Wellington Registry **ENV-WLG-2024-001**
Te Whanganui-a-Tara Rohe

In the Environment Court
I Mua I Te Kōti Taiao O Aotearoa

Under the Resource Management Act 1991 (**RMA**)

and in the matter of the direct referral of an application for resource consents by Meridian Energy Limited in respect of the proposed Mt Munro wind farm under section 87G of the Resource Management Act 1991.

Between

Meridian Energy Limited
Applicant

and

Tararua District Council, Masterton District Council, Manawatū-Whanganui Regional Council and Greater Wellington Regional Council (**Councils**)
Consent Authorities
and

Section 274 parties

Statement of Evidence of Maurice Mills on behalf of Meridian Energy Limited

24 May 2024

ANDREW BEATSON
BARRISTER
RICHMOND CHAMBERS
TEL 021 223 9170 EMAIL ANDREW@BEATSON.CO.NZ

SOLICITORS ACTING: E TAFFS AND H TAPPER, MERIDIAN ENERGY LIMITED
287-293 DURHAM STREET NORTH, CHRISTCHURCH, 8013, NEW ZEALAND
TEL 021 676797 EMAIL ELLIE.TAFFS@MERIDIANENERGY.CO.NZ

CONTENTS

INTRODUCTION

1. My name is Maurice Mills.

2. I am a Principal at Tonkin and Taylor Limited (**T+T**) and hold the position of Senior Civil Engineer in the Nelson office.

3. I have over 35 years' experience working on the feasibility, investigation, design and construction management of a wide range of civil engineering projects, including large Waka Kotahi/NZTA projects such as the SH20/20a Motorway (1992), Mercury's Puketoi Wind Farm (consented 2013) and Top Energy's Ngāwhā Geothermal Power Station (commissioned 2021).

4. I have a New Zealand Certificate in Civil Engineering (NZCE Civil) and am a Chartered Member of Engineering New Zealand CMEngNZ (Eng. Technician).

5. I have a broad understanding of the civil construction aspects and issues associated with designing and constructing wind farms. Of particular relevance to this project, I have undertaken civil engineering investigations and design, ranging from site assessments through to detailed design, for eight wind farms in New Zealand, as listed below:

    (a) Ahipara Gumfields Wind Farm – Feasibility assessment of access options;

    (b) Turitea Wind Farm – Roading feasibility assessment;

    (c) Taharoa Wind Farm – Preliminary and consent design (consented for 27 turbines);

    (d) Puketoi Wind Farm – Feasibility assessment, preliminary and consent design (consented for 53 turbines);

    (e) Cape Campbell Wind Farm – Feasibility assessment of access options;

    (f) Slopedown Wind Farm – Preliminary design;

    (g) Rototuna Wind Farm – Road access feasibility assessment; and

(h) Mt Cass Wind Farm – Preliminary and detailed design.

6. I have been involved in the Mt Munro wind farm project since May 2021, initially to review the internal wind farm roading layout design completed by T+T. In April 2022, T+T was engaged by Meridian Energy Limited (**Meridian**) to prepare a civil engineering report to support a Resource Consent application for Mt Munro wind farm. I had primary responsibility for production of the Civil Engineering Report.

7. I visited the proposed Mt Munro wind farm site with Mr Nicholas Bowmar from Meridian on 27 January 2023. During this visit I traversed the full length of the site by a combination of vehicle and on foot. This included the location of the two proposed access roads up to the ridgeline including the proposed bridge location, the proposed laydown area, the proposed turbine locations, the proposed transmission tower locations and the proposed substation sites.

8. Throughout this process I have worked closely with other consultants and Meridian employees working on the wind farm project; in particular:

(a) Mr Nicholas Peters (Geologist);

(b) Mr Pushpaka Rabel (Stormwater/Hydrology);

(c) Mr Graeme Ridley (Erosion and Sediment Control);

(d) Mr Nicholas Bowmar (Project Manager);

(e) Mr Sam Wilkie (Traffic and Transportation); and

(f) Mr Tom Anderson (Planning).

9. T+T produced the following documentation in support of the Resource Consent application:

(a) The Civil Design Plan Set which is attached as Appendix A to the Assessment of Effects on the Environment (**AEE**) for the Project;

(b) The Civil Engineering Report (**CER**) which is attached as Appendix D to the AEE;

(c) The technical memoranda dated 7 September 2023[1] which responded to parts of the Councils' s 92 request for information dated 6 July 2023;

(d) The clarification dated 25 October 2023, which responded to the email sent by the Councils on 20 September 2023, including the Fill Site Volumes table dated 30 October 2023; and

(e) Other responses to s 92 requests provided by members of T+T's civil and geotechnical engineering team, including the response provided on 31 January 2024.[2]

10. A set of draft conditions was proposed by Meridian within the AEE, and has been updated through the s 92 responses, and further refined through discussions with Mr Neil Crampton, the council-appointed consultant for Geotechnical Engineering. The revised set of proffered draft conditions is attached to the evidence of Mr Anderson, and is discussed in detail in his evidence. I consider the updated draft conditions proffered by Meridian are appropriate to manage to civil engineering related matters.

CODE OF CONDUCT

11. I confirm that I have read the 'Code of Conduct for Expert Witnesses' contained in the Environment Court Consolidated Practice Note 2023. I agree to comply with this Code of Conduct. In particular, unless I state otherwise, this evidence is within my sphere of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

SCOPE OF EVIDENCE

12. In this statement of evidence, I will outline the site development and civil engineering works required to construct the Mt Munro wind farm. My evidence is limited to civil engineering issues that are within my area of expertise, and covers the following matters:

[1] Mount Munro Section 92 Response to Items 96 – 109 and Mt Munro Wind Farm Stormwater S92 Responses

[2] Response to 20 December 2023 Section 92 Additional Information Request, dated 31 January 2024.

(a) Site development methodology;

(b) Core site layout development;

(c) Topographic and geotechnical considerations;

(d) Fill disposal site selection, and how the earthworks volumes have been calculated;

(e) Substation site selection;

(f) Key aspects of construction:

(i) Land Disturbance; and

(ii) Discharges;

(g) Proposed mitigation strategies and measures;

(h) Responses to issues in submissions;

(i) Responses to issues in the Officer's Report; and

(j) Conclusion and recommendations.

13. Evidence relating to erosion and sediment control, and earthworks construction management is covered by Mr Ridley, and a project description and explanation of the envelope approach can be found in the evidence of Mr Bowmar.

EXECUTIVE SUMMARY OF REPORT

14. This evidence describes the civil engineering work required to construct the proposed Mt Munro wind farm, and the development of the wind farm civil engineering design through to its current form. In addition, this evidence addresses issues raised in submissions and the s 87F Report relating to construction issues, within my area of expertise.

15. Construction works will result in cuttings, soil disturbance, vegetation clearance as well as associated discharges to land and water. However, most of the construction effects are short term and potential

adverse effects resulting from such construction effects can be mitigated by the approach to design, construction and application of measures described in this document, and in the statement of Mr Ridley. I confirm that I have read the draft brief of evidence of Mr Ridley in relation to erosion and sediment control.

16. As explained in more detail in the statement of Mr Bowmar, Meridian has taken an envelope approach to design at Mt Munro, and this has resulted in the most conservative civil engineering design, i.e. a 'worst case' or 'pessimistic' scenario. In reality, the design will be refined through the detailed design process, once factors such as the Contractor's construction methodology, final road alignment and locations of the turbines and laydown areas are determined.

METHODOLOGY AND LIMITATIONS

Site Development Methodology

17. Meridian proposes to develop the Mt Munro wind farm approximately 5km south of Eketāhuna in the northern Wairarapa, comprising up to 20 wind turbines, and generating up to approximately 90MW.

18. Meridian has adopted an envelope approach for development within the site, as opposed to seeking consent based on fixed component locations.

