

Before the Independent Hearing Panel at Westport

under: the Resource Management Act 1991

in the matter of: submissions and further submissions in relation to the
Proposed Te Tai o Poutini Plan

Topic: Rural Zone

and: **Radio New Zealand Limited**
Submitter 476

Statement of Evidence of Steve White for Radio New Zealand
Limited

Dated: 2 July 2024

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STATEMENT OF EVIDENCE OF STEVE WHITE FOR RADIO NEW ZEALAND LIMITED

INTRODUCTION

- 1 My full name is Stephen Charles White. I am a Transmission Engineer Specialist employed by Radio New Zealand Limited (*RNZ*).
- 2 I am a qualified Radio Technician, and Electrical Services Technician. I hold a current Radio Technician's Certificate and Supplementary RTC (Digital & Analog Electronics & Advanced Transmission Techniques). I have over 32 years' experience in all aspects of radio and television transmission engineering and maintenance in Australia, New Zealand and the Pacific. This has included:
 - 2.1 31 years extensive experience in the design, construction and commissioning of medium frequency antenna systems and coupling units throughout New Zealand, Australia and the Pacific.
 - 2.2 Extensive experience in the planning, and measurement of medium frequency and high frequency coverage.
 - 2.3 Extensive experience in the prediction, and measurement of medium frequency electromagnetic radiation (*EMR*).
- 3 I have worked for *RNZ* for 15 years and have primary responsibility for the safe operation and maintenance of *RNZ's* AM transmission network.
- 4 I was involved in the preparation of *RNZ's* submission and further submission on the proposed Te Tai o Poutini Plan (*Proposed Plan*). I am familiar with these documents and adopt these as part of my evidence to the extent relevant. I am authorised to give evidence on *RNZ's* behalf.

CODE OF CONDUCT

- 5 Although this is not an Environment Court hearing, I note that in preparing my evidence I have reviewed the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023. I have complied with it in preparing my evidence on technical matters. I confirm that the technical matters on which I gave evidence are within my area of expertise, except where relying on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from my opinions expressed.

SCOPE OF EVIDENCE

- 6 My evidence will deal with the following:
- 6.1 Background and overview of RNZ and its facilities at Cape Foulwind;
 - 6.2 Health and safety risks associated with electromagnetic radiation;
 - 6.3 The process for RNZ to conduct a site-specific assessment and examples of suitable mitigation measures; and
 - 6.4 RNZ's requested relief.

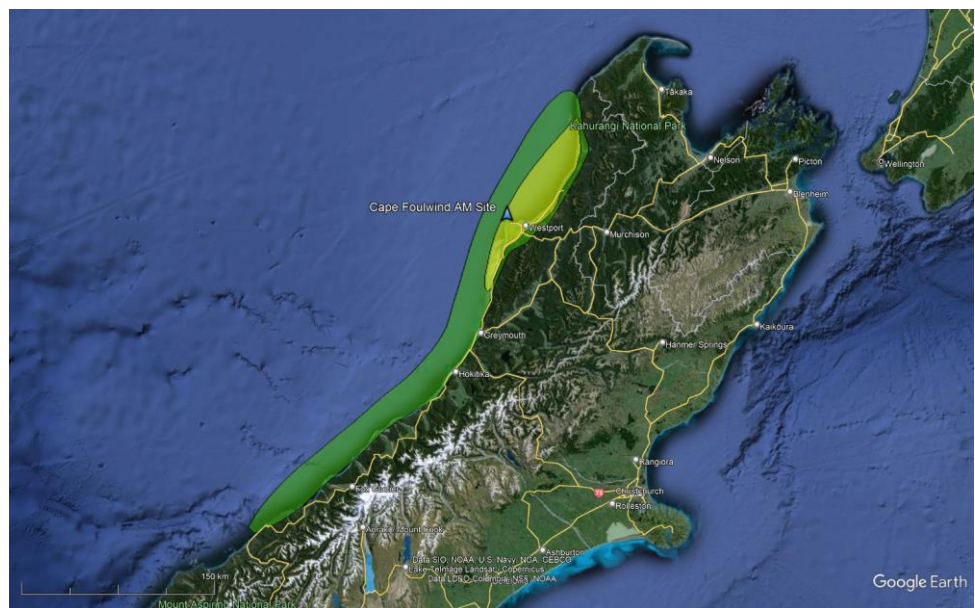
INTRODUCTION

- 7 RNZ is primarily concerned that the Proposed Plan adequately recognises and provides for the safety risks associated with elevated structures near RNZ's radiocommunication transmitters.
- 8 RNZ's submission for the rural zones sought an advice note to ensure that the risks of electromagnetic radiation (*EMR*) coupling are considered and addressed for all structures taller than 18m within 1km of the Cape Foulwind transmitter.
- 9 I understand that the Council Section 42A Officer does not agree with RNZ's submission and considers the only activity where EMR coupling should be addressed is for Emergency Service Facilities.
- 10 With respect to the Officer's assessment, this proposed rule changes would not adequately protect nearby developments from risks associated with EMR. My evidence below explains these risks in more detail.

