offence continues after conviction.
- (9) In any proceedings for an offence under subsection (8) in respect of a statutory nuisance it shall be a defence to prove that the best practicable means were used to prevent, or counteract the effect of, the nuisance.
- NOTE: The defence of best practicable means under subsection (9) is only available where the nuisance arises on industrial, trade or business premises.
- (11) If a person is convicted of an offence under subsection (8), a Magistrates' Court may, after giving the local authority in whose area the nuisance has occurred an opportunity of being heard, direct the authority to do anything which the person convicted was required to do by the order to which the conviction relates.
- (12) Where on the hearing of proceedings for an order under subsection (2) it is proved that the alleged nuisance existed at the date of making of the complaint, then, whether or not at the date of the hearing it still exists or is likely to recur, the court shall order the defendant (or defendants in such proportions as appears fair and reasonable) to pay to the person bringing the proceedings such amounts as the court considers reasonably sufficient to compensate him/her for any expenses properly incurred by him/her in the proceedings.

APPENDIX 2**THE CONCEPT OF NUISANCE**

For any noise to constitute a statutory nuisance, it must either be likely to cause injury to health or amount to a nuisance at common law.

- "...likely to cause..." means probably likely, not just possibly likely.
- "Health" means disease rather than accidental physical injury.
- nuisances at common law are of two types - public and private nuisances. Public nuisances may at the same time be private nuisances.
- for a nuisance to be a public nuisance, it must, as a matter of fact, affect a sufficient number of people for them to constitute a whole class of the population. Alternatively, it must be so widespread in its range or indiscriminate in its effects that it would be unreasonable to expect any private person to take action to stop it.
- the sort of effect on people which could amount to a public nuisance includes obstruction, inconvenience or offence, provided that, as a matter of fact, it is sufficiently severe.
- nevertheless, a noise not adding measurably to background levels but obtrusive and out of character with the area may amount to a statutory nuisance.
- private nuisances are different; based on the maxim "so use your property as not to injure your neighbour's", they comprise damage arising from some unlawful interference with a person's use of his land. A person affected must therefore have some legal interest in the land, eg. as owner or tenant, and the source of the nuisance must lie outside it.
- distinguish nuisances, which are examples of indirect interference, from trespasses, which involve direct interference.
- nuisances may, but do not necessarily involve negligence.
- its effect aside, the activity giving rise to the nuisance may be quite lawful.
- the interference complained of must be unreasonable and substantial; the law implies a degree of "give-and-take" between neighbours - between the right of one occupier to use his land as he likes and the right of his neighbour to live in peace, nor is it concerned in any event with trifles - the "de minimis" rule. Mere annoyance is probably not enough to constitute a nuisance nor do questions of individual taste or preference come into it.
- as a matter of law, the ordinary use of land is incapable of amounting to a private nuisance.

- what is unreasonable will be a matter of fact, depending on the circumstances. A particular noise at midday may be reasonable yet if repeated at midnight, not be. Some things are inherently noisy but must still be done; where in such circumstances noise is truly inevitable, it will not be unreasonable.
- the consent of the person affected is not to be implied by his "coming to the nuisance" but in the case of an "amenity" nuisance, such as noise, the character of the neighbourhood will be relevant to what is reasonable; "what would be a nuisance in Belgrave Square would not necessarily be so in Bermondsey." This does not hold true, however, where physical damage is caused, for example, by vibration.
- a private nuisance is nevertheless made lawful, twenty years after the person affected became aware of it if he acquiesces to it throughout that period.
- what would otherwise be nuisances, caused inevitably in the course of an activity enabled by statute, will not be so since they will not be unlawful.
- the duration of a noise or its frequency of occurrence if it is intermittent are factors relevant to how substantial an interference is. They will not be conclusive, however; a single occurrence may be a nuisance whereas something repeated may still not be.
- abnormal sensitivity on the part of a person or property affected by an alleged nuisance is to be ignored in assessing reasonableness; the standard to be applied is of the notional "ordinary man".
- nuisance is a matter of so-called "strict liability" - the person responsible need not be at fault except if some act of nature is blamed and need not have foreseen the consequences of his act etc.
- the intention of the person causing a nuisance is usually irrelevant but malice may turn a reasonable act into an unreasonable one.
- it is not necessary for officers of a local authority to witness an alleged nuisance in order to be satisfied of its existence; the evidence of a third party, if sufficiently cogent, is enough.
- once a local authority is reasonably satisfied that a statutory nuisance exists or is likely to occur or recur, it has a duty to serve an abatement notice on the person(s) believed to be responsible. Strictly, there is no discretion in this, although it will need to keep in mind the "best practicable means" defence where a nuisance relates to industrial, trade or business premises.
- "best practicable means" is interpreted by reference to the following provisions:
 - (a) "practicable" means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications;
 - (b) the "means" to be employed included the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures;

- (c) the test is to apply only so far as compatible with any duty imposed by law;
- (d) the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances;
- in circumstances where a code of practice under section 71 of the Control of Pollution Act 1974 (noise minimisation) is applicable, regard shall also be had to guidance given in it.
- a person may commit a nuisance as part of a group of persons, even where their own contribution may be insufficient alone.
- statutory notices can be enforced other than by prosecution, i.e. by work in default, but if a local authority decides to go to court it must prove every element of its case beyond reasonable doubt. That does not mean beyond any shred of doubt. Before prosecuting, however, it should consider three things:
 - (a) whether there is a likelihood (not a certainty) of success;
 - (b) whether the likely penalty justifies it, and
 - (c) whether there is a public interest in doing so.

APPENDIX 3**CLAY TARGET SHOOTING DISCIPLINES*****Trap***

Targets are thrown either as singles or doubles from one or more traps situated some 15m in front of the shooter and generally away from the firing point at varying speeds, angles and elevations. The most common disciplines in this group are: Down-the-Line (DTL), Single Barrel, Double Rise, Automatic Ball Trap (ABT), Olympic Trap, Double Trap and Universal Trench.

Down The Line

Also known as DTL, this is a popular clay shooting discipline. Targets are thrown up to a distance of 45 to 50 metres at a fixed height of approximately 2.75m and with a horizontal 'spread' of up to 22 degrees either side of the centre line. Each competitor shoots at a single target in turn, but without moving from the stand until they have all shot at five targets. Then they all move one place to the right, and continue to do so until they have all completed a standard round of 25 birds. Variations of this discipline are: Single Barrel, Double Rise and Handicap-by-Distance.

Skeet

Skeet is a word of Scandinavian origin, though the discipline originated in America. Targets are thrown in singles and doubles from 2 trap houses situated some 40 metres apart, at opposite ends of a semicircular arc on which there are seven shooting positions. The targets are thrown at set trajectories and speeds. The main discipline in this group are English Skeet, Olympic Skeet and American (NSSA) Skeet.

Sporting

This group contains the English Sporting discipline which has the sport's biggest following. Where the previous two groups only use standard targets, in Sporting there is an infinite variety of stands. Targets are thrown in a great variety of trajectories, angles, speeds, elevations and distances and the discipline was originally devised to simulate live quarry shooting, hence some of the names commonly used on Sporting stands; Springing Teal, Driven Pheasant, Bolting Rabbit, Crossing Pigeon, Dropping Duck, etc. Disciplines in this group include English Sporting, International (FITASC) Sporting, Super Sporting and Compak Sporting.

APPENDIX 4**EXAMPLE SITE INFORMATION SHEET**

| | |
|--|--|
| Site Name | |
| Site Managed by: | Site Owned By: |
| Club meeting times and yearly staging of events: | In the event of an emergency contact |
| Club Secretary/Chairman: Address: Telephone No: | Ordnance Survey Map/Diagram of Site Boundary |
| Shooting disciplines available: | |
| Rules of Membership: | Standard of behaviour required: |
| Noise reduction requirements: | Person to whom any complaint should be addressed: Address: Telephone No: |
| Local Police Station Address: Contact Officer: | |
| Local Environmental Health Department Address: Chief Officer: | |
| Planning Department Address: Contact Officer: Planning reference (if applicable): | |

APPENDIX 5**MEASUREMENT OF CLAY TARGET SHOOTING NOISE****A5.1 Aim**

The basic aim of measurement is to obtain a series of shot level readings, each corresponding to successive shots. As far as possible these readings should be unaffected by any other noises occurring during the measurement period. Each shot level (see definitions) should correspond to the maximum A-weighted sound pressure level caused by the shot using time weighting F; or, alternatively, the maximum value caused by the shot in a continuous series of short Leq ($L_{Aeq, 100ms}$ or $L_{Aeq, 125ms}$) measurements. These methods will generally produce very similar values for a given series of shots. From the shot level readings, the shooting noise level, *SNL*, (see definitions) can be calculated.