19. Two envelopes are proposed, being a Turbine Envelope Zone in which turbines and all associated infrastructure (roads, cables) can be placed, and a Turbine Exclusion Zone which provides a route from the site entrance up to the turbine envelope zones.

20. This approach allows for a degree of flexibility in terms of the final placement of wind farm roads and turbine locations in future stages of the design. All earthworks, and permanent and temporary construction activities will take place within these envelopes.

21. In his evidence, Mr Bowmar discusses the envelope approach in more detail.

22. Up to 20 wind turbines are proposed to be located within the proposed turbine envelope zones. Up to 14 of these are on the main south-west to north-east ridge, plus up to 3 wind turbines in each of the smaller ridges running parallel to the main ridge.

23. Internal wind farm roads will be located within both the turbine envelope zone and the turbine exclusion zone. Roads within the turbine envelope zone will have a combined length of approximately 6 km. Roads within the turbine exclusion zone will have a combined length of approximately 5.5 km. In total, approximately 11.5 km of internal wind farm roads are proposed.

24. The main site access is proposed from Old Coach Road at the site's northern boundary. The wind farm's Site Substation is located on the ridgeline at the southwestern end of the Turbine Envelope Zone.

25. A Terminal Substation connecting directly into Transpower's existing 110kV transmission line is proposed on the western side of the corner of Kaiparoro Road and State Highway 2 (SH2), approximately 3.5 km to the west of the Site Substation. Electricity generated from the wind farm will be reticulated via a transmission corridor over private property (and outside of the aforementioned envelopes) via overhead transmission lines from the wind farm Site Substation, before crossing over SH2, to the Terminal Substation.

26. Drawings showing the proposed turbine envelope zones, turbine exclusion zones, site access, internal wind farm roads, turbine locations, substation locations and transmission corridor route, are provided in Appendix A of the AEE.

Preliminary Design Criteria

27. The key design criteria developed for the proposed Mt Munro wind farm are outlined in the CER prepared by T+T. I have provided a summary table in **Appendix A** of my evidence, but have not repeated the detailed information contained in the CER.

Core Site[3] Layout Development

28. The procedure followed to develop the civil engineering aspects for Mt Munro wind farm has been based on a collaborative approach with Meridian and their team of experts. This included:

    (a) Indicative turbine locations provided to T+T by Meridian, based on advice from their wind engineering team;

    (b) A desktop study of site topography and existing features, to identify potential access road routes to the ridge lines where the proposed turbines are to be located;

    (c) Review of potential ecological constraints on the site provided by the ecological experts engaged by Meridian; and

    (d) In conjunction with Meridian, developing a concept level design of internal wind farm roads and turbine platform locations to confirm feasibility.

29. All internal wind farm roads and turbine platforms were modelled using 3D civil design software to quantify the extents of work and the viability of access roads and turbine platform locations.

30. The overall philosophy in developing the wind farm internal roading network was to:

    (a) Follow established farm tracks where appropriate, as these tend to have already adopted desirable routes in terms of gradient and earthworks volumes;

    (b) Avoid any areas of ecological value, if any such areas were identified;

    (c) Consider landowner requirements;

[3] In my evidence, reference to the "core site" is a reference to the combination of access roads, turbine platforms and other construction related activities within the project landowner boundaries and outside of the public road network.

(d) Minimise steep road gradients as much as possible to make it easier for construction vehicles, including concrete trucks and turbine component delivery convoys, to travel within the site;

(e) Follow ridgelines where possible, where turbines are typically located, in order to minimise earthworks;

(f) Provide a site access from Old Coach Road, which as part of an earlier transport assessment, was identified as being the most appropriate site access option; and

(g) Identify an overhead transmission line route from the wind farm to the proposed terminal substation located on the corner of Kaiparoro Road and SH2.

31. The resulting layout identified 20 feasible turbine locations that could be accessed from the internal wind farm roading network. From this initial layout, turbine envelope zones and turbine exclusion zones were developed.

32. An overhead transmission route from the western most turbine, through to the terminal substation was identified. This traverses over private land for approximately 3.5 km before crossing over SH2, to the terminal substation. The proposed route is illustrated in drawing 1016884.1000-01 in Appendix A of the AEE and Figure 1 below.

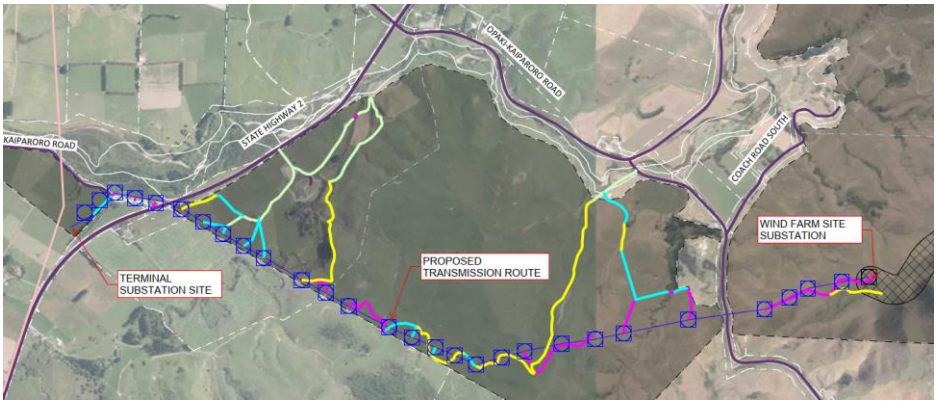

Figure 1: Proposed overhead transmission corridor route

Topographic, Geotechnical and Seismic Considerations

33. Route alignment and turbine platform options are considered in conjunction with site specific geotechnical and topographic factors.

34. The assessment of topographical and geotechnical considerations presented in my evidence is based on my observations on site and my previous experience designing similar wind farms. I have relied on the specialist geotechnical advice provided by T+T's Engineering Geologist, Mr Peters.

Topographic Considerations

35. The core site is located on hill tops approximately 5km south of Eketāhuna, in the northern Wairarapa. Currently, the site is primarily used for pastoral farming and comprises a main ridge running approximately south-west to north-east, and two smaller ridges running parallel to the main ridge. The hill slopes are generally quite steep and high, with more gentle lower hillslopes to the east. The ridgelines are gently rounded, by comparison with the hillslopes.

36. Approximately 11.5 km of internal wind farm roads are required to access the proposed turbine sites. As noted earlier, these roads tend to follow well defined existing farm tracks up to the ridges, before traversing the ridgeline to each turbine.

Geotechnical Considerations

37. Site geology and features such as large slips, slope instability, local bearing capacity and stiffness can affect the feasibility of an access route and placement of turbine foundations.

38. A preliminary geotechnical appraisal of the site was completed by T+T in May 2023 and was included as Appendix A in the CER (**Geotechnical Report**[4]).

[4] Mt Munro Windfarm, Geological and geotechnical information to support civil engineering report, May 2023, Ref: 1016884.1000 v2.

39. Preliminary geotechnical appraisals are standard practice at the feasibility and resource consenting phase for all Meridian wind farm projects and are also standard industry practice for major engineering projects in general. Further geotechnical investigations will be undertaken at the detailed design phase and will include excavating test pits, drilling boreholes and detailed geological mapping.

