**BEFORE THE BOARD OF INQUIRY**

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

**AND**

**IN THE MATTER** of a Board of Inquiry appointed under s146 of the Resource Management Act 1991 to consider an application by Mighty River Power Limited for resource consents to construct, operate, and maintain a wind farm at Turitea

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# SUPPLEMENTARY EVIDENCE OF GRAHAM JOHN LEVY

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## 1. INTRODUCTION

1.1 My name is Graham John Levy. My qualifications and relevant experience are set out in my evidence-in-chief. I confirm that I have prepared this supplementary evidence in accordance with the Environment Court Code of Conduct for Expert Witnesses (July 2006).

1.2 I am providing this supplementary evidence to comment on and respond to the Section 42A report: *Proposed Turitea Windfarm: Review of construction and decommissioning effects*, dated 25 June 2009, authored by Nigel Mark-Brown.

1.3 Specifically, I address the following five elements that are the substantive challenges to matters of sediment and water quality in the Section 42A report:

(a) the nature of the soils;

(b) the adequacy of erosion and sediment control measures;

(c) the prohibiting of winter work;

(d) the need for fish passage on all culverts;

(e) responsibilities for, and detail in, two of the supporting plans.

## 2. NATURE OF THE SOILS

2.1 I have made a general statement in my rebuttal evidence that "there is a relatively small silt and clay fraction in most of the soils that will be encountered". Mr Mark-Brown has disputed this, saying there are “significant proportions of silt and clay soils in much of the soils proposed to be earthworked”, and that consequently flocculation will be needed on the sediment ponds. While at face value he is correct in regard to the surficial soils in some parts of the earthworks, there are other factors behind my general statement which I will expand on in this evidence.

2.2 I based the statement in my rebuttal evidence on information from bore logs in the geotechnical report[1], and my own interpretation of those in regard to where, and to what depth, we might find those soils in different parts of the project. I also took into

[1] *Turitea Wind Farm - Preliminary Geotechnical Report*, Beca Carter Hollings & Ferner Ltd, for Mighty River Power, July 2006.

account the nature of the proposed works, and the nature of the surfaces that were likely to be exposed to erosion during construction. My view on sediment character was particularly focussed on the risks to the water supply catchment, although the context of the statement in my rebuttal evidence does not convey that.

2.3 Mr Mark-Brown notes that the "field log descriptions of clay content at two locations appear to underestimate the actual clay content which was later determined by sieve analysis." The geotechnical report only included particle size descriptions from three of the many investigation holes that were undertaken on site. I therefore relied more on the field log descriptions, of which there were a greater number and coverage across the site.

2.4 The laboratory analysis of four samples from three test locations showed 20% to 50% clay content in three soil samples from two locations, and no clay in the fourth sample. This information is insufficient to categorically define the amount of clay that will be encountered across the site, and needs to be considered in terms of where and how these soils are managed, as I describe below.

2.5 In response to Mr Mark-Brown's report, and to provide more substantive information on this issue I asked my colleague Mr James to calculate the volumes of different material types using his ground model of the project. He based this calculation on an assessment made by Mr Alexander of the likely typical soil depth to weathered rock in various parts of the project. Mr James' and Mr Alexander's supplementary evidence address these matters in more detail.

2.6 The volume calculations show that of the areas draining into the water supply catchment, 16% of the total cut volume is topsoil, and an additional 32% of material is soil (i.e., not weathered rock), with the remaining 52% being weathered rock. For areas draining away from the water supply catchment, the corresponding figures are 21% and 27%, with 52% of weathered rock. Therefore, for the overall project, a little over half (52%) of the total earthworks cut will be in weathered rock.

2.7 The surface areas exposed by the cutting will be primarily for roads and for turbine platforms. Where there is structural fill required in these areas, this will be constructed using weathered rock in preference to soil. Weathered rock would not be sent to a spoil disposal site if the consequence was that soil would be used within a structural fill

within a reasonable haul distance of the weathered rock source. The exposed areas will be covered as soon as practicable with basecourse to provide a running and working surface. As a consequence of this approach, over the development period of the project the dominant erodible surface for these areas will be basecourse, although there will be a time prior to basecourse placement when there will be some exposed areas of weathered rock and other areas of finer soils. Therefore, taken as a whole, I remain of the view that the dominant sediment source in these areas will be in the sand and gravel size range. This is of relevance in considering whether grit traps and silt fences are appropriate for treating flow from these areas, as I have proposed and discuss further below.

