

**IN THE MATTER** of the Resource Management Act  
1991

**AND**

**IN THE MATTER** of applications by Meridian Energy Limited to Manawatū-Whanganui Regional Council, Greater Wellington Regional Council, Tararua District Council and Masterton District Council for resource consents to enable the construction, operation, and maintenance of a new wind farm on Mount Munro, located approximately 5km south of Eketāhuna

**SECTION 87F REPORT OF NEIL THOMAS – GROUNDWATER**

**MANAWATŪ-WHANGANUI REGIONAL COUNCIL, GREATER WELLINGTON  
REGIONAL COUNCIL, TARARUA DISTRICT COUNCIL AND MASTERTON DISTRICT  
COUNCIL**

**15 MARCH 2024**

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## **A. OUTLINE OF REPORT**

- 1 This report, required by section 87F of the Resource Management Act 1991 (**RMA**), addresses some of the issues set out in sections 104 to 112 of the RMA, to the extent that they are relevant to the applications lodged with the Manawatū-Whanganui Regional Council (**Horizons**), Greater Wellington Regional Council (**GWRC**), Tararua District Council (**TDC**) and Masterton District Council (**MDC**).
- 2 The resource consents applied for, by Meridian Energy Limited (**Meridian**), are required to authorise the construction, operation and maintenance and improvement of a new wind farm on Mount Munro, located approximately 5km south of Eketāhuna. The project is known as the Mt Munro windfarm project (the **Mt Munro Project or Project**).
- 3 In this report I address groundwater in relation to the resource consent applications lodged with Horizons and GWRC (the **Regional Councils**).
- 4 While this report is pursuant to section 87F of the RMA, I have in accordance with section 42A(1A) and (1B) attempted to minimise the repetition of information included in the application and where I have considered it appropriate, adopt that information.

## **B. QUALIFICATIONS / EXPERIENCE**

- 5 My name is Neil Malcolm Thomas I am a Technical Director (Water Resources) at Pattle Delamore Partners. I have been employed at Pattle Delamore Partners since 2011. Prior to 2011, I worked in the UK as a hydrogeologist at Entec UK (now part of AMEC) between 2005 and 2010.
- 6 My role involves undertaking assessments of groundwater resources including both groundwater quantity and groundwater quality. These assessments include both small scale assessments, for example at the scale of individual consent applications, as well as larger scale assessments, for example review of State of the Environment monitoring data on behalf of regional councils. I have worked with Horizons on groundwater related matters, as well as technical reviews of consent applications since 2012.

7 I hold the qualifications of BSc (Geology) and MSc (Hydrogeology), both from the University of Leeds in the UK. I am a member of New Zealand Hydrological Society.

8 I have over 15 years' experience in groundwater and related assessments, gained both in the UK and in New Zealand.

9 I am familiar with the site and surrounding area through previous work and resource consent assessments on behalf of Horizons. At the time of writing this report, I have not visited the Mt Munro site itself. While this is not considered necessary for the purpose of my review or the conclusions I reach, I intend to visit the site as soon as practicable.

**C. CODE OF CONDUCT**

10 I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023. This technical report has been prepared in accordance with that Code. In particular, unless I state otherwise, the opinions I express are within my area of expertise, and I have not omitted to consider material facts that might alter or detract from the opinions that I express.

11 I have all the information necessary to assess the application within the scope of my expertise and I am not aware of any gaps in the information or my knowledge.

**D. SCOPE OF REPORT**

12 My report focuses only on issues related to groundwater. It covers the following topics:

- (a) Potential effects of the windfarm and associated activities on groundwater quantity; and
- (b) Potential effects on the proposed windfarm and associated activities on groundwater quality.

- 13 I have reviewed and relied on the information provided by:
- (a) Meridian ('Assessment of Environmental Effects (no Appendices)') (the **AEE**);
  - (b) RDE Limited ('Construction Water Management Plan and Effects Assessment Report') (**CWMP**); and
  - (c) Tonkin and Taylor (Groundwater effects assessment) response to request for further information, received on 14 February 2024 (**RFI#2 Response 2**).
- 14 In preparing this report, I have relied on advice from Mr Neil Crampton – Geotechnical – who is also advising the Councils on the consent applications.