40. I have not repeated the detailed information in the Geotechnical Report in my evidence, but provide an outline summary of key matters discussed in the Geotechnical Report:

(a) *The geology observed at Mount Munro is dominated by older stronger greywacke rock with younger Tertiary rocks dominating to the east and north of the site and deposits of recent alluvium on the lower lying river terraces to the north and south;*

(b) *A number of gullies along the proposed access roads have been observed to exhibit groundwater seepages or a steady water flow. Soils in these gullies are soft, and the ground is locally wet and boggy. Seepages sometimes coincide with localised shallow translational landslides and earthflows. Some gullies where seepages and semi-permanent water flows occur have been dammed by farmers to form stock ponds. The seepages often occur at low points in the topography and will often coincide with minor permeability variations within the greywacke rock (i.e. between variably fractured sandstone and siltstones), or along more defined fracture planes.;*

(c) *Based on our inspections within the project area we expect that the landslide risk to the proposed project is low. Shallow landslides are to be expected and can be easily managed by minor earthworks. We have not identified any existing large scale or deep-seated instability close to the proposed earthworks, road alignments, wind turbines or other project infrastructure. Large areas of superficial soil erosion were also not observed during our site walkovers;*

(d) *Existing fill slopes around the windfarm site are small in height and have been formed during the construction of farm tracks*

across gullies or to create small ponds. Instability in existing fill slopes was not observed during our walkovers and any instability that may be present is expected to be small in nature and extent. Engineered fill batters are expected to perform well provided that they have good surface water control and under drainage and are constructed with engineered fill soils; and

(e) *The greywacke derived materials are likely to perform relatively well in both cut and fill applications providing that, during construction, location specific guidance is provided to manage groundwater, rock and soil conditions.*

41. The Geotechnical Report makes recommendations on indicative cut and fill slope angles to be used for the assessment of earthworks for Resource Consent purposes. These are summarised as follows:

(a) Maximum cut batter slope angles vary from 45° to 75°depending on the material type and slope height; and

(b) Maximum fill batter slope of of 1(V):2(H), or 26°.

42. During construction, a suitably qualified engineer or geologist should assess the road cuts as they are excavated and confirm the appropriate batter slope angle to be adopted, dependant on the strength, weathering and type of soil or rock encountered and whether local stabilisation measures are to be constructed.

43. Further information on relic landslide features[5] was provided by members of T+T's geotechnical engineering team in response to a s 92 additional information request, as repeated below:

(a) *During detailed design the final road alignment will be mapped by Engineering Geologists and any evidence of slope instability would be specifically assessed. If required, specific investigations will be undertaken to support any necessary slope stability analysis. Specific recommendations as to how the instability should be managed during construction will be detailed. Slope*

[5] Response to 20 December 2023 Section 92 Additional Information Request, dated 31 January 2024.

instability can be managed in a number of ways, for example: ongoing maintenance by removal of debris as required, for example if it constrains access or blocks surface drains; slope reprofiling; or engineered solutions including catch walls, soil nails or rock anchors / meshing. Where roads or fill are to be placed in areas of mapped instability, unstable soils may be excavated and replaced with engineered fill and specifically designed subsurface drainage installed. These options are as per Section 5.5 of the geotechnical report. Slope instability was managed in a similar way during the construction of the Mill Creek Windfarm which was also constructed in Greywacke terrain and where the same mechanisms of slope instability and hazards were encountered. At the Mill Creek Windfarm, shallow landslides were typically managed by debris clearance and local slope reprofiling. Where there were space constraints (i.e. property boundary lines or other infrastructure) then unstable slopes were stabilised with rock anchors. This was undertaken at only a small number of locations.

Seismic Considerations

44. Seismic considerations are outside my area of expertise, and I have relied on the specialist geotechnical advice provided by T+T's Engineering Geologist, Mr Peters. At the time the assessment of faulting was completed in 2021, as recorded at paragraph 4.5 of the Geotechnical Report, the GNS New Zealand Active Faults Database (**NZAFD**) recorded no active faults within the Mt Munro site area.[6]

45. Since then, two active faults within the site area and one active fault at the location of the proposed substation have been recorded in the NZAFD after a report on faulting was prepared by GNS in December 2021[7]. Refer to Figure 2 below for approximate locations of faults. Active faults are faults that are considered to have ruptured sometime

[6] See [4.5] of the Geotechnical Report

[7] **Langridge, R.M.; Morgenstern, R.; Coffey, G.L. 2021** Active fault mapping for planning purposes across the western part of the Tararua District. *GNS Science consultancy report 2021/03.* 85 p.

in the last 125,000 years. No information on recurrence interval, slip rate or displacements is provided in the Active Faults Database.

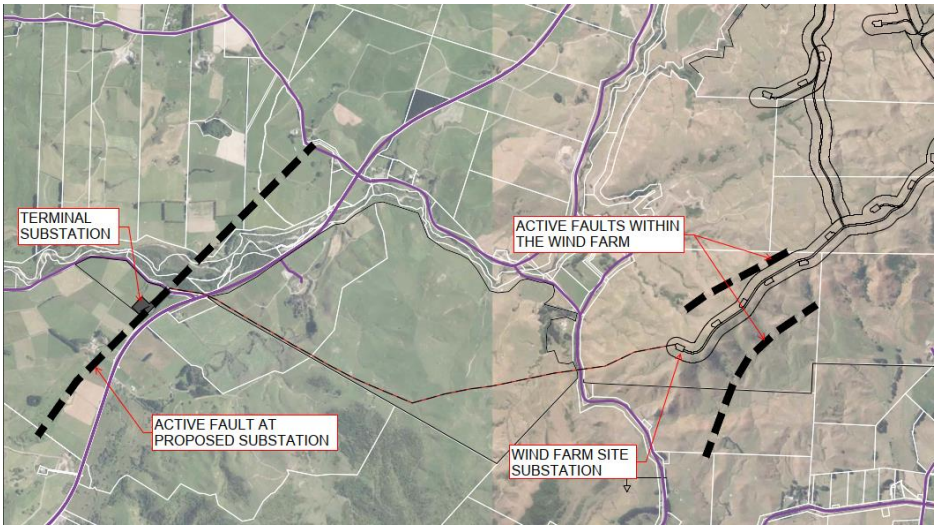

Figure 2: Approximate location of active faults identified by GNS in December 2021.

46. These faults have been inferred by GNS by desk top methods only and their existence is therefore uncertain. No physical investigations have been undertaken by GNS to prove or disprove their assumption. GNS consider these faults to be minor faults that would not result in metres of lateral displacement. The faults within the windfarm area are not located where the turbine envelope is proposed, and it is not considered necessary to investigate further at this stage. Further investigations could be undertaken at the proposed substation site during detailed design to prove or disprove the existence of a fault in this area, but I note that any issues arising will be manageable using standard construction techniques. If displacement occurred, it would be tens or hundreds of mm only, and any resultant damage would be repairable.

47. As detailed in the Geotechnical Report, the NZAFD indicates that there are five active faults within 10km of the site boundary. The nearest active fault is the Mangaoranga Fault which has a characteristic magnitude event of 6.1. The greatest seismic hazard to the windfarm is likely to be from the Wairarapa Fault located to the south of the site. The Wairarapa Fault is capable of generating large earthquakes with large seismic shaking. The Wairarapa Fault has a predicted recurrence interval of 1160-1880 years (according to GNS) and last ruptured in

1855. Seismic shaking hazard will be considered in the turbine foundation design at detailed design stage. The potential for earthquake induced landsliding impacting the internal road network will also be considered (and addressed where appropriate) at detailed design.

Wind Farm Roads

48. This section of my evidence relates to the internal wind farm roads. Details relating to Old Coach Road and the wind farm site access from the public roading network are covered in the evidence of Mr Shields.

49. The purpose of the internal wind farm roading network is to provide access from the public road to the various temporary and permanent components of the wind farm for construction, and operation/maintenance, while minimising the adverse environmental effects from construction of the wind farm.

50. The development of the internal wind farm roading network has been an iterative process. T+T has worked closely with Meridian and their experts, on matters including ecology, geotechnical, visual and landscape, erosion and sediment control and traffic, when developing the layout.

51. The proposed internal wind farm roading network consists of two access roads from the site entrance / laydown area at the end of Old Coach Road, providing access up to the main ridge where up to 14 turbines are proposed. Off each of these access roads is a minor road connecting to two smaller ridges running parallel to the main ridge, each providing access to up to 3 proposed turbines.