BACKGROUND

- 11 RNZ is a Crown entity established under the Radio New Zealand Act 1995. RNZ owns and operates radio transmission facilities at Cape Foulwind, West Coast (*RNZ's Facilities / the Cape Foulwind Site*). This consists of:
- 11.1 a 45 metre guyed mast with a concrete antenna coupling unit (ACU) at its base;
 - 11.2 a concrete block with corrugated iron roof transmitter building located 95 metres to the North East of the mast; and

- 11.3 a diesel generator located in a separate smaller concrete block / concrete roof building on the North Western side of the transmitter building.
- 12 The Cape Foulwind site broadcasts multiple radio programmes and has important civil defence functions for the West Coast and surrounding areas.
- 13 Existing AM transmission sites, such as Cape Foulwind, were selected to obtain the optimum locations from a coverage point of view. Ideal AM sites will be located near population centres, have damp or wet ground for improved ground conductivity and near the coast for improved coverage. The Cape Foulwind facility was constructed and began operating in 1961. It would be difficult today to find an equivalent site.
- 14 **Figure 1** shows the range of RNZ's National AM coverage from the Cape Foulwind Site. The green area is the rural grade coverage area and the yellow area is suburban grade coverage area. The effect of the sea water path is demonstrated by the coverage up and down the west coast.



- 15 RNZ AM and FM radio transmitters cover a large percentage of New Zealand's population reaching 98.54%¹. RNZ National broadcasts on both AM and FM and RNZ also carries Parliament Radio on its AM Transmission sites.
- 16 RNZ's AM and FM transmitters perform an important role in providing news and information to the public and also have an

¹ Based on the 2018 Usually Resident Census Statistics combining FM Suburban and AM Rural coverage

important civil defence function. Radio is a key communication tool in the event of natural disasters and RNZ is designated as a Lifeline Utility under the Civil Defence Emergency Management Act 2002.

- 17 The continued importance of radio has unfortunately been recently emphasised by Cyclone Gabrielle where communities, and indeed whole cities, were largely cut off from all other forms of communication. RNZ broadcasts provided important updates and information to these communities, including evacuation warnings, “on the hour” news updates, evacuation centre locations, road closures, weather forecasts and other important information that can save human lives in a major event.
- 18 AM radio stations generally provide greater coverage into areas that are not covered by FM stations. AM radio waves travel further than FM signals and are less susceptible to being ‘blocked’ (eg. by hills or structures). All RNZ’s AM facilities are equipped with emergency generators so transmission can continue even when there is a full power failure.
- 19 The Cape Foulwind Site is leased to RNZ from the Department of Conservation and designated for Radio Communication Facilities in the operative Buller District Plan (designation number 103) and Proposed Plan (RNZ1). RNZ’s submission on the Proposed Plan is primarily concerned with health and safety effects that can arise with tall structures located nearby RNZ’s Facilities, but outside the area of RNZ’s immediate control.

Health and safety concerns: electromagnetic radiation

- 20 There are two types of physical effects which can arise from EMR exposure. When assessing the RF fields and determining a General Public Exclusion Zone around RNZ’s facilities, RNZ consider both of these effects:
- 20.1 Thermal effects are tissue heating and heat stress.
- 20.2 Athermal effects are electro-stimulation of the nervous system, acoustical sensations, and electrical shocks and burns associated with touching passively energised metallic objects in the RF field.
- 21 Outside the General Public Exclusion Zone (which RNZ technical staff determine on a site-specific basis), the primary concern risk is ‘Athermal’ parasitic re-radiation.
- 22 Radio transmission works by the transmitter mast emanating a large Electro-Magnetic radio signal, which induces a very small signal in the receiving aerial, or any metallic object. At a distance this induced signal is very small (e.g. 0.010V/m in urban areas,

0.0005V/m in rural areas) and causes no issue, even when a person directly contacts the receiving aerial or metallic object.

- 23 However, very "close" to the mast, within a kilometre or so, this can cause issues as the induced voltage can be high. In structures, these metallic objects can include:

23.1 Electrical wires

23.2 Copper water pipes

23.3 Metallic downpipes

23.4 Telephone and computer cables

23.5 Reinforcing rods in concrete

- 24 The induced EMR is related to how far the object is from the mast, and the vertical length of the object, and is concentrated around these metallic objects. RNZ manage the very high EMR levels close to the mast in line with current and international radiation standards. Closer to the mast is an area where no buildings (of any height) should be constructed. RNZ's lease arrangement with the Department of Conservation, and designation, mean that RNZ has effective control of risky activities in this area. However, structures outside RNZ's immediate control, but nevertheless in close proximity to the masts, also need to be carefully managed.