A5.2 Measuring equipment

- (a) The components of the measurement system shall conform to type 1 of BS EN 60651.
- (b) The calibrator shall conform to type 1 of BS 7189.
- (c) The complete measurement system shall have traceable calibration to either National or International Standards.
- (d) The interval between verification of the complete measurement system shall not exceed two years.
- (e) The measurement system shall measure A-weighted and time weighted F instantaneous sound pressure level; or a continuous series of short Leq ($L_{Aeq, 100ms}$ or $L_{Aeq, 125ms}$) measurements.
- (f) Preferably the system shall also be capable of producing a permanent record of the time history of the sound pressure level L_{pA} or $L_{Aeq, 100ms}$ or $L_{Aeq, 125ms}$ measurements series.

A5.3 Site selection

- (a) Measurements should be made out of doors in the vicinity of residential premises on the most exposed aspect and at least 3.5 m from reflecting surfaces other than the ground.
- (b) Measurements should normally be made at a height of 1.2 to 1.5 m above ground.
- (c) The measurement position(s) should be as near as reasonably practical to the curtilage of the residential premises and be representative of the shooting noise level near the premises.

A5.4 Precautions against interference

- (a) Precautions should be taken to avoid potential sources of interference, including:
 - wind passing over the diaphragm of the microphone
 - rain on the windshield or nearby surfaces
 - electrical interference which can be caused in the sound level meter by, for example, power cables, transformers, radio transmitters and mobile phones.
- (b) Windshields should always be used, these being generally effective up to windspeeds of 5 m/s. Measurements should not be made during rain or when wind speeds measured at the microphone exceed 5 m/s.

A5.5 Representative measurement periods**3.6.1 For an existing shoot**

- (a) Measurements shall be made during a regular event or a major event.

Note 1: Each day of a major event can be considered separately

Note 2: If there is weekend shooting it should be included in any assessments.

For a new shoot or a variation to a shoot

- (a) Measurements may be made during a regular event, a specially set up event or a test shoot.
- (b) The shoot organisers should ensure that conditions (shooting and environmental) during any test shoot are representative of those that would occur during normal operation. The shoot organisers should note that it is in their interest to ensure a representative test shoot as they may be required to ensure similar levels are not exceeded should planning permission be granted.
- (c) The type of cartridge, gun, standing position, direction of shooting and the elevation of the muzzle should be representative of the type of shooting that will take place.
- (d) The number of shots fired during a test shoot shall exceed 25. For a small shoot 60 shots, and for a major shoot significantly more (160) would not be unreasonable. The shots should be fired within a 30 minute period.
- (e) If measurements have been made on a weekday, and the shoot organisers are seeking permission to shoot at the weekends, then this should be taken into consideration.

Note: It is the responsibility of the shoot to set up a realistic test shoot since they may be held to the resulting levels at a later date.

A5.6 Measurement protocol

- (a) The measurement duration shall be a continuous 30 minute period during shooting.
- (b) A calibrator shall be applied to the microphone of the measurement system before measurement commences. The sensitivity of the measurement system shall be adjusted if required, and the sound pressure level due to the calibrator recorded.
- (c) At the end of the measurement period the calibrator shall be re-applied, and if the sensitivity of the system has changed by more than 0.5 dB the measurements shall be discarded.
- (d) The measurement system shall be set so that it displays and records the A-weighted, *F* time weighted, instantaneous sound pressure level; or a continuous series of short Leq ($L_{Aeq, 100ms}$ Or $L_{Aeq, 125ms}$) measurements.
- (e) If a time history of the level is being recorded, it should be marked/annotated contemporaneously so that the noise of the individual shots can be differentiated from other noise sources.
- (f) The wind speed and direction relative to the shoot and measurement locations shall be noted. Use of either an anemometer or the Beaufort wind scale is acceptable.
- (g) Any significant change in wind direction should be noted also. Measurements should normally be made with a positive wind vector (see definitions).

Note: In deciding if the noise level is acceptable, it is important that there is a positive wind vector. However, if the noise is unacceptably high with a non-positive wind vector, it will not be acceptable with a positive wind vector.

A5.7 Corrections to recorded levels

- (a) At most sites it is inevitable that some recorded levels will correspond to a combination of shot noise and other noises occurring at the same time. It is important to try to correct for the effect of the other noises, to get the best estimate of actual shot levels. All recorded levels can be thought of as equivalent to the logarithmic sum of the actual shot level and the contemporaneous residual noise level (see definitions). Therefore, if the contemporaneous residual noise level can be estimated reasonably well, it can be logarithmically subtracted from the recorded level to get the best estimate of the shot level (see definitions for relevant equation).
- (b) If the recorded level exceeds the estimated contemporaneous residual noise level by more than 10 dB, no such subtraction is necessary. If the exceedance is between 6 dB and 10 dB (inclusive), the subtraction is necessary. If the exceedance is less than 6 dB the shot should not be included in any calculation of the shooting noise level (see below), but may still be counted as a recorded shot.
- (c) The contemporaneous residual level can often be estimated by inspecting the levels just before and just after the shot in question, and visually interpolating between them to the nearest dB or so. Figures 1 to 3 help illustrate the way contemporaneous residual noise levels need to be taken into account. In Figure 1 the residual noise level is relatively steady and most of the louder shots are unaffected since the recorded levels are more than 10 dB above the residual level. Figure 2 is a time expansion of the first 10 minutes of Figure 1 and clearly shows two double shots marked s6, s7 and s10, s11. Such double shots can be considered as two separate shots if there is more than a 6dB fall in level between the shots. However, a correction to the second shot in the double may be required.
- (d) The measurements shown in Figure 3 were made at the same location but with a negative wind vector. The recorded levels are less than 10 dB above a relatively steady residual noise level and so will need to be corrected to obtain the shot levels. In cases where the residual level appears to be relatively steady, it may be appropriate to use an $L_{A90, T}$ value (see definitions) calculated over the measurement period as an estimate of it.

Note: Manual readings are only likely to be practical if the sound level meter has a maximum hold facility, however, if manual readings have been made directly from a sound level meter in the absence of any record of the time history, shot levels shall only be obtained where the recorded levels are seen to exceed the residual noise level between shots by more than 10 dB. Manual readings are likely to result in a lower shooting noise level because one or more of the loudest shots may not have been recorded.

A5.8 Calculation of shooting noise level (SNL)

- (a) The *SNL* is defined as the logarithmic average of the 25 highest shot levels, from the shoot in question, over the 30 minute measurement period. The shot levels will have been obtained from recorded levels corrected where necessary for residual noise.

A5.9 Calculation of a mean shooting noise level

- (a) The mean *SNL* is the arithmetic average of individual *SNL* values. The number of individual *SNL* values to be used, and the shooting conditions they should represent, depends on the specific purpose of the measurements. For example, when assessing a major shoot that has planning permission, a reasonable number of measurements should be made over a period of several months. Alternatively, when measurements are conducted in support of an assertion that there is not a noise problem, it is particularly important that measurements are made with a positive wind vector.
- (b) When calculating the mean *SNL*, one of the procedures below should be followed, as appropriate:
- (i) Determine the mean *SNL* from five separate events for a shoot that has planning permission over a period of several months, or
 - (ii) Determine the mean *SNL* from two separate events for a shoot that is operating under “the 28 day rule”, or
 - (iii) Determine the mean *SNL* for a shoot that is seeking planning permission. One or two measurements would be appropriate for a small shoot, whilst four or five would be the appropriate number for a major shoot operating on more than one day a week, having a number of stands, or intending to hold major events.

A5.10 Reporting of Results

The following information should be reported:

- (a) Description of shoot.
- (b) Measurement time.
- (c) Mode of operation.
- (d) Location of measurement positions and their relationship to shoot location. This should include details of the microphone height above ground level, the topography of intervening land, and reflecting surfaces such as buildings.
- (e) Instrumentation system used including type, manufacturer serial number and verification dates.
- (f) Operational test using reference signal or calibrator.
- (g) Weather conditions including general wind condition.
- (h) Date, day of the week and time of measurement.

A5.11 Setting limits

Any limits set will be a matter for local negotiation, but should normally be set according to the following guidelines:

- (a) The limit shall take the form of a mean *SNL* of x dB, not to be exceeded.
- (b) x will depend on local circumstances, but would normally be expected to fall somewhere in the range 55 to 65 dB.
- (c) Factors that should be considered in selecting x are:
 - the locality and general background noise levels;
 - on which day(s) of the week shooting occurs;
 - at which time(s) of day(s) e.g. morning, afternoon, evening;
 - the intensity of shooting – e.g. number of shooting days per year;
 - the type of shoot – e.g. 28 day or with planning approval;
 - the rate of fire.

Note 1: Planning permission should not normally be granted for a major shoot if the mean *SNL* exceeds 55dB where the background level is less than 45dB.

Note 2: Individual tuitions that last for no more than a couple of hours in total are generally acceptable up to a maximum *SNL* of 65dB during weekdays between the hours of 10am to 5pm.

Note 3: *SNL* values of around 65dB and are likely to evoke a strong adverse community response. The shoot should take active steps to achieve a very significant reduction in mean *SNL* and/or to make a commensurate reduction in the number of hours that they shoot per week.

Note 4: It would be unusual to consider the levels at premises within the grounds of the shoot.