2.8 Soil material from the cuts will primarily be placed in spoil disposal areas. As discussed below, the surface of these areas will be managed to limit erosion, and the runoff from them treated using sediment ponds.

2.9 I acknowledge that in spoil disposal areas there will be a proportion of soils that contain silt and clay. However, I remain of the opinion that for much of the site, the erosion and sediment control measures will principally need to address sand and gravel. .

## 3. ADEQUACY OF EROSION AND SEDIMENT CONTROL MEASURES

3.1 As a corollary of his belief that there will be significant proportions of silt and clay, Mr Mark-Brown is of the opinion (section 10.2.3 of his report) that the level of erosion and sediment control required to protect the sensitive aquatic receiving environments has not been adequately addressed.

3.2 In sections 10.2.6 and 10.2.7 of his report, Mr Mark-Brown considers that flocculation is likely to be appropriate on all ponds at spoil sites that drain to high value streams, and that the downstream ecotoxicological risks of this treatment will be low. Mr Coffey has provided rebuttal evidence on the ecological impacts of using flocculants. From a sediment management point of view, I consider that widespread use of flocculants will not be necessary as a matter of course, for the reasons outlined further below. I certainly do not see a parallel between the soils on this site, and Auckland's deep clayey soils where flocculation is commonly used. However, I do acknowledge that some of the spoil disposal areas, particularly those located in the deeper soils on farmland in the west, may contain clay that is best settled with flocculants. None of the

spoil disposal sites drains to the water supply reservoir, but some will drain to high value streams.

3.3 The decision as to which spoil disposal sites will receive flocculation should be made on a reasoned basis. Flocculation should only be used where necessary and effective, and at an appropriate dosing rate. I recommend that all sediment ponds be designed to allow for flocculation to be added if required, with particular emphasis on the ponds in the western areas draining to high value streams. In the event that clay content in the spoil disposal areas is not settling in the ponds, jar tests should be carried out to determine if, and with what dose rate, settling can be achieved. This is a common approach to design of flocculation treatment.

3.4 In sections 10.2.5 and 10.2.6 of his report, Mr Mark-Brown states that the use of grit traps should be reviewed, and alternative measures developed where necessary to effectively trap silt and clay. Grit traps, although they are not covered in the Greater Wellington Regional Council's *Erosion and Sediment Control Guidelines* ('Guidelines'), are an appropriate solution in the context of the roads through the site, and were used for road runoff treatment on West Wind. As I have already outlined, most of the road areas will be in cut, or where in fill they will mostly be weathered rock, with roadside bunds that will prevent general discharge over the fill batter. As soon as practicable the road surface will be covered with basecourse.

3.5 Mr Mark-Brown's concerns could be addressed by using super silt fences to further treat the discharge from the grit traps where that discharge is to the water supply catchment or to high value streams. Super silt fences are robust silt fences (using waratah stakes and chain link fence for support) and are a treatment tool included in many guidelines, including those of GWRC. This would be relatively cost-effective, would require minimal additional vegetation clearance, would retain the distributed discharge, and would be consistent with the Guidelines in this context, as the catchments draining to each discharge point will be less than 0.5ha (which equates to 500m of road length).

3.6 I consider that not using grit traps would be a retrograde step for the roads, (which is where the grit traps are proposed), as it would result in larger treatment works (and therefore increased earthworks on steep slopes) and concentration of flows (fewer, larger discharges). I consider that the consequence would be a greater potential for

adverse effects than the use of more closely spaced discharges and grit traps as currently proposed by the Applicant.

## 4. WINTER WORKS

4.1 Mr Mark-Brown recommends in section 10.2.1 of his report that consideration be given to imposing controls on land disturbing activities over the winter period. Although the draft CEMP states that "weather permitting, works will continue through the winter period", the Applicant's proposed approach is to:

(a) Minimise winter working in areas that drain to those water bodies most susceptible to sediment effects: i.e., lower Turitea reservoir; high value streams; and the upper Turitea reservoir (although works in the south eastern ridge, where there are shallow soils, should be acceptable).

(b) Minimise winter working in the higher risk soil types - the finer deeper soils.

(c) Work with deeper cuts in weathered rock is relatively low risk and therefore suitable for winter work.