- 25 This is a common issue with cranes and 'Elevated Work Platforms' near AM transmitter sites. In some cases, people can receive contact burns from metallic objects, or work at heights that expose them to EMR levels above general public limits. Controls are therefore required around the crane or Elevated Work Platform to achieve compliance with safe standards.

- 26 Unfortunately, these health and safety issues are not commonly realised or understood. The primary danger is lack of awareness, and RNZ are generally only alerted to health effects when people nearby working with elevated structures start receiving burns. There is a risk that developers of adjacent properties unknowingly design and build structures which do not meet NZ EMR regulations which is dangerous to both construction staff and occupants of those structures.

- 27 For example, the construction of the Lincoln Road overpass bridge over the North Western Motorway in Auckland was in close proximity to our Henderson site. Problems were encountered with staff receiving contact burns when working with cranes and also with crane control systems. Once contacted, RNZ was able to work with the contractor to establish safe working procedures to allow the

work to be carried out safely. This included training staff as RF workers and the use of manual control cranes.

- 28 In the medium frequency band, radio waves propagate in the surface of the earth. Propagation is affected by ground conductivity more so than topography, so changes in ground height do not determine EMR risk.
- 29 A site by site assessment is carried out for EMR management as there are so many variables involved. The shape and height of the structure, the distance from the transmitter mast to the structure, where people are to be located on the structure, size of cranes and EWP's to be used around a structure, crane lifting plans etc. all come into play in assessing the EMR levels likely to be encountered.

Site-specific analysis and mitigation

- 30 RNZ frequently works with other infrastructure providers and construction companies to maintain the safety of workers. EMR management is a process of analysing proposed work or structures and developing controls to ensure compliance with relevant standards. Modern buildings typically contain a significant amount of metal wiring or cabling, which can provide a 'focus' for EMR, particularly if orientated vertically. Individual assessment of each site is required to determine the risk.
- 31 RNZ conducts site-specific EMR assessments for nearby tall structures on a case-by-case basis as there are a number of variables involved. However these assessments are a relatively straightforward exercise for RNZ technical staff and further information can be provided on these assessments if required.
- 32 The EMR management process includes working with those infrastructure providers / construction companies to implement mitigation measures.
- 33 The primary controls used to eliminate the risk to people are down-powering the radio transmitters or turning them off for the duration of the work. This can result in work having to be carried out overnight when the transmitters can be turned off, to minimise the impact on radio listening audiences.
- #### **RNZ's relief**
- 34 The risk of EMR coupling between RNZ masts and other structures is directly related to how far the structure is from the mast and the vertical height of the structure, along with the strength of the signal.
- 35 My analysis for RNZ's Facilities at the Cape Foulwind Site is that:

- 35.1 At distances greater than 1km from the mast, the EMR risks are sufficiently small to not require active mitigation.
- 35.2 Structures greater than 10m in height within 250m of the mast **will most likely** result in EMR levels exceeding public limits. This raises the risk of shocks and/or burns from contact with large metallic objects, including temporary structures like cranes. This is a significant health and safety risk to workers and the public. It is therefore appropriate that buildings and structures within this area be restricted to 10 metres.
- 35.3 Structures greater than 18m in height between 250m and 1,000m of the mast **may** result in EMR levels exceeding public limits which again could result in shocks and/or burns from contact with large metallic objects. Within this area, it is appropriate for RNZ to complete site-specific and construction materials specific EMR assessment and for it to provide written approval before the structure is constructed.
- 36 I note that structures within 100m of the mast will be at even higher risk of EMR effects. RNZ's control of land immediately surrounding the transmitter, and the surrounding open space controls, means that it has not been necessary to seek a further 'no build' area closer to the mast where the risk is even higher. If RNZ did not have control of this land, more stringent controls would be needed closer to the transmitter.

Section 42A Report

- 37 I note the Section 42A Officer's recommendation to address RNZ's concerns in the rule for Emergency Service Facilities only. While the Officer may be correct that these facilities may create a risk, *any other* structure over the heights discussed above near of RNZ facilities will also create a risk to people in, on or around it.
- 38 With due respect, I do not consider the report's recommendations to be appropriate. The Council Section 42A Officer's recommendation means that there would be no requirement to consider EMR risk for other types of structures greater than the permitted 10m, such as agricultural or horticultural structures, residences, mineral prospecting, rural industry, or any other structures.
- 39 While 18m or higher structures may be unusual in the rural environment, it is exactly the higher and more unusual structures that are exposed to greater risk. It makes sense for this risk to be assessed at the resource consent stage.

CONCLUSION

- 40 My view is that mitigation EMR risks should be conducted at a stage which is the least costly – the planning stage. This is particularly important given the potential safety risks to people from unmitigated EMR effects associated with taller structures.
- 41 The recommendation by the Section 42A Officer is too narrow in scope and does not address the risk.
- 42 RNZ is very willing to have discussions with the Councils, and other parties on the best formulation of rules to ensure EMR risks can be addressed.

2 July 2024

Steve White