

BOARD OF INQUIRY
HAUĀURU MĀ RAKI WIND FARM PROPOSAL

In the matter of the Resource Management Act 1991

And

In the matter of resource consent applications by Contact Wind Limited in respect of the Hauāuru mā raki Wind Farm Proposal

And

In the matter of notices of requirement and a resource consent application by Contact Energy Limited for transmission infrastructure related to the Hauāuru mā raki Wind Farm Proposal

REBUTTAL EVIDENCE OF OLIVER MICHAEL MANINS

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Introduction

1. My name is Oliver Michael Manins (Ollie). I am a Wind Engineer with Garrad Hassan based in Wellington.
2. I refer the Board of Inquiry to the statement of my qualifications and experience in my evidence in chief. I reaffirm my commitment to comply with the code of conduct for expert witnesses in the Environment Court.
3. The purpose of this brief of evidence is to respond to questions raised in the evidence of Reuben Brown of the Raglan Point Board Riders Club Inc as to whether the HMR wind farm will have any potential wind effects on what he describes as the “Northern Beaches Surf Breaks”. The relevant surf breaks, at Mussel Rock, Te Hara Beach, Carters Beach, and Gibsons Beach, are indicated on a plan attached to Mr Brown’s brief.

Questions raised by Mr Brown

4. In his brief of evidence Mr Brown states that: *“nowhere have I found evidence that the subject turbines when operating will not adversely interfere with the necessary enhancing natural wind patterns”*, described as southeast to north offshore winds, that he says are required to create the high quality curling wave at the Northern Beaches Surf Breaks.
5. In his brief Mr Brown also asks whether wind turbulence potentially created by the operating wind turbines at HMR may affect those surf breaks.

Wake effects from wind turbines

6. In this brief of evidence I will address the two issues raised by Mr Brown, ie the “wind patterns” (which I infer to include wind speed and direction), and wind turbulence.
7. At paragraph 39 and following of my evidence in chief, I explained that wind turbines extract energy from the wind and have wake effects, similar to sailing boats. I will not repeat my earlier evidence here but note that, while the resultant wind in the wake has slower speeds and is more turbulent, that wake effect is strongest immediately downwind of the wind turbine rotor and then gradually dissipates and spreads as it mixes with the surrounding wind.
8. Wind turbine wake effects are generally well understood in the wind energy industry, since wake effects are an important aspect of energy capture in a wind farm. The additional turbulence in the wake can also add to fatigue loading of components. It is therefore commonplace in the industry to impose separation distances for turbines defined by an ellipse of 5 by 3 rotor diameters (in this case, a maximum of 500 by 300

metres) to minimise the wind speed reduction and turbulent loading due to wake effects. In respect of the HMR wind farm, Contact proposes a condition relating to these ellipses.

9. This industry standard is used because beyond 5 turbine rotor diameters downstream of a wind turbine the greater majority of the wake effects have dissipated and it is usually appropriate to place another turbine at this distance. A separation distance of 3 turbine diameters is often used in directions that the wind blows from less frequently.

Effects on Northern Beaches Surf Breaks are immaterial

10. I note that the Northern Beaches Surf Breaks described by Mr Brown are at four points (Mussel Rock, Te Hara, Carters, and Gibsons) along a coast line which is approximately 12 kilometres long.
11. The points where Mussel Rock and Te Hara Surf Breaks are marked are approximately 5 and 4 kilometres respectively from the nearest proposed turbines. There will be no effects on wind patterns or turbulence at that distance.
12. Carters Beach is approximately 1.6 km long, with the closest indicative turbine locations being I011 and I021 to the north and J001 to the south. I011, I021 and J001 are greater than 3 rotor diameters (300 m) to the water's edge from the northeast to north directions. The surf break itself I assume is a further distance out to sea from the water's edge. Gibsons Beach is approximately 1.8 km long, with the closest indicative turbine locations being H005 to the north and I001 to the south. I001 and H005 do not coincide with Gibsons Beach from the northeast to north directions. The vast majority of the areas that Mr Brown indicates to be Carters and Gibsons Surf Breaks are further than 5 rotor diameters (the 500 metre maximum extent of the ellipse) from the nearest proposed wind turbines.
13. I note further that these indicative turbine positions are on cliffs or hills rising up from the sea at base elevations of 80 to 140 m above sea level and potential hub heights of up to 100 m above this. This vertical distance further reduces the potential for additional turbulence effects and wind speed reduction, even within the ellipse.
14. At the locations of the surf breaks, which are at an elevation of about 150 m to 240 m below the closest proposed wind turbine hub heights, and distances exceeding 3 rotor diameters, any reduction in wind speed is expected to be immaterial. In addition, wind turbines have a negligible influence on the overall direction of the wind.
15. In respect to turbulence, the wind at sea level prior to the operation of wind turbines is likely to already have moderately high turbulence intensity when the wind is blowing

offshore, due to the effects of the wind flowing down from the hills and cliffs which are common along the Northern Beaches.

16. Given the distances from the turbines to the surf breaks, the effects of any additional turbulence to the surf breaks is expected to be immaterial.
17. More generally, in all cases I consider that the wind effects of the HMR wind farm on the Northern Beaches Surf Breaks will be immaterial.

Oliver Manins