#### **E. BACKGROUND**

- 15 In this section I have briefly described the proposed application and the hydrogeological setting in which it occurs.
- 16 The Applicant has applied for resource consent to construct a windfarm at Mt Munro in the Tararua District. Development of the windfarm will include construction of roadways to the turbine locations as well as installation of concrete foundation structures for the turbines and ancillary buildings. Concrete batching will take place on the Project site, although the location of the concrete batching plant is not yet confirmed.
- 17 A map of the proposed site is shown in Figure 1 (attached to my report), which shows the approximate location of the turbines (the turbine envelope) on a geological map of the area. In addition, the location of registered bores on the Horizons database are shown.
- 18 The proposed site is on a broad, elevated ridge of basement strata, which consists of low permeability sandstones and mudstones. Along the top of the ridge, the low permeability strata is overlain by colluvium, which can be several metres thick in places. The colluvium sediments are made up of silts and sands (based on test pit descriptions provided in Appendix F to the application AEE) and appear to host a local groundwater resource 1 to 3 m

below the ground surface. This shallow, local groundwater resource is not likely to represent the regional groundwater resource.

- 19 Although the application does not include sufficient data to accurately determine groundwater flow directions within the colluvium along the top of the ridge, I expect that groundwater flow directions will follow topography, with a general drainage pattern away from the ridge. The local groundwater resource will be recharged via local rainfall infiltration. I do not expect that additional data around groundwater flow patterns in the colluvium is required, or that that this data would change the conclusions I reach below regarding the effects of the Project on groundwater.
- 20 Away from the ridge where the turbines will be located and to the north-west are the upper reaches of the Mākākahi River, the geological map indicates that the strata along the Mākākahi River valley include recent gravelly river deposits and there are six groundwater bores located within these sediments, close to the base of the Mt Munro Ridge. Only one of these bores has a recorded depth (2 m, Horizons bore id:366002) and no depth is recorded on the Horizons database for the other bores. However, I would expect that these other bores are also shallow, with a potentially good hydraulic connection to the nearby river. I expect that these bores are shallow because the lower permeability mudstone strata outcrops on either side of the river valley and likely underlies the main river valley.
- 21 Based on Horizons consent database, none of these bores are associated with a water take consent and therefore I expect that these bores are not used for more than the permitted volume of 50 m<sup>3</sup>/day. This volume is sufficient for small scale domestic and stock water purposes.
- 22 Groundwater within the shallow alluvial gravels is likely to flow parallel, or sub parallel to the Mākākahi River in downstream (i.e. north-east) direction. The major sources of recharge to groundwater used by the bores are likely to be seepage losses from the river, together with rainfall runoff from the surrounding hills and local rainfall infiltration. Groundwater in this area is likely to discharge towards the Mākākahi River.

**F. ASSESSMENT OF APPLICATION**

23 As described in the AEE, the Project will involve a variety of activities, including earthworks for roads to access the site, installation of substations with associated buildings, a temporary concrete batching plant and a site administration area and laydown area.

24 Meridian has provided very limited assessment of the potential effect of these activities on groundwater. In summary, they indicate that:

- (a) Groundwater use in the area is very limited;
- (b) The greatest impact on groundwater is expected during excavations due to high turbidity in localised areas, but this potential effect can be addressed via the construction management plan; and
- (c) Potential effects on groundwater quality as a result of the development of other structures in the valley (e.g. substations etc) could occur, but the potential effects from these activities can also be addressed through a management plan.

25 In general, I agree with these potential effects. As noted above, there are very few groundwater users in the Mākākahi Valley and in general, the activities proposed are not expected to significantly impact on groundwater.