A5.12 Definitions

Shot level L_{shot}

The maximum A-weighted sound pressure level caused by the shot using time weighting F; or, alternatively, the maximum value caused by the shot in a continuous series of short Leq measurements (i.e. $L_{\text{Aeq}, 100\text{ms}}$ Or $L_{\text{Aeq}, 125\text{ms}}$). Where the recorded level does not correspond to the shot level because of the effect of other noise sources it is denoted below as L'_{shot} .

The shot level L_{shot} can be obtained from the recorded level L'_{shot} by logarithmically subtracting the contemporaneous residual noise level $L_{\text{A,r}}$, according to the equation below.

$$L_{\text{shot}} = 10 * \lg(((10^{L'_{\text{shot}}/10}) - (10^{L_{\text{A,r}}/10})))$$

Residual noise

All noise other than that from the shots being measured.

Contemporaneous residual noise level $L_{\text{A,r}}$

The approximate A-weighted sound pressure level of the residual noise occurring at the same time as the shot whose level is to be determined.

Positive wind vector

A positive wind vector occurs when the wind is blowing directly from the shoot towards the measurement site, plus or minus forty-five degrees. For example, if the residential premises are due east of a shoot then measurements made with the wind blowing in the arc between South West and North West have a positive wind vector.

Recorded shot

A recorded shot is one identifiable from a time history record and/or from a set of measurements.

*Shooting Noise Level *SNL**

The logarithmic average of the 25 highest shot levels from the shoot in question, over the 30 minute measurement period, calculated according to the equation below. The shot levels will have been obtained from recorded levels corrected where necessary for residual noise.

$$SNL = 10 * \lg(((10^{L_{\text{shot},1}/10}) + (10^{L_{\text{shot},2}/10}) + \dots + (10^{L_{\text{shot},25}/10}))/25)$$

where $L_{\text{shot},1}$ to $L_{\text{shot},25}$ are the 25 highest shot levels.

Note: It should be clearly understood that the *SNL* is not equivalent to an $L_{\text{Aeq}, 30\text{minute}}$

$L_{\text{A90},T}$

The A-weighted sound pressure level of the noise at the measurement position that is exceeded for 90% of a given time interval, T (usually 30 minutes), measured using a time weighting F.

Major shoot

A major shoot will have planning permission or is seeking to get it and operate on more than one day a week, have a number of stands, or holds major events.

Major event

A major event would typically consist of a regional, national or international competition, or a sponsored or other event that may attract in excess of 50% more participants than would normally use the shoot.

A5.13 Example calculations

i. Example calculation of Shooting Noise Level

This example shows the calculation of the SNL and the mean SNL in a situation where the shots are more than 10 dB over the contemporaneous residual level.

| Reference number of shot | Recorded shot level L'_{shot} | Recorded shot levels L'_{shot} sorted in descending order | Shot level L_{shot} | $10^{(L_{\text{shot}}/10)}$ |
|--------------------------|--|--|------------------------------|-----------------------------|
| | (dB) | (dB) | (dB) | |
| 1 | 63.4 | 70.7 | 70.7 | 11748976 |
| 2 | 61.9 | 70.2 | 70.2 | 10471285 |
| 3 | 64.6 | 69.4 | 69.4 | 8709636 |
| 4 | 61.0 | 68.3 | 68.3 | 6760830 |
| 5 | 61.0 | 68.1 | 68.1 | 6456542 |
| 6 | 68.3 | 67.4 | 67.4 | 5495409 |
| 7 | 69.4 | 67.3 | 67.3 | 5370318 |
| 8 | 60.4 | 67.2 | 67.2 | 5248075 |
| 9 | 63.5 | 67.2 | 67.2 | 5248075 |
| 10 | 66.9 | 66.9 | 66.9 | 4897788 |
| 11 | 67.2 | 65.8 | 65.8 | 3801894 |
| 12 | 63.9 | 65.7 | 65.7 | 3715352 |
| 13 | 62.9 | 64.7 | 64.7 | 2951209 |
| 14 | 64.7 | 64.6 | 64.6 | 2884032 |
| 15 | 65.7 | 64.3 | 64.3 | 2691535 |
| 16 | 68.1 | 63.9 | 63.9 | 2454709 |
| 17 | 67.2 | 63.5 | 63.5 | 2238721 |
| 18 | 62.4 | 63.5 | 63.5 | 2238721 |
| 19 | 63.5 | 63.4 | 63.4 | 2187762 |
| 20 | 62.3 | 63.4 | 63.4 | 2187762 |
| 21 | 61.3 | 62.9 | 62.9 | 1949845 |
| 22 | 62.0 | 62.4 | 62.4 | 1737801 |
| 23 | 65.8 | 62.3 | 62.3 | 1698244 |
| 24 | 60.8 | 62 | 62 | 1584893 |
| 25 | 67.4 | 61.9 | 61.9 | 1548817 |
| 26 | 60.6 | | | |
| 27 | 70.2 | | | |
| 28 | 70.7 | | | |
| 29 | 64.3 | | | |
| 30 | 67.3 | | | |
| 31 | 63.4 | | | |

Table 1 Example of calculation of SNL

Table 1 shows the 31 marked shots in Figure 1. In this example all the shots are more than 10 dB over the contemporaneous residual level; consequently the shot levels and recorded shot levels are the same.

The SNL is the logarithmic average of the 25 highest shot levels and equals 66.3 dB.

If, for example, the SNL calculated in the same way on four other occasions was, 63.8, 67.3, 62.9 and 65.4 then the mean Shooting Noise Level (mean SNL) would be the arithmetic average of these five SNLs and would equal 65.1 dB.

