

**BEFORE THE PROPOSED PORIRUA DISTRICT PLAN HEARINGS
PANEL**

PORIRUA CITY COUNCIL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the Proposed Porirua District Plan

**STATEMENT OF EVIDENCE OF DARRAN HUMPHESON
ON BEHALF OF NEW ZEALAND DEFENCE FORCE
SUBMITTER 124
20 January 2022**

STATEMENT OF EVIDENCE OF DARRAN HUMPHESON ON BEHALF OF NEW ZEALAND DEFENCE FORCE (NZDF) – SUBMITTER 124

INTRODUCTION

- 1 My full name is Darran Humpheson. I am a Technical Director of Acoustics at Tonkin & Taylor Limited. I am providing acoustic evidence on behalf of New Zealand Defence Force (**NZDF**).
- 2 I hold a Bachelor of Science degree with Honours in Applied Physics and a Master of Science degree in Environmental Acoustics. I am a Member of the Acoustical Society of New Zealand and a Member of the United Kingdom's Institute of Acoustics. I am a New Zealand representative of the International Standards Organisation (**ISO**) technical committee ISO/TC 43 SC1 "Noise".
- 3 I have been employed in acoustics since 1991 and have previously held positions as a consultant for international firms AECOM (Technical Director 2013-2019), Bureau Veritas (Technical Director 2012-2013), RPS Group plc (Technical Director 2002-2012) and as a UK Ministry of Defence scientist (Head of the Royal Air Force's Noise and Vibration Division 1991-2002).
- 4 Of relevance to this hearing, I have extensive experience providing acoustics services for military activities specialising in aviation and weapon noise. I have previously provided expert opinion on behalf of NZDF regarding noise associated with Temporary Military Training Activities (**TMTA**) at five district plan hearings.
- 5 I am familiar with NZDF's submission on the proposed Porirua District Plan (**Proposed District Plan**). I have reviewed the statement of evidence of Mr Nigel Lloyd, the section 42A Noise report prepared by Mr Rory Smeaton, and the section 42A Temporary Activities report prepared by Mr Michael David Rachlin.
- 6 Where appropriate, my statement of evidence references the statement of evidence provided by Ms Rebecca Davies of NZDF and Mr Alex Gifford's

planning statement of evidence.

CODE OF CONDUCT

- 7 I confirm that I have read the Environment Court's Code of Conduct for Expert Witnesses set out in the Environment Court's Code of Practice Note 2014. I agree to comply with this Code. I confirm that the issues addressed in this statement of evidence are within my area of expertise and that I have not omitted to consider any material facts known to me that might alter or detract from my opinions expressed in this evidence.

TEMPORARY MILITARY TRAINING ACTIVITIES

- 8 NZDF undertakes TMTA across the country as part of its duties to maintain the nation's security, maintaining NZDF operational capacity and providing for the well-being, health and safety of New Zealand's communities.
- 9 Training activities are essential in maintaining the capability of the armed forces so that NZDF is ready to respond to a wide range of national and international situations, including providing aid and assistance following emergencies such as earthquakes and major storm events. As Ms Davies has explained, TMTA are carried out off-base to 'test' personnel and resources in unfamiliar surroundings and to provide 'realism' to the skills learnt on-base.
- 10 TMTA by definition are temporary in nature and can vary in duration from a couple of hours or days to a few weeks depending upon the type and scale of the activity. TMTA may take place in a variety of locations ranging from built-up urban areas to remote rural sites.
- 11 As explained by Ms Davies, use of weapons and explosives are much less likely to take place than other essential activities. Live and blank firing will more likely occur in rural zones with landowner permission, however these activities may also be carried out in industrial, commercial and built-urban areas to provide diversity and realism in different training environments.

NOISE SOURCES

- 12 Not all TMTA include impulsive noise associated with weapon firing, grenades and “battle simulation” pyrotechnics. For much of the time, the noise associated from TMTA may be low level with occasional periods of higher levels of noise.
- 13 The noise generated by TMTA may be categorised by the following:
 - a) Impulsive noise - live and blank firing and explosions;
 - b) Mobile sources, such as vehicles and earth moving equipment;
 - c) Fixed sources, such as power generators and water pumps; and
 - d) Helicopter landings.
- 14 These four categories of noise may occur in isolation or in combination and each category of noise has its own characteristics in terms of noise level (magnitude), duration (transient or continuous) and frequency (low or high frequency/pitch). The character of each noise source means that different noise assessment methods are relevant when controlling and assessing noise effects.
- 15 The following section only considers the first category of noise and the relief sought in the Proposed District Plan. NZDF’s submission on mobile sources, fixed sources and helicopter landings has been accepted in Mr Rachlin’s Section 42A Officer’s Report and as detailed in the Proposed District Plan’s Appendix APP2-Table 1.
- 16 One matter of clarification is that the noise measurement/assessment location should be specified. As the majority of TMTA takes place in a rural area, the appropriate measurement location will generally be at any point with the notional boundary¹ of any rural dwelling, i.e. where the noise is experienced rather than the site boundary, which for large rural sites could be many hundreds of metres from a dwelling. For TMTA which may take