52. The final routes were selected as those best meeting the overall philosophy described in the **Core Site Layout Development** section of my evidence.

53. The indicative internal wind farm roading layout is illustrated on drawing 1016884.1000-008 in Appendix A of the AEE, and shown in Figure 3 below.

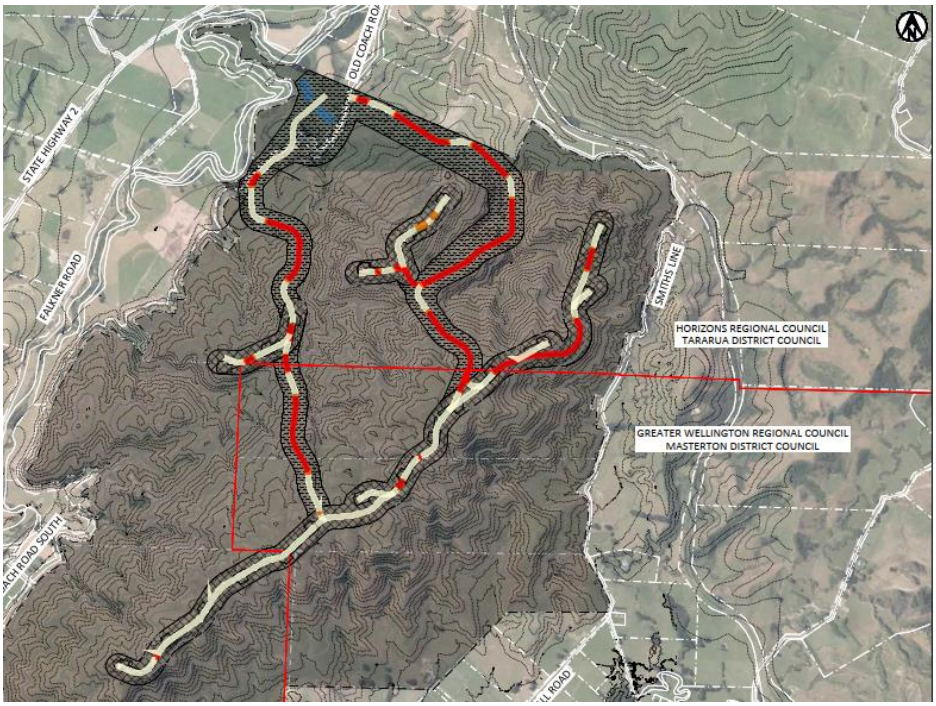

Figure 3: Indicative internal wind farm roading layout (gradient of roads shown red typically 15 – 16.2%, gradient of roads shown orange typically 12.5 – 15%, gradient of roads shown white typically less than 12.5%)

54. Internal wind farm roads will only be located within the turbine envelope zone and the turbine exclusion zone. Roads within the turbine envelope zone will have a combined length of approximately 6 km and a width of between 8 and 11 m. Roads within the turbine exclusion zone will have a combined length of approximately 5.5 km and a width of between 6 and 8 m. The variable widths are to accommodate crawler crane tracking requirements within the turbine envelope zone and large vehicles such as turbine blade transporters within the turbine envelope and exclusion zones.

Earthworks Design Philosophy for Steep Terrain

55. The construction of wind farms in steep terrain typically results in a larger quantity of cut material than fill material. There are several reasons for this, including:

(a) It is generally less expensive and simpler to form road alignments and turbine platforms in cut rather than fill. The placement of engineered fill material on steep slopes to form these elements would require the cutting of level benches to allow placement and compaction of the fill, and a fill slope similar to the natural ground slope. This would result in fill extending for significant distances

until the surfaces of the fill meet the existing slope. Therefore, to avoid the significant earthworks requirement that this would bring, most of the road alignments and turbine platforms on windfarms are typically formed in cut;

(b) In fill disposal areas, excess cut material can be placed to a lower level of compaction than what is required for engineered fill to support roads and turbine components, while still being suitable for pastoral farming activities;

(c) Cut batter slopes can generally be much steeper than fill slopes and therefore cover a smaller plan area, reducing the earthworks footprint; e.g. a 5m deep cut would typically have a plan footprint width of 1.5m, whereas a 5m deep fill would typically have a plan footprint width of 10m;

(d) The overall volume of the completed earthworks is increased by putting the roads and platforms largely in cut. However, cutting benches to form these elements in fill on steep slopes such as at Mt Munro often results in a similar volume of earth moved to the volume which results from cutting to a spoil site; and

(e) The resulting overall earthworks area on a balanced cut to fill (i.e. zero cut to waste) in steep terrain is typically greater than the overall earthworks area of cut to spoil. The balanced cut to fill option therefore typically creates more erosion and requires greater erosion and sediment control.

Fill Site Selection

56. During the earthmoving operation excess excavated material will be placed at clearly defined fill sites. Various potential fill sites have been identified along proposed internal access roads throughout the site. All earthworks will take place within the turbine envelope zone or turbine exclusion zone (with the exception of earthworks for the transmission line and terminal substation).

57. Excess cut material will be placed in designated fill areas adjacent to the internal wind farm roads. Indicative fill disposal areas and fill

profiles have been illustrated on drawings 1016684.1000-016 and 017 which were included in Meridian's "Clarification of s 92 Points – 25 October" response to request for further information. I understand that Mr Girvan has assessed the landscape and visual effects associated with fill disposal along these roads.

58. In selecting suitable fill areas, the following criteria were considered:

(a) Selecting sites where the natural ground slope that fill is to be placed on is typically no steeper than 1V: 5H;

(b) Avoiding steeper sites where fill cannot easily be placed without benching, and erosion and sediment control measures are both extensive and difficult to implement;

(c) Where practicable, avoiding overland flow paths;

(d) Avoiding wetlands and areas of identified ecological value where practicable; and

(e) Minimising haul distances where possible.

59. The extent and depth of each identified fill site will be determined based on the final design and proposed construction methodology.

60. Fill site selection strategy involves selecting sites close to excavation areas to limit haulage length and selecting sites which are appropriately sized to control the area of disturbance and re-vegetation. Details of the Erosion and Sediment Control Plan (ESCP) and its processes are discussed in detail in the evidence of Mr Ridley.

61. Fill sites will be progressively revegetated and stabilised as the works progress, to minimise soil erosion and re-establish pastureland for farming purposes.

Substation Site Selection

62. There are two proposed substations for the Mt Munro wind farm project.

63. A Terminal Substation is proposed on the western side of the corner of Kaiparoro Road and SH2, approximately 3.5 km to the west of the nearest wind turbine. The Terminal Substation will receive power from the wind farm and connect directly to the National Grid via Transpower's 110kV transmission line.

64. The Terminal Substation site was selected by Meridian based on its gentle sloping topography, easy access from SH2 and its functional requirement to be in close proximity to Transpower's existing 110 kV transmission line.

65. A Site Substation is also required and will be located within the Turbine Envelope Zone at the southwestern end of the main ridge. The Site Substation will receive power from the underground cables from the wind turbines, and electricity generated from the wind farm will then be reticulated via overhead transmission lines, over private property, before crossing over SH2 to the Terminal Substation.

66. Access to the internal overhead transmission line for construction, erection and maintenance of the towers and lines will be over private farmland, within land that Meridian has landowner agreements in place.

67. Existing farm tracks off SH2 and Opaki-Kaiparoro Road will provide access to the transmission pole locations, largely following existing farm roads and tracks.

68. The indicative substation locations and transmission line layout is illustrated on drawings 1016884.1000-010 and 011 in Appendix A of the AEE, and in Figure 1 of my evidence.

KEY ASPECTS OF CIVIL CONSTRUCTION

69. In this section I will provide a physical description of the key civil construction work elements and their envisaged construction methodologies.