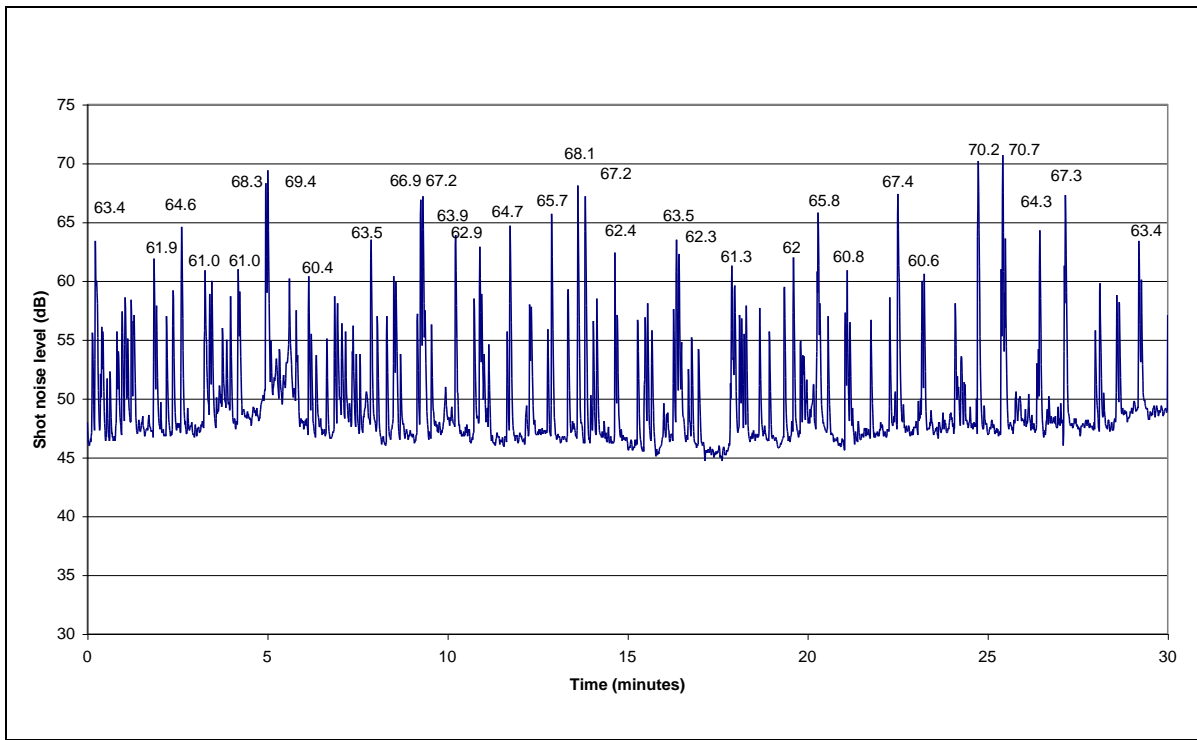


Figure 1: 30min time history of shot noise levels, louder shots marked

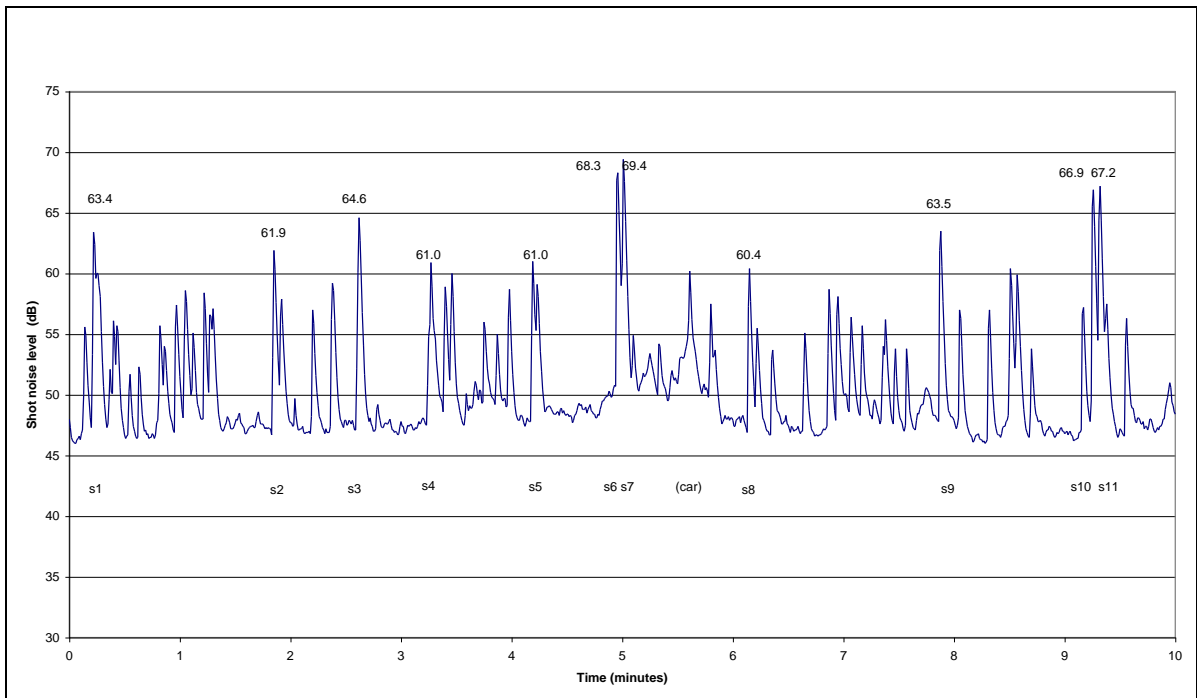


Figure 2: 10min time history of recorded shot levels, louder shots marked (expanded first 10min from Fig 1)

ii. Example calculation of shot level where correction is required

In this example the contemporaneous residual level has been determined as 42.1 dB on the basis of $L_{A90, 30min}$. The example uses a sample of 16 shots recorded in a 3.5 minute period to illustrate the correction of the recorded shot levels for contemporaneous residual level. Table 2 shows the 16 marked shots in Figure 3. Shots 2 and 6 (marked with an *) are less than 6 dB over the contemporaneous residual level and would not be included in any subsequent calculation of SNL. Note that the subsequent calculation of SNL will use the 25 loudest shots over a 30 minute measurement period.

| Reference number of shot | Recorded shot level L'_{shot} | Residual noise level $L_{A,r}$ | Shot level L_{shot} |
|--------------------------|---------------------------------|--------------------------------|-----------------------|
| | (dB) | (dB) | (dB) |
| 1 | 48.9 | 42.1 | 47.9 |
| 2 | 46.7* | 42.1 | * |
| 3 | 48.5 | 42.1 | 47.4 |
| 4 | 48.7 | 42.1 | 47.6 |
| 5 | 49.6 | 42.1 | 48.7 |
| 6 | 46.9* | 42.1 | * |
| 7 | 48.6 | 42.1 | 47.5 |
| 8 | 49.2 | 42.1 | 48.3 |
| 9 | 49.0 | 42.1 | 48.0 |
| 10 | 48.3 | 42.1 | 47.1 |
| 11 | 48.8 | 42.1 | 47.8 |
| 12 | 49.2 | 42.1 | 48.3 |
| 13 | 48.7 | 42.1 | 47.6 |
| 14 | 49.1 | 42.1 | 48.1 |
| 15 | 49.4 | 42.1 | 48.5 |
| 16 | 48.9 | 42.1 | 47.9 |

Table 2: Example of calculation of shot level with correction for contemporaneous residual level

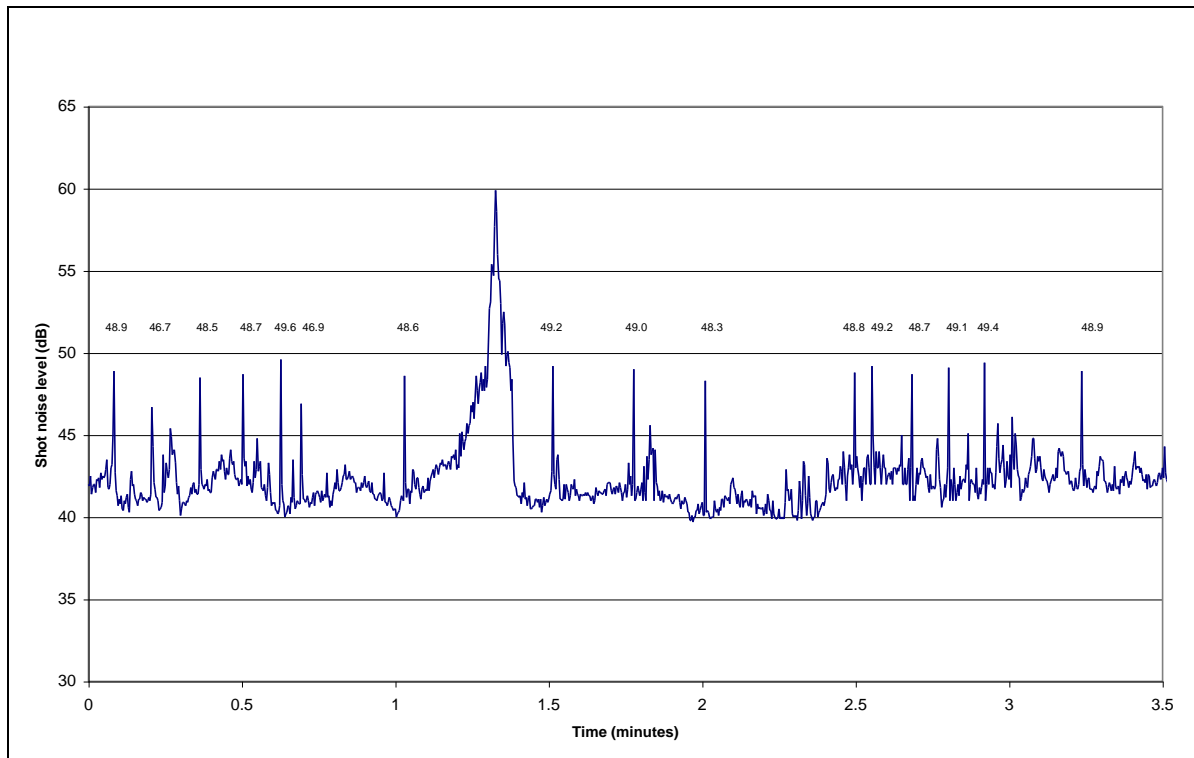


Figure 3: 3.5min time history of recorded shot levels

APPENDIX 6**FURTHER INFORMATION**

Institute of Acoustics
77A St Peter's Street
St Albans
Herts, AL1 3BN

Association of Noise Consultants
6 Trap Road
Guilden Morden
Royston
Herts, SG8 0JE

Countryside Agency
John Dower House
Crescent Place
Cheltenham, GL50 3RA

Council for the Protection of Rural England
Warwick House
25 Buckingham Palace road
London, SW1W 0PP

English Nature
Northminster House
Peterborough, PE1 1UA

Countryside Alliance
The Old Town
367 Kennington Road
London, SE11 4PT

Game Conservancy Trust
Burgate Manor
Fordingbridge
Hampshire, SP6 1EF

Forestry Commission
231 Corstorphine Road
Edinburgh, EH12 7AT

National Farmers Union
164 Shaftesbury Avenue
London, WC2H 8HL

Herpetological Conservation Trust
665a Christchurch Road
Boscombe
Bournemouth, BH1 4AP

Wildlife Trust
The Kiln, Waterside
Mather Road
Newark
Nottinghamshire, NG24 1WT

Wildlife & Countryside Link
31 Pitfield Street
London, N1 6HB

Shooting Associations and Bodies – please refer to an internet or library search

Wildfowl & Wetlands Trust
Slimbridge
Gloucestershire, GL2 7BT

APPENDIX 7

BIBLIOGRAPHY*Books*

Miller D C, *Sound waves their shape and speed*. Macmillan Co., 1937.

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ACKNOWLEDGEMENTS

The CIEH gratefully acknowledges the assistance of BRE staff, past and present, for the provision of technical advice and editorial support. In particular the CIEH wishes to thank Colin Grimwood, John Seller, Matthew Ling, Philip Wright and Nick Antonio without whom this guidance could not have been produced.

Some written material has been adapted from existing regional guidance on clay target shooting noise, most notably material provided by the Midland Joint Advisory Council which formed the basis of the first consultation draft of this document.