26 Any effects due to high turbidity during excavations could reasonably be addressed through a construction management plan. Appendix F to the AEE notes that turbid groundwater encountered during the construction process will be directed to sediment retention ponds and other sediment removal devices. In my opinion, this represents a suitable means by which effects on groundwater can be minimised to an extent that is less than minor.

27 The exceptions that I have noted include the concrete batching plant, which in my opinion could result in effects on groundwater quality. However, the scale of these impacts will depend on the ultimate location of the batching plant, which the application notes could be either on the ridge or in the valley close to Coach Road South. As I describe below, I am unable to determine

these nature and extent of these effects based on the information provided to date.

- 28 The main activities related to the concrete batching plant that could impact on groundwater quality is where the concrete trucks are washed out and where stormwater runoff is discharged to ground. The application indicates that the runoff from washing the trucks will be discharged to ground, where it may soak into groundwater and that stormwater runoff will soak into ground via a settling pond. In my experience, this type of discharge can result in effects on groundwater quality by increasing hardness, alkalinity and pH in groundwater.
- 29 However, as the location of the concrete batching plant is not yet finalised, the eventual effects on groundwater are therefore uncertain. In my opinion, the greatest risk would be in the event that the concrete batching plant is located in the valley. This is because the strata in the valley are likely to be more permeable, and because the distance to the nearest receptors where groundwater may be discharged will be shortest, allowing the least opportunity for attenuation along a groundwater flow path. I note that the receptors where groundwater may discharge also include the Mākākahi River and nearby shallow bores.
- 30 If the concrete batching plant were located on the ridge where the turbines are proposed, I expect that the risk to groundwater will be much lower, as there would be a much greater distance to any receptors. This greater distance would allow much greater dilution of any contaminants along a groundwater flow path and I do not consider that an issue would arise.
- 31 In my opinion, any potential effects on groundwater from the concrete batching plant could be addressed through a management plan, which could require the installation of a shallow monitoring bore down-gradient of the concrete batching plant if it is located in the valley in an area where groundwater is used for drinking water. The management plan should include a requirement for groundwater quality monitoring at quarterly intervals, including at least two samples obtained prior to concrete batching starting to provide a baseline.



- 32 There is no drinking water standard or aesthetic guideline values for alkalinity. However, an aesthetic standard for drinking water<sup>1</sup> is set for hardness (<200 mg/L) and pH (7 to 8.5), which are both directly related to alkalinity and these thresholds should be used as triggers for further action if the discharge from the concrete batching plant occurs in the valley and in an area where groundwater is used for drinking water.
- 33 Stormwater discharges can affect groundwater quality in some situations. As noted above, in my opinion, the greatest risk is from the concrete batching plant. Stormwater in other situations is considered less likely to present a risk. In this regard I note that stormwater from roads leading to the turbine locations is not likely to include contaminants due to the relatively low volume of traffic (compared to a typical urban road) and the stormwater from buildings is not expected to cause issues with groundwater quality because of the limited scale of buildings. I also note that Meridian expect to comply with the permitted activity requirements for stormwater discharges and provided this is the case, I do not expect that stormwater from the Project is likely to cause groundwater quality issues (excluding, in my view, discharges from the concrete batching plant if it is located in the valley).
- 34 Historically, electrical substations have represented potential sources of contamination to groundwater. This is due to the use of dielectric fluids containing polychlorinated biphenyls (PCBs) within the transformers for insulation and cooling (Ministry for the Environment, 2023). However, these fluids were banned in New Zealand in 2016 and therefore the proposed new transformers that will be used as part of the Project are not expected to pose a risk to groundwater.
- 35 The Project does not include large scale dewatering or long-term groundwater abstraction. However, I note that the construction of the turbines, associated roads and buildings may change the area of land to which rainfall recharge occurs because these structures may be less permeable than the original strata at those locations. However, if stormwater from these areas is discharged to ground, the net effect on

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<sup>1</sup> Taumata Arowai: Aesthetic Values for Drinking Water Notice, 2022.

groundwater recharge will be negligible. Therefore, I do not expect that effects on groundwater quantity are an issue to be considered as part of the Mt Munro Project.

