**MEMORANDUM**

PEET AVIATION
CONSULTANTS TO THE AVIATION INDUSTRY

**TO:** CRAIG SHEARER

**FROM:** BRIAN WHELAN

**SUBJECT:** HAURAKI DISTRICT COUNCIL, RADIO INTEFERENCE.

**DATE:** 17 SEPTEMBER 2018

**CC:**

Contents



## KAIMAI WIND FARM, DISTRICT COUNCIL ADDITIONAL INFORMATION REQUEST:

Following review of the Radio Communications Information by AECOM New Zealand Limited it is noted that there are some other communications services that have not been considered by the report and they need to be investigated and analysed to determine if the wind farm will have any impact on them. These services are:

- Aviation Radio - VOR, DME, NDB and SSR
- Weather Radar

1. Aviation Secondary Surveillance Radar (SSR)

There are secondary surveillance radar sites at Ruaotuwhenua (NZAA) and Hamilton (NZHN) that cover the wind farm site. CAA ENR 1.6 shows coverage at least down to 1500ft over the area. More detailed and lower level maps may be available from CAA.

SSR normally has filters to avoid detection of slow-moving targets however the speed of blade tips can exceed these thresholds and sites overseas have been known to cause clutter on SSR screens.

2. Aviation Navigation Beacons

There are VHF omnidirectional range (VOR) beacons in the 112-118MHz band, distance measuring equipment (DME) in the 962-1213MHz band and non-directional beacons (NDB) in the MF band operating in the area. For example, Hamilton VOR operates at 114MHz and NDB operates at 390kHz.

3. Weather Radar

The Bay of Plenty weather radar is located in the vicinity. Wind turbines have been known to cause false rain areas on weather radars.

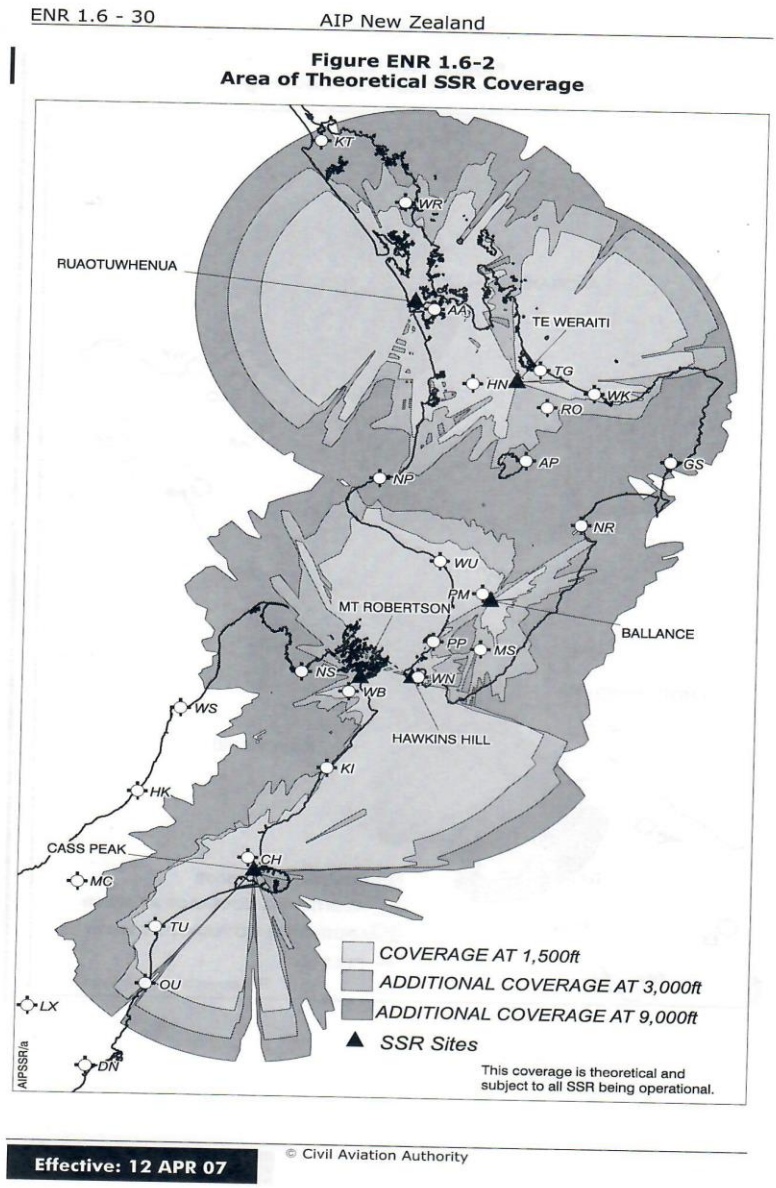
An assessment in relation to these facilities is required to provide a comprehensive assessment of the potential effects.