¹ Notional boundary as defined in the National Planning Standards - a line 20 metres 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.

place in an urban area the use of the notional boundary is also appropriate as the definition allows for use of the legal/site boundary if the 20 metre line falls outside the site. Mr Gifford addresses this clarification in his evidence.

Weapons firing and/or the use of explosives

- 17 Live and blank firing activities are relatively infrequent and are recognised as being a unique source of noise, specific to certain forms of TMTA. Weapon firing and the detonation of explosives are typically performed within designated training areas; however, firing of blank ammunition on land controlled by a private or public owner does occur and will more commonly be from small arms (rifles).
- 18 Unlike other sources of impulsive noise which commonly occur in the district (bird scarers, alarms etc), the impulsive characteristics of weapon firing and/or use of explosives by NZDF warrants a different assessment approach compared to the average or maximum noise level assessment approach routinely applied in district plans².
- 19 In comparison to general environmental noise sources, TMTA impulsive noise associated with the use of weapons and explosives has a greater magnitude and strong low frequency component. It also has a very fast rise time and very short decay (very short duration), typically lasting for less than 100 milliseconds.
- 20 Compared to the noise generated by a shotgun for example, the noise from small arms is typically described as a 'crack' rather than a 'bang'. This is a feature of the much shorter duration of the noise.

New Zealand Standards

- 21 *New Zealand Standard NZS 6801:2008 'Acoustics – Measurement of environmental sound'* is a mandatory noise standard of the National Planning Standards (**NPS**). NZS 6801:2008 requires that an impulse noise

² Average level being measured and assessed by the LEQ / LAeq noise metric. Maximum by the LMax / LAmx noise metric.

source (such as weapon firing and use of explosives) is measured using the peak level and either the C-weighting or the Z-weighting (L_{peak}) is applied. C-weighting is more commonly used as it more accurately mimics the frequency response of the human ear to low frequency impulsive noise.

- 22 *New Zealand Standard NZS 6802:2008 Acoustics – Environmental Noise* is used as the starting platform for setting district plan environmental noise limits within New Zealand. It is also a referenced standard in the NPS.
- 23 The Proposed District Plan requires that noise shall be measured in accordance with NZS 6801:2008 and assessed in accordance with NZS 6802:2008. The plan recognises³ that specific sources of noise such as construction and aircraft should not be assessed using NZS 6802:2008 as other more relevant noise standards apply.
- 24 The noise standards for TMTA proposed in the section 42A report of Mr Rachlin⁴ does not comment on the application or otherwise of NZS 6802:2008 when assessing the noise from TMTA weapon firing and use of explosives. Clause 1.2.1 of NZS 6802:2008 states that the standard was not designed to assess impulse sound such as gunfire and blasting due to the unique characteristics of these noise sources.
- 25 The only New Zealand standard which is relevant is NZS 6803:1999 Acoustics – Construction Noise. NZS 6803:1999 sets out recommended noise limits for impulsive noise and blasting activities, and this standard is applied in the Proposed District Plan (NOISE-R2). For the reasons I explain in the following section, NZDF adopts a more onerous sets of noise limits for gunfire and blasting than the impulse noise limit recommended in NZS 6803:1999.
- 26 For consistency within the Proposed Plan, I recommended that APP2 includes an appropriate statement that noise from weapon firing and use of explosives is not assessed using NZS 6802:2008.

³ Officer's Report: Part B – Noise – Appendix A

⁴ APP2

Proposed NZDF noise limits

27 NZDF has a standard two tiered approach to assessing and managing noise from weapon firing and use of explosives. The approach is based on minimum separation distances and maximum peak sound levels for the day time (0700-1900) and night time (1900-0700) periods.

28 The applicable noise rules are:

Notice is provided to the Council at least 5 working days prior to the commencement of the activity.