Acknowledgement is also given to the Ad Hoc Technical Group (John Grant - Midland Joint Advisory Council; Alan Purdue - Morpeth Borough Council; Mel Kenyon - Martec; Bob Davies - ISVR Consultancy Services) who carried out preliminary trials of an earlier assessment methodology and highlighted many of the issues that have been addressed by this document.

This document has been edited and published by the Chartered Institute of Environmental Health. The acknowledgements given to those listed above does not infer or imply their collective or individual agreement to the content.

IN THE MATTER of the Resource Management Act
1991 and the Local Government
(Auckland Transitional Provision)
Amendment Act 2013

AND

IN THE MATTER of the Proposed Auckland Unitary
Plan

TOPIC: 080 – The Waitemata Gun Club
Precinct

**SUMMARY OF EVIDENCE OF NEVIL IAN HEGLEY
ON BEHALF OF THE WAITEMATA GUN CLUB**

1 EXECUTIVE SUMMARY

- 1.1 The gun club has been operating since 1966 and has operated continuously since then. Although Auckland Council has indicated they think it unlikely the club has existing use rights I am advised the club believes it does have existing use rights. Regardless, the club has shot at, and above, the levels now sought for many years.
- 1.2 The control of gun noise using the normal District Plan noise rules will not provide any realistic protection for the community. Based on the only detailed research currently available the Composite Noise Rating (CNR) method of assessment is recommended as a guide on the effects of gun noise.

- 1.3 I have measured the noise from the gun club under controlled conditions with some noise screens adjacent to the shooting positions and modelled the noise in the area.
- 1.4 From the above work, and limiting the ammunition to 12 gauge and 28 grams of shot the noise has been predicted at representative locations around the range. By controlling the noise level at these locations to the minimum practical this will represent the best practicable option to ensure that the emission of noise does not exceed a reasonable level for the neighbours.
- 1.5 When taking the above into account I am of the opinion that adopting the noise control as originally included in the Draft Unitary Plan will be practical for the gun club to comply with and satisfy section 16 of the Resource Management Act.

2 INTRODUCTION

- 2.1 My name is Nevil Ian Hegley. I have the following experience and qualifications that are relevant to the evidence I shall give:
- (a) I have more than 40 years' experience in civil engineering, for the last 35 years I have specialised in acoustics;
 - (b) I have an MSc from Southampton University where I undertook research in acoustics in 1975/76;
 - (c) I am a Chartered Professional Engineer, International Professional Engineer, a Member of the Institution of Professional Engineers New Zealand, the Institution of Civil Engineers London and the Acoustical Society of America;
 - (d) I have been on the majority of the sub-committees for Acoustic Standards since 1977 and I was the Chairman of the 1984 and

1999 versions of the Construction Noise Standard NZS6803;

(e) In 2010 I received the Meritorious Award by Standards New Zealand for outstanding commitment to the development of New Zealand Acoustic Standards; and

- 2.2 I have been involved with more than 40 different gun and small bore ranges throughout the country. This includes the evaluation of existing and proposed ranges from small corporate style facilities to large facilities where a significant amount of shooting would take place such as for the Commonwealth Games and for the armed forces.
- 2.3 I have provided acoustic advice to the Gun Club since 2012. As part of the preparation of the Draft Unitary Plan, I provided Mr Hay my opinion on the controls which should be included within any Precinct for the Gun Club which were both practical (in terms of the current Gun Club Operation) and which would not result in noise levels beyond what I consider to be a reasonable level in terms of s16. I understand that these recommendations were incorporated into the draft Unitary Plan but were subsequently modified by Council in the notified version of the Proposed Unitary Plan.
- 2.4 I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note and that I agree to comply with the conditions. I confirm that I have considered all of the material facts that I am aware of that might alter or detract from the opinions expressed here.
- 2.5 I have read the evidence of Ms Cox for Auckland Council. I understand that Council has not tabled any Acoustic Evidence. Ms Cox has referred to an earlier report by Mr Styles prepared for Auckland Council. I have previously read this report and had a number of concerns with it and these concerns were relayed to Council. Mr Styles subsequently provided a written response to my concerns in March 2014 although I

have not subsequently heard from Council since then in respect to noise complaints from the Gun Club activity.

3 BACKGROUND

3.1 The Waitemata Gun Club (the Club) was established at 465 Old North Road, Huapai in 1966 and has operated continuously since then. Although originally a rural environment the area to the south has recently been subdivided into countryside living lots.

3.2 Shooting currently can occur 7 days a week and generally between the hours of 9am and 5pm. On two occasions per week shooting can continue through to approximately one hour before twilight, generally this occurs on a Wednesday and Sunday.

3.3 Having monitored the noise from the Gun Club operation it is my opinion that the current noise levels are reasonable in terms of s16.

4 DESIGN LIMITS

4.1 There are no controls in either the Operative District Plan or the Proposed Auckland Unitary District Plan (PAUP) that relate to gun noise. Clause 1.2.1 of NZS6801:2008 *Acoustics – Environmental Noise* as used in the PAUP states the *“impulsive sound (such as gunfire and blasting), requires special techniques that generally are outside the scope of this Standard”*.

4.2 The exclusion of the assessment of gunfire noise from analysis using these Standards is for a good reason. Community reaction to any short duration impulsive type of noise is different to the reaction to typical industrial types of noise.

4.3 Therefore in my opinion it is sensible to include within the Unitary Plan specific noise controls for the Gun Club to reflect that that noise controls in the District Plan do not cover gun noise. Furthermore, adopting a control then sets a limit which noise can be monitored

against in the future in the event of noise complaints.

- 4.4 One method that has been adopted in the past to determine a reasonable noise level from the impact of gun noise is based on a report "Community Reaction to Noise from Hornsby Rifle Range, NAL Report No 84, February 1981". This report uses a composite noise rating value. Based on this research¹, it has been shown that a single figure (CNR) can be calculated from variables that include the number of shots fired on any one day, the proportion of days of the year when shooting takes place, the community adaptation to the shooting and the peak linear noise level of the shots. The following is the equation used to predict the nuisance of gunfire noise:

$$\text{CNR} = (Y - A) - 12 + 10\log N + 10\log R + 10\log T$$

Where:

Y = Linear peak level (dB)

A = a number corresponding to the degree of community adaption correction for community adaptation to the noise. The values of A are 13, 19 or 24 depending on whether adaptation is minimal, moderate or complete (a level of 13 has been adopted in this report).

N = number of single shots or bursts per day

R = number of rounds, detonations, per burst

T = proportion of days per year that shooting occurs

- 4.5 In my opinion, for the Gun Club precinct the aim should be to set a control that stops a general increase in the existing noise level and takes into account the requirements of section 16 of the Resource Management Act which states that the best practicable option must be adopted to ensure that the emission of noise does not exceed a reasonable level.
- 4.6 It is noted that the majority of residents have come to the area after the gun club was established 40 years ago and at that time there was no specific noise limits to comply with. In addition, the Planning

¹ Community Reaction to Noise from Hornsby Rifle Range, NAL Report No 84, February 1981

Tribunal (now the Environment Court) has stated² with respect to a quarry:

... the location of quarries is dependent on where suitable material is to be found. There is not the same freedom for selecting quarry sites as there is for selecting the sites of other industries. In the case of the Waitakere Quarry, it has been established there for many years. The appellants and other residents have only come to the locality more recently, and in the knowledge of the quarry's existence. Therefore they are not entitled, in our opinion, to expect a degree of rural peace which they might have if the quarry were not located in the neighbourhood.

- 4.7 There are a number of similarities with the above decision and the gun club. The locations where a gun club can be relocated are limited and, as set out above, the residents have come to the area in the knowledge of the gun club's existence.
- 4.8 With respect to gunfire, the noise level of each shot has not changed over the years except for the recent introduction of low recoil shells, which will reduce the noise level of the individual shots. The only other potential change to the noise received in the environment will be the number of shots fired. When considering it takes doubling of the number of shots to increase the total noise by 3dBA there has been no significant change in the noise over the years.
- 4.9 To ensure the Club continues to avoid creating unreasonable noise emissions and to satisfy the requirements of section 16 of the RMA I consider that controls should be set on both hours of operation, shot load and a composite noise rating control.
- 4.10 The following restrictions for the operation of the gun club are therefore recommended (and reflect those which were included in the draft Unitary Plan) and can be incorporated as rules within the Precinct:

² Planning Tribunal decision A57/83 J R and J K Carlson vs Waitemata City Council

Hours of operation

1. Shooting must only take place between 9am and 5pm subject to the controls below.
2. For up to two days per week, shooting can continue past 5pm till 1 hour before sunset (as determined by the New Zealand Nautical Almanac as applicable to Auckland).
3. On up to 5 occasions per year, shooting may continue until darkness (as determined by the New Zealand Nautical Almanac as applicable to Auckland) if shooting is required to complete a competition. All neighbours within 1km of the club premises must be notified at least 1 month before these occasions.
4. No shooting must occur on Good Friday, Easter Sunday or Christmas Day.