Land Disturbance

70. Erosion and sediment control measures, and revegetation techniques relating to land disturbance are discussed in the evidence of Mr Ridley.

Earthworks Volumes

71. Indicative earthworks volumes have been estimated based on a combination of 3d modelling of internal wind farm access roads and turbine platforms, together with an estimate of earthworks volumes for other components of the wind farm, such as cable trenches, concrete batching plant compound, construction compound / laydown area, substation compound, and the disposal of excess cut material from Old Coach Road improvements.

72. Based on recommendations in the Geotechnical Report, when calculating earthworks volumes, cut slopes of between 0.3V: 1H and 0.7V: 1H (depending on cut height), fill batters of 1V: 2H and a topsoil depth of 250mm have been adopted. When assessing volumes in fill disposal areas, a minimum fill batter of 1V: 3H has been adopted. Refer to Figure 4.

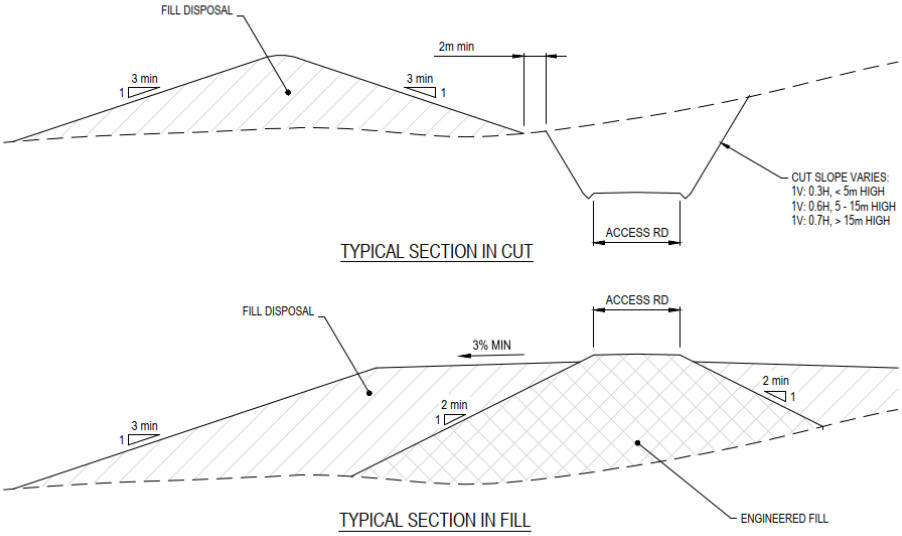

Figure 4: Indicative typical earthworks sections

73. Following discussions with Mr Crampton (Council appointed consultant for Geotechnical Engineering), an updated summary of earthworks volumes was provided as part of the s 92 response (Fill Site Volumes table dated 30 October 2023). This table is produced in my evidence as Table 1.

Table 1: Mt Munro Wind Farm Earthworks Summary

Earthworks source	Earthworks volumes - Current Design			Maximum Earthworks		Minumum Earthworks	
	Topsoil stripping	Cut	Fill	Cut (Current design + 10% contingency ***)	Fill (Current design)	Cut (Current design less 10%)	Fill (Current design)
Internal wind farm roads	47,000	850,300	305,200	935,300	305,200	765300	305,200
Cabling	(incl. in wind farm roads)	13200	12,700	13,200	12,700	13,200	12,700
Turbine platforms	39,600	651,500	109,400	716,600	109,400	586400	109,400
Turbine foundaton excavation	(incl. in turbine platforms)	42,000	21,000	42,000	21,000	42,000	21,000
Concrete batching plant	1500	6,000	6,000	6,000	6,000	6,000	6,000
Construction compound/laydown area	3500	5000	5000	5,000	5,000	5,000	5,000
Sub station	2500	5000	5000	5,000	5,000	5,000	5,000
Old Coach Road		5000	5000	5,000	5,000	5,000	5,000
Site won road base material (assumes 300mm layer over internal wind farm roads and turbine platforms)			32000		32,000		32,000
Total (m3)	**94,100.00**	**1,578,000**	**501,300**	**1,728,100**	**501,300**	**1,427,900**	**501,300**
Fill disposal volume			1,076,700		1,226,800		926,600
Bulking factor (1.15)			161,505		184,020		138,990
Total fill disposal volume (m3)			**1,238,205**		**1,410,820**		**1,065,590**

74. The figures in Table 1 are an estimate of the total earthwork volumes, together with a predicted range for the maximum and minimum estimated earthwork volumes.

75. Based on my experience of other projects, it is my opinion that the total fill disposal volume is likely to reduce by approximately 10% during detailed design, as the design is refined and optimised.

Spoil Fill Sites

76. Excess cut material is to be placed in fill areas within the designated envelope zones, adjacent to the internal wind farm roads.

77. The extent and depth of each identified fill site will be determined based on the final design and proposed construction methodology. However, fill site selection strategy involves selecting sites close to excavation areas to limit haulage length and selecting sites which are appropriately sized to control the area of disturbance and control later re-generation.

78. Fill sites will be progressively revegetated and stabilised as the works progress, to minimise soil erosion and re-establish pastureland for farming purposes.

Access Road Formation

79. Earthworks associated with construction of the internal wind farm road make up approximately 55% of the total earthworks for the project; comprising of approximately 850,300 m^3 of cut and 305,200 m^3 of fill.

80. The indicative internal wind farm roading layout is illustrated on drawing 1016884.1000-008 in Appendix A of the AEE. Indicative earthworks cut and fill batters for the internal wind farm roading layout is illustrated on drawing 1016684.1000-016 which was included in Meridian's "Clarification of s92 Points – 25 October" response to request for further information.

81. Earthworks will be carried and stabilised on a progressive basis with appropriate erosion and sediment control measures established prior to commencement of earthworks for each section.

82. Topsoil will be removed and stockpiled within the envelope zones, for respreading and establishing vegetation over fill disposal areas.

83. Roading aggregate will be sourced through a combination of site won material for the lower pavement layer (subject to confirmation of the excavated material being suitable) and the balance of aggregate imported for the upper / running course layer. If the site won material is found not to be suitable, all aggregate will be imported.

84. Aggregate is likely to be imported from one of the sources identified by Meridian. Refer to Appendix 5 of the AEE, Aggregate Supply Memo.

Turbine Platforms and Cable Trenching

85. Earthworks associated with the formation of turbine platforms and foundations make up approximately 40% of the total earthworks for the project; comprising of approximately 693,500 m^3 of cut and 130,400 m^3 of fill.

86. The indicative turbine layout is illustrated in drawing 1016884.1000-006 in Appendix A of the AEE.

87. Each turbine platform will vary in configuration to suit the topography, but will typically consist of a turbine foundation area approximately 23 x 23 m, a crane erection hardstand area of approximately 125 m at its longest point, and 60 m at its widest and temporary laydown areas for storage of the wind turbine components. The final dimensions are subject to confirmation of the wind turbine model selected by Meridian. However, a conservative approach has been adopted, and the consent design is based on the requirements of a Vesta V136 turbine.

88. Once the turbine platform has been formed, excavation of the turbine foundation to an approximate depth of 3.5 m will be undertaken with appropriate drainage and erosion and sediment control measures in place and the concrete turbine foundation constructed in the excavation.

89. Following construction of the turbine foundation, backfilling around the foundation will be completed and the areas stabilised with a granular hardfill material.

90. Trenching, laying and backfilling of the underground 33kV transmission cables from the turbines to the Site Substation will typically take place when the roads and turbine platforms are formed.

Site Substation and 33kV Internal Transmission Line

91. A Site Substation is proposed within the Turbine Envelope Zone at the southwestern end of the main ridge. The Site Substation will consist of a switchyard and small control building with an overall footprint of approximately 70 x 90 m.