4.2 This approach leads to the following working principles, which are best addressed via appropriate consent conditions:

(a) For those areas that have low potential effects and have low risk soil types (e.g. shallow topsoil over weathered rock), should be permitted all year round.

(b) For those areas that have either higher potential effects, or have a higher risk soil type, Horizons Regional Council approval would be required on a month by month basis for undertaking work through the winter season. Horizons could consider antecedent conditions (soil moisture and rainfall), long term weather predictions, and any issues specific to the relevant receiving environments at that time.

(c) For those areas that are both higher potential effects and higher risk soil type, a prohibition on winter earthworks is probably appropriate.

4.3 In most parts of New Zealand the winter period is typically taken as starting on 1 May and ending on 30 September.

## 5. FISH PASSAGE AT CULVERTS

5.1 Mr Mark-Brown proposes (section 10.4.6 of his report) that fish passage be required at all culverts. The nature of this project is that the works are mainly located in the steep uppermost reaches of what are typically relatively small catchments. As such, most of the culverts are located on ephemeral streams, and a blanket requirement for fish passage appears excessive.

5.2 I would therefore propose that fish passage be required at all culverts on permanent streams, but only where there will be a residual stream channel upstream after construction. Although I have not inspected all the culvert sites, my expectation is that most would not qualify, i.e. they are ephemeral. The most important one, the tributary of the Kahuterawa Stream, no longer has a culvert, which I believe is the best outcome for that site. In discussion with me, Dr Coffey has confirmed this assessment.

## 6. SUPPORTING PLANS

6.1 In section 11.1 of his report, Mr Mark-Brown considers that the CEMP should state who is to prepare the SEMP. He also sets out a number of additional criteria that he considers should be included within the ESCPs.

6.2 In my opinion these are matters of detail that it is not appropriate to specify at this stage of the project. However, I consider that it is appropriate to confirm the following:

(a) The CEMP is the overarching environmental management plan through which the consents are given effect. This must be prepared by the consent holder, and must reflect its commitment to achieving appropriate environmental outcomes from the project implementation.

(b) At the other end of the scale, the ESCPs are the detailed documents that set out how the earthworks will be carried out, including day-to-day activities at a construction level. While the consent holder might outline the form it wants this plan to take, it is the contractor who must take the day-to-day responsibility to see that earthworks are appropriately planned and managed.

6.3 Who prepares the SEMP will depend on the contractual structure adopted for the project implementation. If there is a single design/build, or turnkey, contractor, then they are likely to be the party that prepares the SEMP, as this document reflects the

micro-siting of turbines, and confirmation of road platform design, earthworks quantities and spoil disposal location and design.

6.4 If, however, there is a conventional design and tender approach, with multiple contractors, it is more likely that the designer would prepare each SEMP, as part of confirming the detailed location and sizing of the works as above.

6.5 I do not consider that this process is of any concern because whichever approach is taken, the SEMPs must comply with the CEMP and the resource consent conditions be approved by the consent holder and submitted to the consent authority.

6.6 As to the criteria that should be included within the ESCPs, while I do not disagree with the list provided by Mr Mark-Brown, I do not consider that level of detail necessarily needs to be included within the conditions of consent.

## 7. CONCLUSIONS

7.1 In relation to the five substantive issues regarding sediment and water quality matters raised in the Section 42A report, I conclude as follows.

7.2 The nature of the soils is such that, while silt and clay soils may be a significant proportion of the surficial soils, such soils make up less than half of the total earthworks volume. Moreover, most of the residual cut faces and finished surfaces will be comprised of sandy gravels and fractured greywacke of varying degrees of weathering. I therefore remain of the opinion that "there is a relatively small silt and clay fraction in most of the soils that will be encountered".

7.3 The use of flocculation on sediment ponds should be decided on a case-by-case basis, and grit traps should continue to be used for the roads as the primary sediment control device. However, their performance could be enhanced by using super silt fences at the discharge points within the catchments of the water supply reservoir and high value streams.

7.4 It is the Applicant’s expectation that winter earthworks would only be allowed in appropriate areas and subject to certain conditions, and criteria have been outlined for this.

7.5 As confirmed by Dr Coffey, provision for fish passage should only be required at culverts on permanent streams, where there will be a residual stream channel upstream after construction.

7.6 It is not necessary for consent conditions to specify which party should prepare the SEMP, nor contain a highly prescriptive list of matters to be included in the ESCPs.

**Graham John Levy**

**20 July 2009**