The activity complies with the following minimum separation distances to the notional boundary of any building housing a noise sensitive activity:

0700 to 1900 hours: 500m

1900 to 0700 hours: 1,250m

Where the minimum separation distances specified above are not met, then the activity shall comply with the following peak sound pressure level when measured at the notional boundary of any building housing a noise sensitive activity:

0700 to 1900 hours: 95 dBC

1900 to 0700 hours: 85 dBC

29 Although an absolute peak sound pressure level limit of 120 dBC is recommended in NZS 6803:1999 Acoustics – Construction Noise⁵, NZDF applies a more rigorous level of:

- a) 95 dBC L_{peak} during the ‘day time’ period from 0700 to 1900 hrs; and
- b) 85 dBC L_{peak} for the ‘night time’ period from 1900 to 0700 hrs.

30 Malcolm Hunt Associates (MHA), on behalf of NZDF, prepared a noise report on TMTA noise⁶. This technical report details the source levels for a

⁵ NZS 6803:1999 states at clause 8.1.4: “Noise from use of explosives is also a special case. The adoption of good blasting practices will reduce the inherent and associated impulsive noise and vibration. Practices should conform with the provisions of documents such as AS 2187:Part 2 [Explosives—Storage and use Part 2: Use of explosives 2006], provided that the airblast noise limit shall be a peak sound level of 120 dBC measured at a suitable location as specified in 6.1.”

⁶ Re-Assessing Noise from Temporary Military Training in New Zealand District Plan Recommendations, Malcolm Hunt Associates, January 2013

range of weapon types and explosives.

- 31 For typical TMTA weapon firing, the peak levels I have outlined above correspond to setback distances of 500m and 1,250m respectively. The setback distances are based on worst case positive downwind sound propagation conditions. In practice, the resulting sound levels will be lower than these due to more favourable propagation conditions. The setback distances therefore ensure the NZDF's peak noise limits will be met with a factor of safety built into them.
- 32 The original setback distances that were included in AP22-Table 1 were based on use of the howitzer, which produced very high levels of sound. This weapon system is no longer used by NZDF and hence the reason why much shorter setbacks are now proposed by NZDF.
- 33 I consider that the setback distance has merit because it allows NZDF personnel with no acoustics knowledge to plan where firing may occur without adversely affecting residential amenity. It also provides certainty to Councils as the distance at which an activity occurs can be measured without the need to undertake compliance noise monitoring. A further advantage to the setbacks is that weather conditions do not need to meet the prescribed standards for undertaking noise measurements. Ms Davies provides more details on the advantages of this approach in her Statement of Evidence, in particular the use of the two tiered system.
- 34 The tiered system to managing the effects of weapon and explosive noise, i.e. initially using setback distances when planning TMTA, will provide additional assurance that these peak sound levels will be achieved.

Council's recommendation

- 35 Mr Nigel Lloyd considers TMTA noise in paragraphs 59-73 of his evidence. He does not consider a need for APP2 to include separation distances *'because the space is quite limited as to where TMTA could take place [in] the Porirua City District that is greater than 500 metres from a noise*

*sensitive activity*⁷. Mr Llyod's statement only relates to TMTA that involves use of weapons or explosives. As Ms Davies has explained, many TMTA do not involve these activities.

36 I have reproduced Figure 1 from Mr Rachlin's report below. The areas shaded blue are the 500m setbacks from noise sensitive activity. All of the areas shaded orange and green would be greater than 500m from any noise sensitive activity. The map therefore shows there are areas where weapon firing and use of explosives can occur in the district based on the proposed setbacks.