92. The Site Substation will be located on a relatively flat section of ground immediately south of the westernmost turbine location, requiring minimal earthworks. The compound will have a perimeter fence with the surfacing generally consisting of concrete plinth foundations for the plant, with a granular hardstand around them.

93. Access for construction, erection and maintenance of the towers and lines for the internal 33kV overhead transmission line will be over private farmland, largely following existing farm tracks and access roads.

94. This will result in minimal land disturbance, mainly consisting of upgrading surfacing by overlaying existing tracks with a metal course layer and replacing existing farm culverts where they are in poor condition.

Terminal Substation

95. The Terminal Substation will consist of a switchyard and control building with an overall footprint of approximately 100 x 125 m.

96. The Terminal Substation will be located on a gently sloping site, requiring minimal earthworks. The site currently falls from south to north at a gradient of approximately 5% (1 in 20). The main switchyard and control building will be on a flat platform with any excess cut material being placed as fill within the Terminal Substation site.

97. The compound will have a perimeter security fence with the surfacing generally consisting of concrete plinth foundations for the plant with a granular hardstand around them.

98. Access to the Terminal Substation will be from Kaiparoro Road.

Temporary Concrete Batching Plant

99. One temporary concrete batching plant will be required to provide concrete for construction of the turbine foundations. The temporary Concrete Batching Plant will be established within the Turbine Envelope Zone or Turbine Exclusion Zone, but not within the Construction Laydown and Site Administration Area.

100. The concrete batching plant will occupy an area of approximately 100 x 60 m and will be located such that it requires minimal earthworks for establishment. The final location of the batching plant is subject to the parameters outlined in the conditions, and will be selected by the contractor to suit their construction methodology.

101. The concrete batching plant yard will be constructed by stripping topsoil and stockpiling on site and placing a granular hardfill layer to provide a sound working surface. Upon completion of the wind farm construction, the hardfill can be removed, the stockpiled topsoil reinstated, and the area re-sown with grass.

102. The concrete batching plant will be self-contained including all aggregate, cement, fuel and water storage. The batching plant will require a number of small temporary buildings for staff facilities, administration and equipment storage. These buildings are likely to be small “Portacom” type structures.

103. There is no proposal for on-site wastewater disposal within the concrete batching yard compound, with all wastewater being directed to an on-site holding tank which will be periodically emptied by tanker truck on an as required basis.

104. An on-site diesel fuel storage facility of approximately 3,000 litres may also be required to service the batching plant. This will be self-bunded to contain any spilled fuel.

Temporary Site Offices and Temporary Laydown Areas

105. Temporary laydown areas are required to service the wind farm site during construction and long-term operations. The proposed location for the main storage laydown area is a 1.4 hectare area on the western side of Old Coach Road, opposite the wind farm Site Entrance, as illustrated on drawing 1016884.1000-009 in Appendix A of the AEE. The temporary site offices will likely include storage sheds and plant servicing sheds and will be located in the laydown yard.

106. This area is relatively flat and will require minimal earthworks to establish. The yard formation will be constructed by stripping topsoil from the full extent of the laydown area and stockpiling immediately adjacent to the laydown yard. A granular hardfill layer will be placed to provide a sound working surface. The size of the laydown area required will depend on the project construction schedule, the number of turbines, the actual turbines selected, turbine servicing, type of crane availability, the requirements for any pre-erection activities such as

preliminary work on the nacelles and the Contractor's site office location and layout.

107. Water supply for the site offices will be by rainwater collection from the site building roofs into storage tanks, supplemented by water tanker top-ups as and when required.

108. Smaller short term laydown areas typically 130 m x 30 m will be required closer to the turbines, typically onsite alongside hardstands or roads for the temporary storage of components. Construction staff facilities in the form of a "Portacom" and "Portaloos", will be located on one of these smaller laydown areas.

109. There is no proposal for on-site wastewater disposal to service the Contractor's administration area, with all wastewater being directed to an on-site holding tank which will be periodically emptied by tanker trucks on an as required basis. In addition to the wastewater facilities proposed in the Contractor's administration area, "Portaloos" will be placed around the site where works are currently taking place and will be serviced on an as required basis.

110. Upon completion of the wind farm construction all facilities that are not required for the operation of the wind farm will be removed and the respective areas will be rehabilitated back to its original state.

DISCHARGES

111. Proposed erosion and sediment control measures during construction are discussed in the statement of Mr Ridley. In this evidence, I cover the permanent stormwater control measures.

Permanent Stormwater Control

112. The objective for permanent stormwater control within the wind farm will be to limit erosion and sediment loading within the completed works through a combination of:

(a) Appropriate re-vegetation measures;

(b) Provision and maintenance of road surfacing; and

(c) Provision and maintenance of permanent stormwater control measures and devices.

113. Internal wind farm access roads will typically consist of a granular basecourse surface, with steep sections being sealed with chip seal or asphalt to minimise maintenance requirements and improve traction.

114. An assessment of the water quality effects of the new sealed and unsealed road surfaces will be carried out during the detailed design stage of this project. It is expected that access roads and laydown areas are likely to generate a small amount of suspended sediment from run-off. Where this has the potential to discharge into existing watercourses, it will be managed through the design by incorporating measures such as table drains to collect the run-off, scour protection within the drains, and treatment measures to capture sediment prior to discharge. The sediment from these areas can be further minimised through maintenance of these surfaces and drainage systems over their design life. These measures will provide compliance with both the Horizons and Greater Wellington Regional Council discharge permitted activity standards.

115. For areas of access roads in cut, table drains will be provided at the toe of the cut slopes. The table drains will have velocity control and treatment measures incorporated in the design where required before discharging to natural watercourses within the site. A design specific to each location will be required for these. The design will consider aspects such as erosion risk, water quality, and effects on the downstream watercourses. Options for treatment of runoff include (but are not limited to): planted swales, vegetated filter strips, and sediment retention ponds. These items will be resolved during the detailed design stage.

Culverts and Bridge Crossing

116. The Core Site topography can generally be categorised as farm pasture on relatively steep hillside. The proposed access road alignment typically follows the ridgeline of these hills but also crosses several smaller catchments and one or two more significant catchments when climbing from the lower reaches in the northeast.

117. A preliminary assessment of the hydrology was undertaken for the Core Site which identified 4 major culvert crossings, 4 medium culvert crossings and 4 minor culvert crossings that are required where the access road crosses overland flow paths and gully crossings. Major, medium and minor culverts on this site are defined as follows:

(a) Major culverts typically range between 900 and 1200 mm diameter and have a catchment area greater than 5 hectares;

(b) Medium culverts range between 450 and 750 mm and are typically 600 mm diameter and have a catchment area ranging from 1 – 5 hectares; and

(c) Minor culverts are typically 300 mm diameter and have a catchment area less than 1 hectare.

118. The location and indicative details for these proposed culverts are provided in Appendix 13 of the AEE, and shown in Figure 5 below.