4. Discussion

**SSR, (SECONDARY SURVEILLANCE RADAR)**

Civil Aviation Authority New Zealand (CAA) ENR 1.6 – 30 shows Theoretical SSR Coverage [figure 1.]. The image is not definitive that coverage is below 1500ft in this area. Coverage may occur below 1500ft.

**Figure 1 CAA ENR 1.6-30 Area of Theoretical Coverage**




Source: Aeronautical Information Publication NZ, © Civil Aviation Authority.

SSR in New Zealand is enabled through interrogation communication between the SSR and an aircraft-based transponder avionics system (normally Mode S Transponder).

In discussion with Airways NZ, they have no known event in New Zealand where SSR has been affected by a wind farm. The algorithms used in the SSR system have filtered any wind farm "clutter" affect in New Zealand.

The site of the proposed Kaimai Wind Farm has Class G Airspace immediately above it. Class G airspace is "uncontrolled" airspace with free movement of aviation activity within this area. SSR is primarily used for "controlled" airspace, in New Zealand this is Class A, C or D. Class A being airspace over the ocean and Class C & D over land and in particular in stepped heights close to main airfields.

## AVIATION NAVIGATION BEACONS

Airways advise there is no known effect of a wind farm in New Zealand on ground-based navigation beacons, that is VOR, DME or NDB.

**New Zealand Airspace – A shift to satellite-based technology**

New Zealand is currently in a transition phase with the introduction of aviation policy and rules transitioning aircraft navigation and surveillance from ground based to satellite-based systems.

Aircraft surveillance is being phased in from December 2018 and will essentially be complete by December 2021. Aircraft operating in "controlled" airspace will be required to have installed avionics technology called ADS-B. The main centres of Auckland, Wellington and Christchurch will maintain SSR, these will communicate with the ADS-B systems.

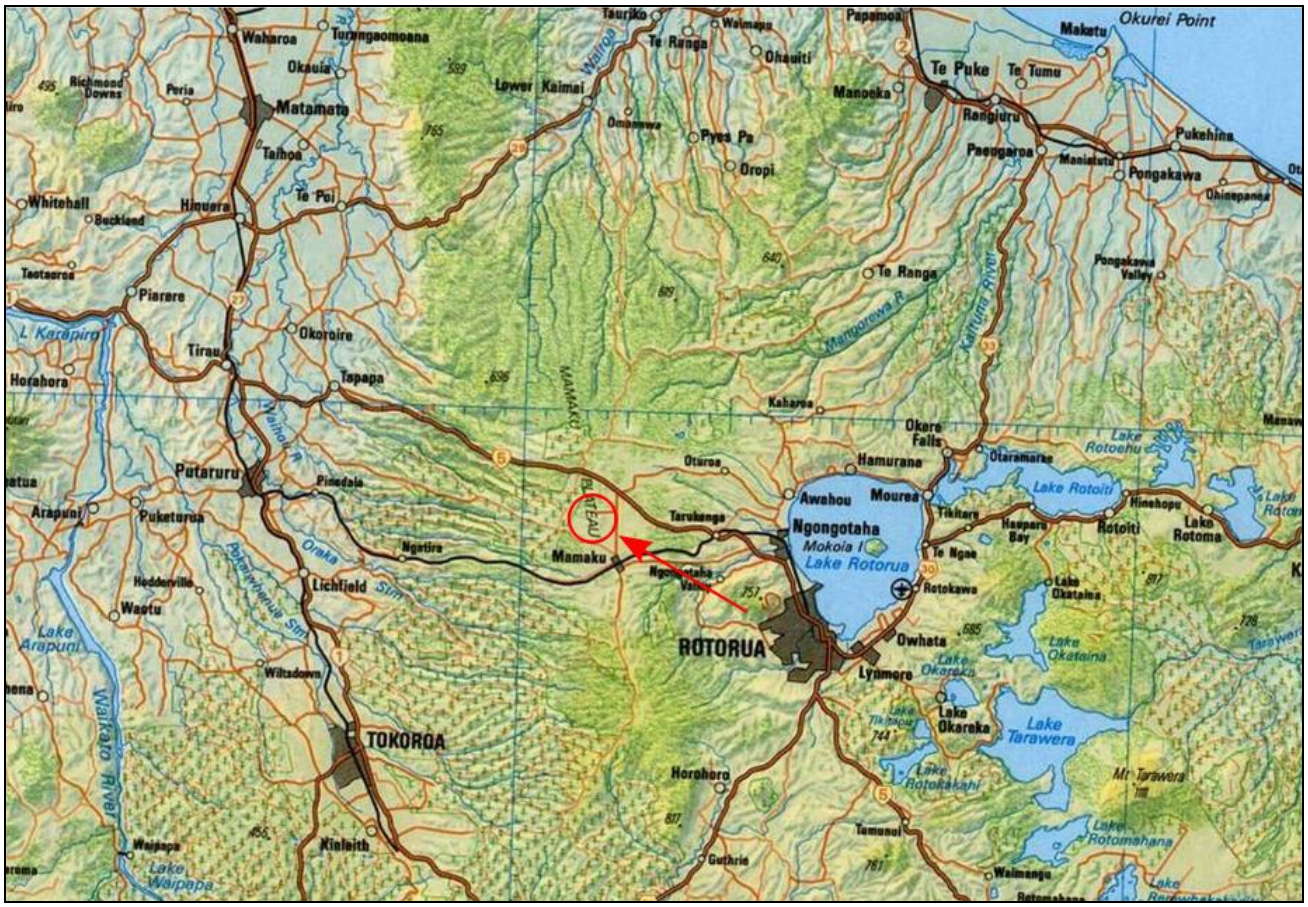
Aircraft navigation is already utilising satellite navigation technology for IFR (Instrument Flight Rules) flight in New Zealand. Two prime examples of this technology are the navigation arrival and approach to Queenstown Airport and the "SMART" approaches to Auckland International Airport. Over the next few years there will be a gradual move to total satellite-based navigation of aircraft in New Zealand in "controlled" airspace as opposed to the "uncontrolled" Class G airspace immediately over the proposed Kaimai Wind Farm site. This shift away from using ground-based navigation beacons, VOR/DME/NDB, will see less reliance on in New Zealand airspace.

