

**BEFORE THE ENVIRONMENTAL PROTECTION AUTHORITY  
AT WELLINGTON**

**IN THE MATTER** of the Exclusive Economic Zone and Continental Shelf  
(Environmental Effects) Act 2012 (“the Act”)

**AND**

**IN THE MATTER** of the applications by Trans Tasman Resources Limited  
(TTRL) for marine and discharge consents to recover iron  
sand under sections 20 and 87B of the Act and

**BETWEEN** **Trans- Tasman Resources Limited**

Applicant

**AND** **The Environmental Protection Authority**

EPA

**AND** **Kiwis Against Seabed Mining Incorporated (KASM)**

Submitter

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**SUPPLEMENTARY STATEMENT OF EVIDENCE BY SHAW TREVOR MEAD  
ON BEHALF OF KIWIS AGAINST SEABED MINING INCORPORATED  
Dated 19 May 2017**

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## INTRODUCTION

- 1 My name is Shaw Trevor Mead.
- 2 I prepared expert evidence dated 23 January 2017 with respect to these proceedings on behalf of Kiwis Against Seabed Mining Inc.
- 3 My qualifications and experience as a marine biologist, physical oceanographer and numerical modeler are set out in paragraphs 2-5 in my first statement of expert evidence.
- 4 I repeat the confirmation given at paragraph 8 of my First Statement that I have read the Code of Conduct for Expert Witnesses and agree to comply with it.
- 5 The purpose of this supplementary evidence is to provide opinion of the addition evidence supplied for these proceedings, namely:
  - a) The TTR interactive maps pdf.
  - b) Pinkerton 2017 – worst case scenario optical effects modelling.
  - c) Supplementary evidence of Dr Cahoon.
  - d) Supplementary evidence of Dr James.
  - e) Supplementary evidence of Dr MacDaimid.

### **TTR INTERACTIVE MAPS PDF**

- 6 In viewing and navigating the TTR interactive spatial maps, I found it very difficult to use and interpret results, and have similar concerns as those described by the Fisheries Submitters:
  - a) They do not record depths, navigation warnings, or other key features of hydrographic charts including navigational warnings;
  - b) They do not have a complete key that would assist interpretation of the map. For example, assuming the red arrows represent current flows, neither the intensity of the currents nor the time period the currents represent is explained;

- c) They provide no obvious time scale covering the information recorded on the map;
- d) They contain no commercial fishing information, such as trawl tracks, aggregation of surf clams or aggregations of krill are overlaid on the map, and;
- e) They are cluttered, hard to interpret and requires a feature that allows layers to be toggled on and off.

### **WORSE CASE OPTICAL EFFECTS MODELLING**

- 7 Pinkerton’s worst-case scenario modelling indicates that the optical effects are significantly greater than the results of the previous optical effects modelling, “Predicted optical effects in the new simulations are qualitatively similar to those from Pinkerton & Gall (2015), but quantitatively greater. Averaged across the sediment model domain, optical effects that are relevant to estimating effects on primary productivity were 44% greater in the new simulations than estimated using the models summarised in Pinkerton & Gall (2015). This considered effects of mining on mean light in the water column, mean light at the seabed, and the number of days per year when seabed light was greater than two ecologically-relevant limits”, and “On average, optical effects of mining at the selected eight stations are 41% greater in the new simulations than estimated using the models summarised in Pinkerton & Gall (2015). This considers four optical effects: horizontal visibility (midwater, seabed), number of high visibility days per year (in midwater and at seabed), euphotic zone depth, and number of days per year with >1% light at the seabed. The predicted effects are 2.2 times greater due to mining at site A than mining at site B.”.
- 8 However, similar to the initial work and the interpretations of Dr Cahoon, the results are greatly reduced by averaging them over the entire sediment model domain (SMD), “Average light in the water column averaged over the domain of the sediment model is predicted to be reduced by only a small amount: 2.9% (mine A, was 1.9%) and by 2.4% (mine B, was 1.6%). Reductions in water column light

are predicted to occur predominantly to the east of the mining site due to the sediment plume often moving in this direction.”