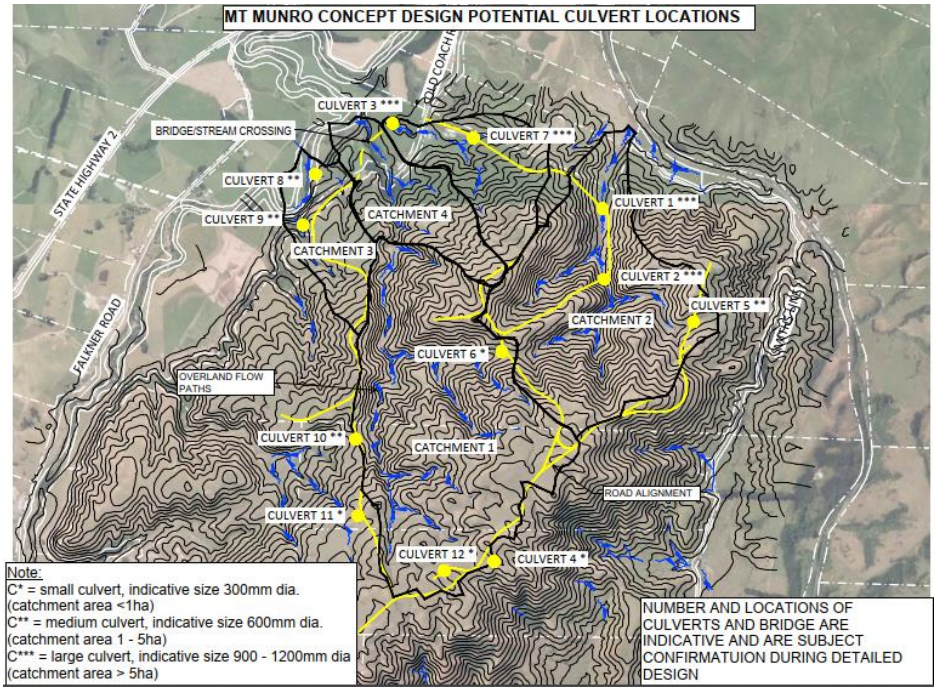

Figure 5: Indicative culvert locations

119. A permanent bridge crossing is proposed on an un-named tributary of the Makahahi River to provide access from the laydown area to the western part of the site. This is illustrated on drawing 1016884.1000-014 in Appendix A of the AEE.

120. The proposed bridge is likely to consist of driven steel piles, steel girders and a concrete deck. Concrete abutments will be placed back from the stream bank so that no excavation will take place within the waterway. If retaining is required around the abutments this will be provided with rock gabions, concrete mass blocks or similar. No earthworks or retaining are proposed within the waterway.

121. The level of the underside of the bridge will be set at 1.0m above the 2% AEP, (1 in 50 year) flood level. An allowance for climate change has been included when assessing the 2% AEP flood level. During the detailed design phase, the design flood level adopted will be reviewed to assess any benefit in increasing the bridge level to reduce maintenance costs.

Water Storage Pond

122. A water storage pond is required to store water imported via water tanker for use during construction activities such as dust control and increasing the moisture content of over-dry soils to allow optimum compaction.

123. Two potential water storage pond locations have been identified near the laydown area as illustrated on drawing 1016884.1000-009 in Appendix A of the AEE. However, only one pond is proposed to be constructed, with the location to be confirmed as part of the detailed design process.

124. Detailed design of the pond is yet to be completed; however, the pond size allows for buffer storage to balance out the peak demands versus the overall daily supply rate (via tanker trucks) to allow for high water demand periods over summer when water supply may be restricted. The approximate footprint of the pond is 100 m long x 50 m wide x 4 m deep with 2H:1V side slopes, providing a total volume of 17,200 m^3 and a working volume of 13,200 m^3.

125. Meridian has not sought consent to take water from a source within the site. It is proposed that all water is sourced from offsite and trucked to the site in tankers as detailed above.

PROPOSED MITIGATION STRATEGIES AND MEASURES

126. In my opinion, the potential adverse environmental effects from the construction of the Mt Munro wind farm can be mitigated by applying the measures outlined in the CER, and the key mitigation measures summarised below. My opinion is based on site observations and the demonstrated success of management and mitigation measures applied to other projects. These include Meridian's other wind farm developments and projects I have been personally involved in such as the Ngāwhā OEC4 geothermal power station.

127. This section outlines mitigation measures applied to the preliminary design as well as key measures I believe are necessary, and that Meridian has undertaken to implement to mitigate adverse effects on the environment. These measures relate to the design, construction, operation, and maintenance of the civil works components of the Project. I note that the following focuses on key measures only, while the CER contains a comprehensive list of mitigation measures. All measures referred to are addressed in the proposed conditions of consent which are attached to the evidence of Mr Anderson.

Seismic Risk

128. Any road cuts will be set back from the base of turbine foundations.

129. Turbine platforms will have setbacks from steep slopes below them and from cut slope above them to protect the stability of these slopes.

130. Further investigations will be undertaken to determine liquefaction potential at the proposed turbine locations, main storage laydown area, Site Substation and Terminal Substation. The advice I have been given by our T+T Geotechnical expert Mr Peters is that based on the geotechnical work completed to date, the risk of liquefaction affecting these sites is low.

Slope Stability & Route Alignment

131. Initial geotechnical analysis by T+T confirms that the natural slopes and existing cuttings within the Core Site are generally stable. Some slope instability is present around the site and will be expected during

construction but is expected to be shallow. Access road alignments have been developed to avoid steeper sloping terrain wherever possible. However, the geography of the site has meant that some roads need to locate on this steeper terrain. Detailed site investigations will assist in identifying if any specific slope stabilisation measures are required in these areas, such as shallower batter slope angles, localised drainage controls, or retaining structures.

132. Detailed geotechnical investigations will form part of the slope stability assessment offered as a condition of consent, and are required to provide input to the detailed design of cut batters together with identifying any specific slope stabilising measures to accommodate local discontinuities, or unfavourable bedding plane or material interface orientations that could result in slope instability. The scope and type of investigation will be confirmed at detailed design stage; however, investigations are likely to comprise combinations of geological mapping, test pitting and boreholes, downhole geophysics, laboratory testing and other methods such as cone penetration testing.

Erosion and Sediment Control

133. Mr Ridley has prepared a detailed statement covering the proposed erosion and sediment control framework which will be managed through the ESCP processes. Mr Ridley's evidence details specific sediment controls and describes how similar controls have been implemented on other projects.

Stabilisation

134. As the works progress, the primary aim will be to stabilise exposed areas as quickly as possible to ensure the topsoil is protected and to minimise sediment generation. A requirement to this effect will be included in form of a Site Specific Erosion Sediment Control Plan (SSESCP), to be submitted to the relevant authorities for approval, prior to any earthworks commencing.

Fill Site Selection

135. Disposal of excess cut material, as outlined earlier in my evidence, will be within the turbine envelope zone and turbine exclusion zone, at locations which will be confirmed as part of detailed design.

136. All fill sites will be set back from the envelope zones to allow sufficient space to accommodate erosion and sediment control measures within the envelope zones.

137. Based on the estimated volume of earthworks and the available fill disposal areas, it is my opinion that sufficient suitable fill sites will be available to accommodate the volume of surplus material that is expected, while still providing sufficient room to accommodate the ERSC measures withing the envelope zones.

Concrete Batching Process & Aggregates

138. As outlined earlier in my evidence, the concrete batching plant will be self-contained including all aggregate, cement, fuel and water storage.

139. Facilities required for operation of the batching plant will include an on-site diesel fuel storage facility of approximately 3,000 litres, water storage of approximately 100,000 litres, aggregate and sand stockpile areas, and a site office/amenity building. The batching plant compound will be self-bunded to contain any spillages.

140. Establishment of the batching plant compound will require minor earthworks to create a large, level platform, approximately 100 x 60 m. Any cut material generated from formation of the platform will be used to form a perimeter bund around the compound, which can then be reused when reinstating the area back to pasture.

141. Stormwater runoff from within the compound will be collected and directed to a sediment retention pond prior to discharge to the surrounding land. The pond will contain an isolation valve to contain any runoff within the compound area, in the unlikely event of a spillage.

142. A wash down area will be provided within the batching yard compound where concrete trucks will be washed down. All runoff from the wash

down area will be directed to interceptor pits where any granular material will be allowed to settle out with the resulting water reused in the concrete production.

143. 40 days prior to the commencement of construction, a Concrete Batching Plant Management Plan (CBPMP) will be provided to the relevant authorities for certification. This is outlined in proffered condition CB4.

144. The requirements for the CBPMP under condition CB4 are appropriate, and reflect the example CBPMP that was included as Appendix 14 in Meridian's s92 Response dated 7 September 2023.