NDB beacons are being totally removed and there will remain a ground-based navigation aid network, VOR and DME, for recovery of aircraft in the event of a satellite-based system failure in New Zealand.

## WEATHER RADAR

The Bay of Plenty NZ Meteorology Service Weather Radar [Figure 2] is not located in the vicinity of the proposed Kaimai Wind Farm, on the Western side of the Kaimai Ranges. The Weather Radar is located approximately forty (40) miles South in the Mamaku Ranges, near to Rotorua and on the Eastern side of the Mamaku Ranges. Between the Weather Radar site, at approximately 2000ft, there are the Mamaku and Kaimai Ranges with Te Weraiti (2500ft), Ngatamahinerua (2785ft) and Mount Te Aroha (~3100ft).

**Figure 2 NZ Meteorological Service Weather Radar Site**




Source: NZ Meteorological Service

**Weather Radar Clutter**

NZ Meteorological Service advise they do have radar clutter evidence in New Zealand, especially from the site near Wellington. The Wellington Makara weather radar, it should be noted, is in close proximity to the West Wind Farm. The main radar clutter-removal algorithms assume that land-clutter is associated with a zero (or near-zero) velocity (i.e. the land normally doesn't move), and the algorithms can identify these zero-velocity echoes as clutter and remove the data. As there is a non-zero velocity associated with wind farms, the radar assumes the echoes are associated with weather and does not remove them. Generally, the echoes from wind farms are small, but can still be noticeable when a large wind farm is near the radar, for example Makara.

## CONCLUSION

1. SSR: Expect no known effect of the Kaimai Wind Farm proposed site on SSR in New Zealand
2. Navigation Aid Beacons: Expect no known effect of the Kaimai Wind Farm proposed site on navigation beacon's, VOR/DME/NDB, in New Zealand
3. Weather Radar: Expect little, if any, or no effect of the Kaimai Wind Farm proposed site on the NZ Meteorological Bay of Plenty weather radar

## CIVIL AVIATION AUTHORITY NEW ZEALAND (CAA) RULE PART 77 OBJECTS AND ACTIVITIES AFFECTING NAVIGABLE AIRSPACE

This Rule Part prescribes the Rules for persons in New Zealand proposing to:

a. Construct or alter a structure that could constitute a hazard in navigable airspace, or

b. The use of a structure, lights, lasers, weapons or pyrotechnics that could constitute a hazard in navigable airspace

The Director CAA, has a legal obligation to undertake an aeronautical study when a structure exceeds certain height dimensions and provide a determination. Ventus Energy (NZ) will be required to submit an application, under Rule Part 77, for the proposed Kaimai Wind Farm, due to the height of the proposed wind turbines.

On receiving a notification under Rule Part 77 the Director shall conduct an aeronautical study to determine whether the specific proposal, if executed, will constitute a hazard in navigable airspace.

In conducting the aeronautical study, the Director shall consult with such persons and organisations as the Director considers appropriate, the aeronautical study is advertised. These organisations will include both Airways Corporation NZ – SSR and navigation beacons, and NZ Meteorological Service – weather radar.

The aeronautical study process is laid out and the criteria standards that identify a hazard determination are prescribed. The study process is robust.

The Director is solely responsible for airspace hazard determinations in New Zealand. The Director may impose conditions or limitations for marking or lighting a structure that is considered a hazard to navigation.