Noise

1. The gun cartridge loads must not exceed 12 gauge and 28 grams of shot.
2. All shooting activity within the facility must be conducted to ensure that gunshot noise does not exceed a composite noise rating (CNR) of:
 - a. 100 at the intersection of the western boundary of 465 Old North Road (the site) with Pinestone Road
 - b. 95 at the intersection of the boundaries of 465 Old North Road, 41 Pinestone Road and 86 Burns Lane
 - c. 90 at the intersection of the boundaries of 465 Old North Road, 451A Old North Road and 45 Terry Smyth Drive
3. The noise must be measured in accordance with the requirements of NZS6801:2008 *Acoustics - Measurement of Environmental Sound*.

4.11 As outlined earlier, Council has modified the rules in the notified version of the Unitary Plan. The difference between my recommendation and the notified Unitary Plan rules are.

- allowing controlled shooting each day; albeit for a restricted number

of hours;

- the direct notification to neighbours as this information is available on the gun club web site;
- changing the recommendation for loads not to “exceed 12 gauge ~~or~~ and 28 grams of shot”.
- adopting the set CNR levels to reflect what is occurring at the moment (including the existing screening and use of lower recoil shells), which is 5 points above the current proposal and actual levels; and
- the use of NZS6801 has been recommended rather than NZS6802, which appears to be an editorial error.

4.12 It is noted that to reduce the CNR level by what appears to be an arbitrary 5 points, as set out in the Proposed Unitary Plan, means the shots fired would need to be reduced to approximately one quarter of the shots currently fired. This would effectively mean the gun club could not function at this site. I am unsure of the basis of this change by Council.

4.13 The outcome of reducing the number of days when the gun club may operate may not be in the best interests of the neighbours. If no shooting is undertaken on, say, Monday to Wednesday then for the same total noise exposure this would result in significantly more shots being fired during the weekend when most of the residents would be at home. Thus, the effects would be greater for the residents. Again, I am unsure of the basis on which Council has made this change.

5 CONCLUSIONS

5.1 In my opinion, it is appropriate that there is a specific precinct for the Gun Club which incorporates rules for hours of operation, shot load and noise controls.

5.2 I support the controls originally proposed in the draft Unitary Plan with the exception to the correction required to the Standard for noise measurement.

- 5.3 In my opinion the confirmation of the precinct with the rules I have outlined will ensure that a reasonable level of noise is achieved while also setting controls which can be monitored against.
- 5.4 By adopting the proposed controls the noise from the gun club will be at the minimum practical noise level that can be achieved.

Nevil Hegley
15 December 2015

Appendix D: MDA memoes 007 and 008.1

MEMO

| | | | | | |
|-------------------|-------------------------------|-------------------------|------------------|---------------------|----|
| Project: | NPPC | Document No.: | Mm 007 | | |
| To: | NPDC | Date: | 11 December 2024 | | |
| Attention: | Campbell Robinson | Cross Reference: | Mm 006 | | |
| Email: | email | Project No.: | 20220112 | | |
| From: | Damian Ellerton | No. Pages: | 4 | Attachments: | No |
| Subject: | AES AEE dated 6 December 2024 | | | | |

MDA have been commissioned by New Plymouth District Council to review the AES document AC23328-02-R3 dated 6 December 2024 and provide peer review feedback.

Much of our commentary from our memo Mm 006 (5 August 2024) remains relevant and we have retained that where appropriate. Changes made have been highlighted grey for ease of comparison.

By way of recap we have previously:

- Undertaken noise measurements on several different days at the neighbour property
- We have shared raw measurement data with AES
- Undertaken site visit with NPDC staff and AES, hosted by NPPC on a non-shooting day for familiarisation purposes
- Limited our comments with respect to 1222 Devon Rd houses and have not considered the Future Urban Growth areas. However, the same thought process will apply to these, albeit for the Reporting Officer to determine any difference between actual (1222 Devon Rd) and potential Special Purpose – Future Urban Zone (FUZ) effects.
- Prepared Mm 006 in response to AES document AC23328-01-R4 dated 4 July 2024.

PROPOSED NEW PLYMOUTH DISTRICT PLAN (PLAN)

We note the Plan noise rules quoted in AES Table 2.1 are correct, but the matters of discretion appear to be incorrect. Whether the noise limits are applicable because of the limitations of the noise assessment standard they relate to – NZS6802:2008 is not addressed directly.

In our opinion, the noise limits per se are not appropriate for determining the acceptability of noise from firearms. AES correctly identify that NZS6802:2008 specifically notes noise from gunfire is outside the scope of the standard.

We understand from Council staff the activity is non-complying and there are no listed matters of discretion that are applicable.

In our opinion it is therefore incumbent on the applicant to demonstrate the actual or potential effects are avoided, remedied or mitigated to an acceptable level.

With respect to noise, that includes a bespoke approach given the characteristic nature of the noise source and for the technical reasons identified by AES and Council.

AMBIENT NOISE

SH3 road traffic is clearly audible and forms part of the acoustic environment. We note the AES document relies on the ambient noise as a form of mitigation that is sufficient to disguise or mask the proposed activity. We disagree because the character of the noise is significantly different.

The AES document does not explain how the L_{AFmax} and L_{Aeq} inter-relate with respect to either potential masking effect or whether the character of the sounds is comparable enough to provide useful masking at the respective levels.

The character of gunfire and road traffic are very dissimilar. It is our experience that the sound of gunfire at 65dB L_{AFmax} , being the noise limit promoted by AES, is clearly audible at the 1222 Devon Rd houses and is not masked or disguised by road traffic noise to such an extent it could be considered acceptable.

AES para 2.3 does not appear to address how the ambient/background noise is relevant to the activity sound which has a very different character – either at 1222 Devon Rd or Future Urban Zone. We do not have any details of the noise logging undertaken by AES and it may be necessary to review this in the future.

CRITERIA FOR GUNSHOT NOISE

This aspect is critical for determining what an acceptable level of noise is from the proposed activity, particularly in the absence of clear nationally applied guidelines. There are examples of resource consent and Environment Court decisions that use all of the acoustic criteria noted below, which does not assist.

We agree NZS6802:2008 and the Plan is deficient for assessment of noise from gunshot noise.

We also agree the L_{peak} and L_{AFmax} criteria have been used elsewhere. We note L_{Aeq} as an acoustic parameter has been used elsewhere, as well as CNR (based on L_{peak} noise levels).

We have reviewed the documents referenced, and note the following from the Chartered Institute of Environmental Health document¹ (CTS) that AES reference, states:

Where justified complaints of noise have been received or are anticipated by the local authority, or where noise levels are measured or predicted to exceed the levels given in Section 6 of this guidance, then restricting shooting to the following times may provide a suitable remedy:

- (i) Mondays to Fridays: 09.00 to 18.00 with a maximum cumulative duration of 4 hours
- (ii) Saturdays: 10.00 to 18.00 with a maximum cumulative duration of 3 hours
- (iii) Sundays: 10.00 to 14.00 with a maximum cumulative duration of 3 hours

On those sites where shooting occurs on more than 28 days within any calendar year it may, in some circumstances, be appropriate to further restrict the times of operation and/or the number of days per week and/or weeks per year that shooting may take place.

And

“For a given exposure level, community annoyance was found to vary significantly between shoots, but no particular shoot characteristics or socio-demographic variables were seen to be associated with the degree of annoyance. There is some suggestion in the data that different sensitivities exist in different communities and that this affects annoyance, but the causes of differing sensitivities are not clear.

At shooting noise levels below the mid 50's dB(A) there is little evidence of significant levels of annoyance at any site, whereas for levels in the mid to high 60's, significant annoyance is engendered in a majority of sites. For levels in between however, the extent of the annoyance varies considerably from site to site. Thus a level of, say, 60 dB(A) may be deemed acceptable at one site, but not at another.”

We note the noise criteria referred to in the CTS uses SNL – the logarithmic average of highest 25 L_{AFmax} shots in a 30-minute period corrected for residual noise level. Statistically using the highest 25 shots appears acceptable and reflects the comparatively low number of shots anticipated for clay bird shooting compared to the New Plymouth Pistol Club.

¹ Chartered Institute of Environmental Health (2003) Clay Target Shooting Guidance on the Control of Noise

The CTS anticipates limited hours of operation and concludes in summary, SNL <50= good, 65=significant annoyance at majority of sites, and 50-55= generally OK.

The AES document suggests a criterion of 65dB L_{AFmax} – as defacto SNL- relying on the CTS upper limit. What is less clear is whether the CTS criteria is relevant when 1000+ rounds are fired in a 60 min period.

We have three comments regarding the AES statement (page 6 second to last paragraph) “we consider that where noise levels during representative high noise periods from the pistol club of 65dB L_{AFmax} are received at the notional boundary of residential dwellings such as those located at 1222 Devon Rd, the noise will be acceptable and effects minimal, as the instantaneous noise would only be 5-10dB higher than the ambient noise. Given the elevated ambient noise environment in this case, that approach is more conservative than what would often occur in a more ‘typical’ rural environment, with a shooting noise threshold of 55dB L_{AFmax} ”.