Permanent Stormwater & Road Maintenance

145. Routine maintenance of roads and permanent stormwater devices will be implemented to limit erosion and sediment generation.

146. The permanent stormwater control measures outlined in my evidence will limit erosion and sediment generation and ensure controlled discharge through any road cut sections.

Culverts

147. New culverts within the Site will be designed with inlet and outlet protection works where required to minimise scour and erosion.

RESPONSES TO ISSUES IN SUBMISSIONS

148. I respond to submissions which raise issues relevant to the civil engineering design development and the direct physical effects of the civil construction, while Mr Ridley will respond in his statement to matters pertaining to erosion and sediment control.

149. The key construction and civil engineering related issues raised in the submissions relate to onsite aggregate crushing, onsite concrete batching, and the construction programme. My response to submissions focuses on design development and direct physical effects. Mr Halstead has responded in his statement to matters

pertaining to acoustic issues raised by submitters, and Mr Van de Munckhof on air quality matters.

150. **Submission issue:** Location of on-site aggregate crushing plant, and hours of operation.

Related submissions: (8) Chris Clarke, (11) Hamish Anderson, (13) Hastwell/Mt Munro Protection Society Incorporated, (15) John A Murray, (21) Charmaine Jane Semmens, (34) Glen Opel Ltd, (47) Rebecca Braddick-Tohiariki, (67) Andrea Sutherland.

Response: The requirement for the establishment of an onsite mobile aggregate crushing plant is subject to confirmation that any excavated rock from within the site is suitable for use as road or hardstand aggregate. Should the material be suitable, the 'MACF' conditions in the set attached to Mr Anderson's evidence address how actual and potential environmental effects will be managed.

151. **Submission issue:** Location and details of the temporary concrete batching plant.

Related submissions: (8) Chris Clarke, (11) Hamish Anderson, (13) Hastwell/Mt Munro Protection Society Incorporated, (15) John A Murray, (21) Charmaine Jane Semmens, (34) Glen Opel Ltd.

Response: Discussion on the location and details pertaining to the concrete batching plant are outlined in paragraphs 99 – 104 and 138 – 144 of my evidence.

152. **Submission issue:** Earthquake risk

Related submissions: (8) Chris Clarke, (13) Hastwell/Mt Munro Protection Society Incorporated, (21) Charmaine Jane Semmens, (34) Glen Opel Ltd, (37) Robin Remington Olliver, (48) Anne Braddick.

153. **Response:** Discussion on seismic and liquefaction risk is outlined in paragraphs 128 – 130 of my evidence. In summary, based on the geotechnical work completed to date, the seismic and liquefaction risk at the proposed turbine locations, main storage laydown area, Site Substation and Terminal Substation is considered low.

RESPONSES TO ISSUES IN THE S 87F REPORT

154. As noted under ‘Responses to Issues in Submissions’ above, my comments on the s 87F Report focus on civil design development and direct physical effects of the civil construction, while Mr Ridley will respond in his statement to matters pertaining to erosion and sediment control and water quality management.

Operational Water Quality

155. I have read the technical report authored by Susan Ira – Operational Water Quality, which is attached as Appendix 14 to the Section 87F report and generally agree with the conclusions reached.

156. I support the proposed Culvert Design and Construction Standards conditions CU1 to CU13 in Appendix 23 of the 87F Report, subject to the minor amendments to CU12 and CU13 in Meridian’s proposed condition attached to the evidence of Mr Anderson.

157. I agree that stormwater treatment of the permanent works should generally achieve a minimum of 75% total suspended solids (TSS) removal on a long term average; noting that the risk of sediment laden runoff will occur during a relatively short period of time during construction of the wind farm. Stormwater treatment will be achieved using a variety of treatment methods that may include, but are not limited to, stormwater ponds, wetlands, and vegetated swales. These will form part of an overall stormwater management strategy developed during future design stages of the project and is assessed to be a permitted activity as defined in Chapter 14: Discharges to Land and Water, Horizons Regional Council One Plan – 2014. I see no reason why these requirements cannot be met.

Operational Water Quantity / Hydrology

158. I have read the technical report of Andres Roa Concha – Operational Water Quantity, which is attached as Appendix 15 to the Section 87F report and generally agree with the conclusions reached.

159. I support the proposed Culvert Design and Construction Standards conditions CU1 to CU13 in Appendix 23 of the 87F Report.

160. Mr Roa considers there was absence of detail on stormwater measures, but that it is possible to design and incorporate appropriate stormwater measures to address the risks identified, and that these can be covered through robust consent conditions.[8]

161. Paragraph 14 (h) of Mr Roa's report states that the extent or location of the proposed fill disposal areas is not well understood. Details of fill disposal areas have been provided in Meridian's s92 response dated 25 October 2023. In the Geotechnical report prepared by Mr Crampton, he notes that the indicative fill disposal areas plan adequately represents the sites required to accommodate the maximum excess fill volume.

162. Paragraphs 14 (i) and 39 of Mr Roa's report recommends using a Representative Concentration Pathway (**RCP**) climate change scenario of 8.5 which is generally adopted as the basis for worst-case climate change scenarios, in which greenhouse gas concentrations continue to rise throughout the 21st century. The advice I have received from our T+T stormwater expert, Mr Rabel, is that using RCP 8.5 projections represents a cautious, risk adverse approach, while using a smaller RCP value of 4.5 or 6.0 remains a more plausible scenario given international pledges to reduce greenhouse gas emissions. The RCP value to be adopted for detailed design will be agreed with the Regional Council prior to the commencement of detailed design.

Geotechnical

163. I have read the technical report prepared by Mr Crampton – Geotechnical, which is attached as Appendix 8 to the Section 87F report and generally agree with the conclusions reached.

164. I support the proposed Earthworks Stability Standards conditions EW1 and EW2 in Appendix 23 of the 87F Report.

165. Mr Crampton concludes[9] that the Project is feasible from a geotechnical perspective, that the table of indicative earthworks

[8] Paragraph 33 of Mr Roa's report

[9] Paragraph 12 of Mr Crampton's report

volumes provided is sufficient for outlining the indicative earthworks for consenting purposes, and that the indicative fill disposal areas plan adequately represents the sites required to accommodate the maximum excess fill volume.

CONCLUSIONS

166. In my opinion, the proposed Mt Munro Wind Farm site is suitable for the construction and operation of a wind farm, from a civil engineering perspective.

167. The procedure followed to develop the proposed wind farm layout and design has been an iterative and structured process. Expert inputs have been provided by a range of people including the Tonkin + Taylor civil design team, Tonkin + Taylor geotechnical engineers and geologists, Meridian's inhouse wind farm experts, and other experts as outlined in my evidence. This has resulted in a robust civil engineering design.

168. I consider there are no civil engineering related issues that should prevent the granting of resource consent, subject to the updated set of conditions proposed by Meridian.

Maurice Mills

24 May 2024

APPENDIX A – TABLE 1 (PRELIMINARY DESIGN CRITERIA)

Design Aspect	Preliminary Criteria Adopted
Internal wind farm access roads to ridgeline	Approximately 6 -8m wide with a 1.0m drainage channel. Drainage channel to be provided in cuts.
Internal wind farm access roads along ridgeline (traversable by crawler crane)	Approximately 8 - 11m wide with a 1.0m drainage channel. Drainage channel to be provided in cuts.
Maintenance road (post-construction)	Pavement maintenance to 5m central strip only.
Gradient	Preferred: < 12.5% High: 12.5% – 15.0% Very high: 15.0% – 16.2%
Curvature	Minimum internal horizontal radius = 50m Minimum vertical radius (vertical curvature) = 250m
Working platform (for cranage and turbine foundation)	A flat area of approximately 125m x 60mm depending on cranage requirements and specific site constraints