#### **G. SUBMISSIONS**

36 I have read the submissions on this proposal that are relevant to groundwater.<sup>2</sup> None of the submissions appear to directly refer to groundwater, although there are several that refer to potential effects on waterways with some specifically raising a concern around the effects of dust on water quality.

37 As discussed above, in my opinion, the main risk to groundwater quality is via discharge of runoff from washing concrete trucks and stormwater runoff from the concrete batching plant. In my view, this risk is likely to be limited to the immediate area around the concrete batching plant and I consider it able to be addressed through the CWMP.

38 The materials and activities at the site that could cause dust will generally be locally derived (for example from earthworks removing local material) and as a result, I do not expect that these will pose a risk to groundwater quality.

39 Comment on the risks to surface water quality are outside my area of expertise and are discussed in the report of Dr Forbes.

#### **H. CONDITIONS**

40 The conditions proposed in the AEE supplied with the application appear to rely heavily on Specific Environmental Management Plans, particularly with respect to earthworks and construction activities. A general outline of what those management plans may include is provided in Appendix 7 to the AEE.

41 In general, the use of management plans, provided there is a rigorous review and confirmation process prior to implementation, is a reasonable means by which potential effects on groundwater from the activities proposed can be

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<sup>2</sup> These include submission numbers 1 (Rachel Taylor), 25 (Logan Kahu), 29 (Freedom Ward), 31 (Trinity Buchanan), 36 (Rebecca Needham), 39 (Lisa Joy Mirrin), 40 (Steve Merrin).

managed. The specific risk I have identified in my report relates to the concrete batching plant, if it is located in the valley in an area where groundwater is used for drinking water. I do not consider that there is a risk to groundwater quality if the concrete batching plant is located outside the valley, or away from areas where groundwater is used for drinking water. As the location of the concrete batching plant is not yet identified, I do not consider groundwater monitoring (via a condition of consent) to be necessary at this time. However, it will be important that this issue is addressed in the appropriate management plan (as I note below). I note that the proposed condition 25 highlights that concrete work areas must protect against leachate and spills generally. I agree with this general condition.

42 The management plan should identify that groundwater quality sampling will be required if the concrete batching plant is located in the valley in an area where groundwater is used for drinking water. It should also identify actions to be taken in the event that groundwater quality sampling indicates elevated concentrations of parameters such as alkalinity (or hardness and pH) down-gradient of the concrete batching plant. Any trigger levels (as proposed in my paragraph 32) should also account for baseline monitoring undertaken prior to the concrete batching process starting.

**I. CONCLUSION**

43 Overall, in my opinion, the risk to groundwater posed by the proposed windfarm and its construction appears to be limited. The main potential issue relates to groundwater quality around the concrete batching plant, however, as with the risk of other groundwater related effects, this issue should be able to be addressed via an appropriate management plan.

**Neil Thomas**

**15 March 2024**

**J. FIGURES**

**Figure 1:** Geological map of the Mt Munro area, also showing the locations of bores sourced from the Horizons GIS database. **(Attached)**