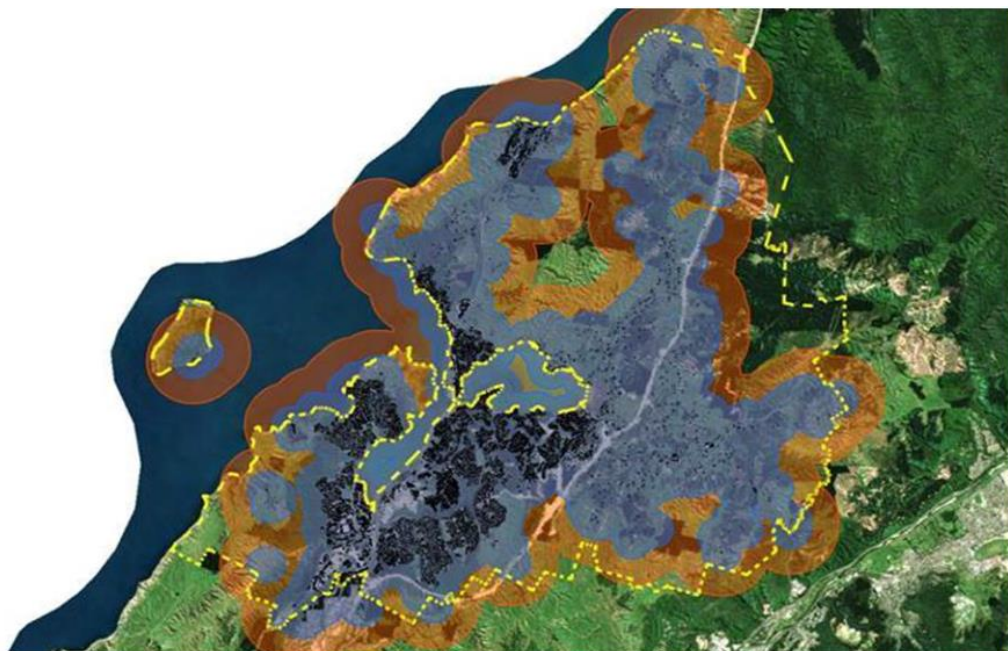


Figure 1: Map of Porirua showing 500m and 1250m setbacks from residential properties

37 For the reasons I have set out above (my paragraphs 31 to 34), it is more appropriate to retain the setback approach as NZDF personnel can assess where TMTA involving weapon firing and/or use of explosives can occur.

38 Mr Lloyd does not raise an issue with the noise level itself but rather that people who hear even distant gunfire (battle simulations) will be perturbed or frightened⁸. His justification for this statement is not supported. The peak sound levels used by NZDF to manage weapon firing and explosives have

⁷ Mr Lloyd's evidence, paragraph 61

⁸ Mr Lloyd's evidence, paragraph 65

been informed by international research⁹ and are sufficiently conservative to minimise the adverse effects of this type of noise, such as annoyance and disturbance.

- 39 As explained by Ms Davies, the frequency of NZDF exercises which may involve using weapons and explosives is limited compared to other TMTA and it is NZDF standard practice when undertaking TMTA to provide prior notice to neighbouring landowners. If people are aware of the presence of a noise source and expect it to occur, they are much less likely to be startled when it occurs. Prior notice involves informing potentially affected properties when TMTA is likely to take place and the days and times when unusual noise will be generated. This communication allows people to be aware that noise will occur and as a consequence, these people are less likely to be affected. Ms Davies provides more information on this engagement process.
- 40 Prior notice to surrounding landowners and the use of NZDF's tiered approach (separation distances and peak noise limits) will, in my opinion, minimise the potential for people to be 'perturbed or frightened'.
- 41 APP2, as currently drafted, allows use of weapons or explosives as a permitted activity during the day (0700–1900 hrs) and a restricted discretionary activity at night (1900-0700 hrs). As explained by Ms Davies this does not provide the necessary flexibility for NZDF.
- 42 While some exercises may involve firing weapons and use of explosives after 2200 hrs at night when people may be sleeping, such occasions are relatively rare and it is more likely that TMTA will occur during the evening period (1900-2200 hrs), especially in the winter months when it is dark but still considered part of the normal day (1900 hrs). The effects of this type of noise on people during these hours will be significantly less than if the noise occurred during the middle of the night. There will be locations in the district where use of weapons and explosives could occur whilst meeting

⁹ Sorenson and Magnusson, 'Annoyance caused by noise from shooting ranges', *Journal of Sound and Vibration*, Vol 62, 437-442, 1979.

the night time noise standard of 85 dBC due to the shielding effects of terrain and/or building structures. As I have stated people will be less disturbed by a noise if they know when it will occur. For these reasons I do not consider it appropriate to require a consent for use of weapons and explosives during the hours of 1900 – 0700 hrs. Instead, I consider the permitted activity status (as established by the two-tiered approach) appropriately manages the noise effects of this activity at night.

- 43 I consider that the day time limit is sufficient to preserve residential amenity when experienced either indoors or outdoors and the night time limit is sufficient to prevent loss of sleep quality¹⁰ across all zones. The use of setback distances when planning TMTA provides additional assurance that these peak sound levels will be achieved.

CONCLUSION

- 44 Temporary military training activities are essential and in many respects are identical to training activities carried out by other emergency services and commercial organisations. NZDF is seeking to apply a standard set of rules to TMTA noise that can be consistently used in district plans throughout the country. These controls are proposed for the Proposed District Plan.
- 45 As noted in my evidence, I consider that the relief sought will result in acceptable noise effects that appropriately protect amenity values.

Darran Humpheson

January 2022

¹⁰ Sleep quality is dependent upon the sound level, frequency of events and the cumulative effects over multiple nights. A single night of 'noise' has been shown by the World Health Organisation to have a negligible effect on sleep quality. Whereas multiple exposures will result in a gradual reduction in sleep quality. This observation also applies to general TMTA noise. Source - WHO, Environmental Noise Guidelines for the European Region, 2018.