- 9 As I pointed out in my first evidence (paragraph 39), using the SMD as the metric for assessing impacts of the mining activity is not a valid approach and cannot be rationalized in any way. Since there are very large proportions of the SMD that are not impacted at all, averaging over the whole SMD greatly diminishes the % of these impacts, which are significant ‘locally’ (especially inshore and to the southeast of the mining) and also represent very large areas (Figure 2.11 in the Pinkerton report). Averaging impacts over the entire SMD is not a valid representation of impacts of the plume in this case. There are a large variety of depths, habitats, substrates, background conditions, etc., throughout the SMD and the impacts of mining are concentrated on a particular area of it. The area of impact needs to be quantified both spatially and in terms of the magnitude of the impacts, not diluted over the entire SMD (which is ~13,300 km<sup>2</sup>), especially since the modelling clearly shows that impacts are not diluted/spread over the entire SMD. Questions 1 and 2 to Dr’s Cahoon, James and MacDiarmid request that the impacts be quantified spatially (“When, where, and to what extent”), however, Dr’s Cahoon and James provide no information in relation to this question.
- 10 This is recognized in Section 2.6 of Pinkerton’s report with respect to light at the seabed, that by averaging over the entire SMD the large local reductions in light at the seabed (i.e. 87-92%) are reduced to 30% and 21% (Site A and B, respectively), “This reduction reflects the fact that for much of the time the plume of fine sediment passes over relatively shallow sea floor which would otherwise be relatively well lit. Most of the SMD is deep and/or overlain by turbid water, receives little seabed light and would be little affected by the mining.”.
- 11 Pinkerton suggests that this averaging is necessary due to the resolution of the modelling “Note that this maximum reduction depends on the resolution of the

modelling – smaller cells (higher resolution modelling) would give a higher maximum changes and vice versa.” and suggests that therefore in order to not over-interpret these results in terms of ecological significance, the mean over the entire SMD is a more reliable measure of this impact. I do not agree with this interpretation – while the values within individual model cells could vary with varying model cell size/resolution, the overall area and quantity of impact is not affected.

#### **ADDRESSING QUESTIONS 1 AND 2**

12 Dr’s Cahoon, James and MacDiarmid were asked to respond to questions with respect to the impacts of the plume (optical effects modelling):

- a) When, where, and to what extent will elevated SSC levels cause environmentally significant changes (for benthos, primary production, fish) arising from light received? Decreased primary production is an example. What comprises a “significant” change should be specifically addressed.
- b) When, where, and to what extent will elevated SSC levels cause environmentally significant changes (for benthos, primary production, fish) related to physical effects? Smothering of algae or filter feeders is an example. What comprises a “significant” change should be specifically addressed

13 Dr MacDiarmid answers these questions by providing both a quantitative description of the impact and its spatial extent. However, Drs Cahoon and James do not sufficiently answer questions a and b and present results that are greatly reduced by averaging them over the entire SMD. As described above and in my first statement, using the SMD as the metric to measure impacts against is invalid and down plays the magnitude of the impacts over what is regularly described as a relatively small area, even though the impacted area is very large; it is only relatively small when related to the marine area in the SMD of some 13,000 km<sup>2</sup>.

- 14 Similarly, the chronic impacts of the plume generated by the mining operation is not considered. This is highlighted in Dr Cahoon's response (paragraph 12), where he states, "Thus, the worst case scenario posited here represents a much smaller and more spatially limited perturbation than natural events that occur with some frequency in the SMD. As I have observed previously, the flora of the South Taranaki Bight are selected by and adapted to the environment in which they are living. Consequently I conclude that the worst case scenario would not create conditions at all close to those already occurring at event time scales in this continental shelf ecosystem." This conclusion is incorrect. The benthic ecology within the proposed mining area, or close to the plume (which includes a range of habitat types), is not adapted to almost permanent low light conditions and suspended sediment, the press impact of the mining activity. They are adapted to pulse events and likely require the intervening calm/increased light periods to maintain the existing community structures.
- 15 Dr James also points out how the chronic impacts caused by elevated suspended sediments are not adequately addressed, with the scientific evidence that has been relied upon only considering short periods of exposure or hours to several weeks, rather than decades.
- 16 The results of the worst case scenario modelling do not change my assessment presented in my first statement of evidence, although they highlight the concerns and reasons behind them that I have already presented.

Dr Shaw Mead

19 May 2017

A handwritten signature in black ink, appearing to read "Shaw Mead", is placed on a light grey rectangular background.