**K. REFERENCES**

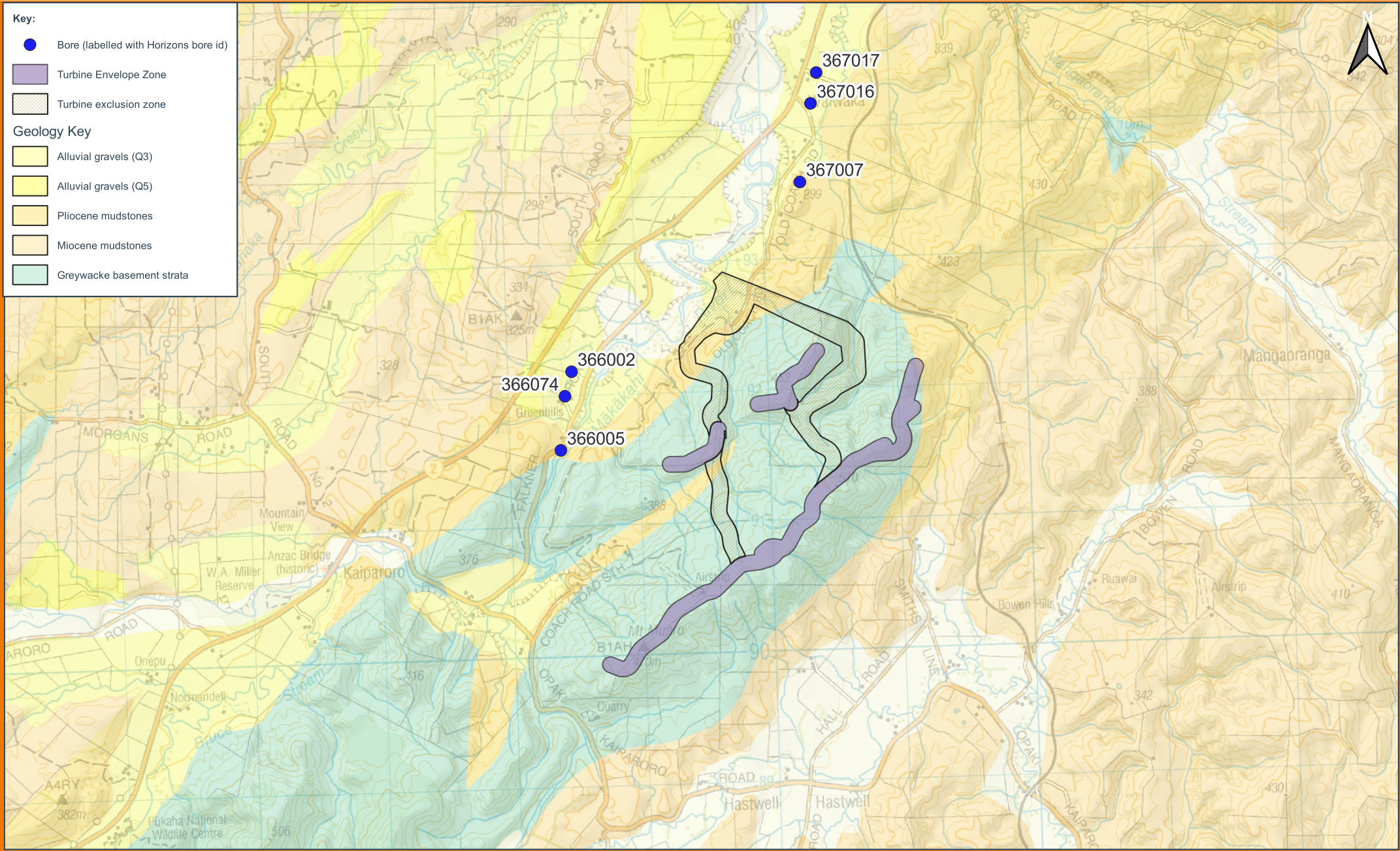
Ministry for the Environment. (2023). *Hazardous Activities and Industries List Guidance: Identifying HAIL land*. Wellington, New Zealand: Ministry for the Environment.

**Key:**

- Bore (labelled with Horizons bore id)
- Turbine Envelope Zone
- ▨ Turbine exclusion zone

**Geology Key**

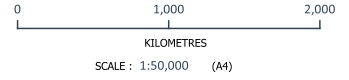
- Alluvial gravels (Q3)
- Alluvial gravels (Q5)
- Pliocene mudstones
- Miocene mudstones
- Greywacke basement strata



**FIGURE 1: Geological map and bore locations**

NOTES:  
 1. AERIAL IMAGERY SOURCED FROM THE LINZ DATA SERVICE (<https://data.linz.govt.nz>) AND LICENCED BY LINZ FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.  
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