1. We agree other consents have used 55dB L_{AFmax} as a noise limit. However, it is not clear what role the ambient (L_{Aeq}) noise plays in masking impulsive gunshot noise quantified by L_{AFmax} . In our experience at 1222 Devon Rd, gunfire can be clearly heard regardless of the road traffic noise.
2. What has not been considered is the number of rounds discharged in relation to the potential number of hours of operation.

Furthermore, the existence of a strong adverse reaction by the owner of 1222 Devon Rd must be factored into this situation and cannot be ignored.
3. We have previously suggested the CNR criteria which uses the L_{peak} rather than the L_{max} . The L_{peak} vs L_{max} are describing *similar* characteristics - in lay terms “the loudest instantaneous noise experienced”. The CNR approach determines representative L_{peak} value for the type of firearm, the number of rounds fired and includes a community sensitivity component.

Whichever acoustic criteria is chosen, it must be appropriate for the receiver site use **and** the consider the number of rounds discharged per hour/per day **and** the total hours of activity **and** the number of days of operation.

In our opinion the *broad noise limit options* include:

- 55dB L_{AFmax} / Monday to Saturday 9am-8pm, Sunday noon-6pm / no limit on number of rounds
- 60dB L_{AFmax} / Monday to Saturday 9am-8pm, Sunday noon-6pm / limit of 2,500 rounds per day
- 60dB L_{AFmax} / 3 days per year/Monday to Saturday 9am-8pm, Sunday noon-6pm / no limit rounds per day – designed to allow competition event

It is not clear what noise criteria is being proposed. We recommend the suggested noise criteria written in the form of a condition, should consent be granted, be provided. The CNR 90 has been discussed, but we also note \reliance on L_{AFmax} in the AES document.

The CTS document is of interest, but we do not consider this to provide any meaningful utility with respect to this application. The averaging of 25 shots is not considered particularly relevant in this case because of the wide range of firearms that may be used at the application site.

We agree a noise management plan is an appropriate tool for addressing noise and allows for changes to be incorporated as required. However, any noise management plan should be practicable, reasonable and enforceable and be written with these principles in mind.

The suggestion that as part of noise management that “seven contiguous 4-hour periods ... each week, within the overall 9am to 9pm hours ... low or no noise ... display these periods on their website calendar, 1 week in advance...” on the face of it seems convoluted and fraught with practical limitations. It also requires third parties to review the applicant website and in effect organise themselves around the calendar. It may be easier to simply suggest instead of 9am to 9pm that these hours are reduced to 6-7 hours per day as shown in Table 7.1 for instance.

The eight annual Club events each being three days long are not guaranteed to comply with the criteria sought (to be confirmed by applicant) and therefore we cannot comment whether this is acceptable. The exemption for two three-day events may be acceptable, depending on the degree of respite offered before or after the event.

We do not agree with the suggestion that Police or AOS firearm training should be exempt from consideration of noise emissions.

The Future Urban Zone and Table 8.1 suggests high L_{AFmax} values from range 6 and 7 usage. Should CNR 90 be used we don't agree that the community adaption factor can be automatically relaxed – it is after all the community response and not solely an engineering assessment.

NOISE MODELLING

We have not reviewed the AES noise model in any detail and have taken their predictions at face value as presented in their Tables 3.1 and 3.2. It appears the applicant proposes some specific noise mitigation in the form of solid fencing, bund height increase, shipping containers stacked two high and a new 2 storey clubroom.

It appears from Table 3.1 that compliance with the suggested noise criteria of 65dB L_{AFmax} may not be achieved. We do not agree with the suggestion that 1-2dB of the proposed limit will have a minimal effect and is therefore acceptable. As a non-complying activity, it is essential that actual or potential noise effects are thoroughly addressed. Proposing a noise limit and then suggesting exceeding this would seem counter to this premise.

The reliance, and mitigating effect of, the ambient (L_{Aeq}) noise environment for masking, is also not explained satisfactorily as previously noted.

While we are not addressing the FUZ specifically, the rationale that a noise limit to future housing should be 70dB L_{AFmax} “to ensure effects are only minor” is not clearly explained.

SUMMARY

We are comfortable the L_{AFmax} acoustic parameter is appropriate for quantifying firearm noise provided the frequency of occurrence and hours/days are also considered in determining an appropriate noise limit.

The proposed noise limits to control noise from the New Plymouth Pistol Club is considered too high.

Council has received a number of complaints from 1222 Devon Rd and undertaken a number of measurements. During the measurement and analysis of noise from the New Plymouth Pistol Club it was noted the discharge of firearms was clearly audible even at the noise limit level suggested by AES as being appropriate.

The proposed limits do not appear to include any consideration of the number of rounds discharged nor the potentially extensive hours that are applied for.

Assuming the noise modelling is correct for the proposed mitigation, we do not agree with the approach the 1-2dB over the proposed noise limit is acceptable.

In our opinion, and for the reasons given above, we consider the proposed noise limit to be too high and will not appropriately control noise to an appropriate level.

MEMO

| | | | | | |
|-------------------|-------------------------------|-------------------------|-----------------|---------------------|----|
| Project: | NPPC | Document No.: | Mm 008.1 | | |
| To: | NPDC | Date: | 30 January 2025 | | |
| Attention: | Campbell Robinson | Cross Reference: | Mm 006 | | |
| Email: | email | Project No.: | 20220112 | | |
| From: | Damian Ellerton | No. Pages: | 5 | Attachments: | No |
| Subject: | AES AEE dated 6 December 2024 | | | | |

This memo is an updated version of Mm008 in response to comments raised by consultant planner in email dated 27 January 2025. New text is shown as **bold** to make it easier to follow from original text.

By way of summary we have distilled our outstanding questions as follows:

- **Where was the ambient noise obtained via noise logger during May 2024?**

Please send a copy of the details regarding the equipment used and the personnel responsible as well as the raw and filtered noise logging data.

- **We consider the character of firearm noise is significantly different to the noise of road traffic noise. We do not agree with the suggestion that the sound of gunfire would “emerge over the ambient noise to a modest degree”.**
- **The use of CNR as a criteria used in determining potential noise levels which we agree with. There is also reference compliance with District Plan noise limits that we consider redundant.**

We recommend the applicant draft a proposed noise condition for Council to review.

In addition to a draft noise condition, a draft noise management plan would be prudent to illustrate how noise may be managed on a day to day basis.

- **We understand the reference to L_{AFmax} has been used in some instances to determine what effect noise mitigation may have in comparison to the noise model. It should be noted if the CNR noise limit is adopted it utilises the L_{peak} acoustic parameter and therefore the potential variation in L_{AFmax} / L_{peak} values for different firearms should be factored into this.**

Should consent be granted, it would be anticipated that a noise monitoring condition be included to determine the actual noise mitigation provided by the proposed barriers and building structures.

- **The exemption of Police/AOS activities has not been previously discussed or agreed to and is not appropriate in our opinion.**

MDA have been commissioned by New Plymouth District Council to review the AES document AC23328-02-R3 dated 6 December 2024 and provide peer review feedback.

Much of our commentary from our memo Mm 006 (5 August 2024) and Mm007 (11 December 2024) remains relevant, and we have retained that where appropriate and provided commentary on degree of public notification.

By way of recap we have previously:

- Undertaken noise measurements on several different days at the neighbour property
- We have shared raw measurement data with AES
- Undertaken site visit with NPDC staff and AES, hosted by NPPC on a non-shooting day for familiarisation purposes
- Limited our comments with respect to 1222 Devon Rd houses and have not considered the Future Urban Growth areas. However, the same thought process will apply to these, albeit for the Reporting Officer to determine any difference between actual (1222 Devon Rd) and potential Special Purpose – Future Urban Zone (FUZ) effects.
- Prepared Mm 006 in response to AES document AC23328-01-R4 dated 4 July 2024.
- Prepared Mm 007 in response to AES document AC23328-01-R4 dated 6 December 2024.

PROPOSED NEW PLYMOUTH DISTRICT PLAN (PLAN)

We note the Plan noise rules quoted in AES Table 2.1 are correct, but the matters of discretion appear to be incorrect. Whether the noise limits are applicable because of the limitations of the noise assessment standard they relate to – NZS6802:2008 is not addressed directly.

In our opinion, the noise limits per se are not appropriate for determining the acceptability of noise from firearms. AES correctly identify that NZS6802:2008 specifically notes noise from gunfire is outside the scope of the standard.

We understand from Council staff the activity is non-complying and there are no listed matters of discretion that are applicable.

In our opinion it is therefore incumbent on the applicant to demonstrate the actual or potential effects are avoided, remedied or mitigated to an acceptable level.

With respect to noise, that includes a bespoke approach given the characteristic nature of the noise source and for the technical reasons identified by AES and Council.

It is not clear how the conclusion (page 14 final paragraph) is reached that “full compliance will be achieved with the District Plan noise limits ...”.

AMBIENT NOISE

SH3 road traffic is clearly audible and forms part of the acoustic environment. We note the AES document relies on the ambient noise as a form of mitigation ***in section 2.4, page 6 last paragraph, but fails to offer any explanation as to what extent. In our opinion*** the character of the noise ***of the activity*** is significantly different ***that even at elevated ambient noise levels gunfire can be clearly heard.***

The character of gunfire and road traffic are very dissimilar. It is our experience that the sound of gunfire at 65dB L_{AFmax} , being the noise limit ***recommended*** by AES (***section 2.4, page 6 last paragraph***), ***is clearly audible at 1222 Devon Rd second house and further afield and we disagree that the sound of gunfire would “emerge over the ambient noise to a modest degree”.***

AES para 2.3 does not appear to address how the ambient/background noise is relevant to the activity sound which has a very different character – either at 1222 Devon Rd or Future Urban Zone. In section 2.4, page 7 first paragraph, we do not have any details of the noise logging undertaken by AES and it may be necessary to review this in the future.

CRITERIA FOR GUNSHOT NOISE

This aspect is critical for determining what an acceptable level of noise is from the proposed activity, particularly in the absence of clear nationally applied guidelines. There are examples of resource consent and Environment Court decisions that use all of the acoustic criteria noted below, which does not assist.

We agree NZS6802:2008 and the Plan is deficient for assessment of noise from gunshot noise.

We also agree the L_{peak} and L_{AFmax} criteria have been used elsewhere. We note L_{Aeq} as an acoustic parameter has been used elsewhere, as well as CNR (based on L_{peak} noise levels).

CTS Document

We have reviewed the documents referenced, and note the following from the Chartered Institute of Environmental Health document¹ (CTS) that AES references. *This document* states:

Where justified complaints of noise have been received or are anticipated by the local authority, or where noise levels are measured or predicted to exceed the levels given in Section 6 of this guidance, then restricting shooting to the following times may provide a suitable remedy:

- (i) Mondays to Fridays: 09.00 to 18.00 with a maximum cumulative duration of 4 hours
- (ii) Saturdays: 10.00 to 18.00 with a maximum cumulative duration of 3 hours
- (iii) Sundays: 10.00 to 14.00 with a maximum cumulative duration of 3 hours

On those sites where shooting occurs on more than 28 days within any calendar year it may, in some circumstances, be appropriate to further restrict the times of operation and/or the number of days per week and/or weeks per year that shooting may take place.

And

"For a given exposure level, community annoyance was found to vary significantly between shoots, but no particular shoot characteristics or socio-demographic variables were seen to be associated with the degree of annoyance. There is some suggestion in the data that different sensitivities exist in different communities and that this affects annoyance, but the causes of differing sensitivities are not clear.

At shooting noise levels below the mid 50's dB(A) there is little evidence of significant levels of annoyance at any site, whereas for levels in the mid to high 60's, significant annoyance is engendered in a majority of sites. For levels in between however, the extent of the annoyance varies considerably from site to site. Thus a level of, say, 60 dB(A) may be deemed acceptable at one site, but not at another."

We note the noise criteria referred to in the CTS uses SNL – the logarithmic average of highest 25 L_{AFmax} shots in a 30-minute period corrected for residual noise level. Statistically using the highest 25 shots appears acceptable and reflects the comparatively low number of shots anticipated for clay bird shooting compared to the New Plymouth Pistol Club.

The CTS document is of interest, but we do not consider this to provide any meaningful utility with respect to this application. The averaging of 25 shots is not considered particularly relevant in this case because of the wide range of firearms that may be used at the application site.

¹ Chartered Institute of Environmental Health (2003) Clay Target Shooting Guidance on the Control of Noise

Proposed criteria

We agree other consents have used 55dB L_{AFmax} as a noise limit. However, it is not clear what role the ambient (L_{Aeq}) noise plays in **mitigating the emergence of** impulsive **firearm discharge** noise quantified by L_{AFmax} . In our experience at 1222 Devon Rd, gunfire can be clearly heard regardless of the road traffic noise.

What has not been considered is the number of rounds discharged in relation to the potential number of hours of operation.

Furthermore, the existence of a strong adverse reaction by the owner of 1222 Devon Rd must be factored into this situation and cannot be ignored, given the history of complaint.

We have previously suggested the CNR criteria which uses the L_{peak} rather than the L_{max} . The L_{peak} vs L_{max} are describing *similar* characteristics - in lay terms “the loudest instantaneous noise experienced”. The CNR approach determines representative L_{peak} value for the type of firearm, the number of rounds fired and includes a community sensitivity component.

Whichever acoustic criteria is chosen, it must be appropriate for the receiver site use **and** the consider the number of rounds discharged per hour/per day **and** the total hours of activity **and** the number of days of operation.

We recommend the applicant prepares for comment the noise criteria proposed and written in the form of a condition, should consent be granted. The CNR 90 has been discussed, but we also note reliance on the assumption in AES document that Future Urban Zone residents will be less sensitive to firearm discharge noise – which affected the calculation of CNR.

We do not agree with the suggestion that Police or AOS firearm training should be exempt. It has not been discussed previously and excluding a potentially significant source of noise is not considered to be avoiding, remedying or mitigating the [noise] effect. Furthermore, it appears from the predicted noise levels that compliance with CNR 90 can be achieved including use of 9mm service firearms – in which case, why do they need to be exempt?

Noise management

We agree a noise management plan is an appropriate tool for addressing noise and allows for changes to be incorporated as required. However, any noise management plan should be practicable, reasonable and enforceable and be written with these principles in mind.

The suggestion that as part of noise management that “seven contiguous 4-hour periods ... each week, within the overall 9am to 9pm hours ... low or no noise ... display these periods on their website calendar, 1 week in advance...” on the face of it seems convoluted and fraught with practical limitations. It also requires third parties to review the applicant website and in effect organise themselves around the calendar. It may be easier to simply suggest instead of 9am to 9pm daily that these hours are reduced to 6-7 hours per day as shown in Table 7.1 of the AES document for instance.

The eight annual Club events each being three days long are not guaranteed to comply with the criteria sought (to be confirmed by applicant) and therefore we cannot comment whether this is acceptable. The exemption for two three-day events **may** be acceptable, depending on the degree of respite offered before or after the event.

With respect to the Future Urban Zone, should CNR 90 be used we do not agree that the community adaption factor can be automatically relaxed – it is after all the community response and not solely an engineering assessment.

The reliance, and mitigating effect of, the ambient (L_{Aeq}) noise environment **in minimising the emergence of firearm discharge noise**, is also not explained satisfactorily as previously noted.

NOISE MODELLING

We have not reviewed the AES noise model in any detail and have taken their predictions at face value as presented in their Table 3.1. It appears the applicant proposes some specific noise mitigation in the form of solid fencing, bund height increase, shipping containers stacked two high and a new 2 storey clubroom.

Should consent be granted it is likely a condition requiring noise monitoring would be imposed. The results of this noise monitoring and calculation of CNR, if that criteria is used, will determine the accuracy of the noise modelling particularly with respect to mitigation of noise from proposed barriers/structures.

PUBLIC NOTIFICATION

We have been asked to provide an indicative radius around the application where the potential noise effects may be reduced to an appropriate extent site.

Should Council decide to limit the public notification process for the application, we recommend this include all properties within a 500m radius of the site.

The distance of 500m was considered to represent a radius where noise from firearm discharge is reduced to a level whereby still audible, but not to an extent Council would consider immediate enforcement action.

SUMMARY

Council has received a number of complaints from 1222 Devon Rd and undertaken a number of measurements. During the measurement and analysis of noise from the New Plymouth Pistol Club it was noted the discharge of firearms was clearly audible, albeit to different degree depending on factors such as the firearm, ammunition type and range in use.

We acknowledge firearm noise criteria varies throughout New Zealand and AES on behalf of the applicant suggest CNR criteria. The CNR calculation includes a Community Adaption Factor and it is suggested that new home owners will be less sensitive to firearm noise due to SH3 road traffic noise. This may be too simplistic an approach given the character difference between road traffic noise and firearm discharge means that masking of the proposed activity [noise] effect will be minimal if at all.

It is not clear from the AES document what form the proposed noise rule would take. We recommend a draft noise rule is provided for comment with the application.

The fundamental considerations for any noise criteria/rule must be appropriate for the receiver site use **and** the consider the number of rounds discharged per hour/per day **and** the total hours of activity **and** the number of days of operation.

The requirement for a noise management plan has been discussed and we agree this would be a fundamental requirement. It is not clear why the L_{AFmax} criteria is discussed with respect to the noise management plan – but as noted previously a draft noise rule may clarify this. There has also been suggested an online diary is available ahead of usage – we are not sure how effective this would be in mitigating any potential noise effects.

A noise management plan has not been provided for us to review and we recommend one is drafted for comment with the application.

It has been suggested that Police/AOS training noise be exempted and we disagree with this suggestion.

There may be some limited exemption afforded to a small number of 2-3 day events such as hosting national events, but this may only be tempered by a respite period either prior or post event. Submitter feedback on such a proposal will help inform what form any exemption may take.

Should the application be subject to limited public notification we recommend properties within a radius of 500m around the application site be included.