BEFORE THE ENVIRONMENTAL PROTECTION AUTHORITY
AT WELLINGTON

IN THE MATTER	of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012
AND	
IN THE MATTER	of a decision-making committee apppointed to hear a marine consent application by Trans Tasman Resources to undertake iron ore extraction and processing operations offshore in the South Taranaki Bight

EXPERT REBUTTAL EVIDENCE OF DR TERRY HUME ON BEHALF OF TRANS TASMAN RESOURCES LIMITED

1 FEBRUARY 2017

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INTRODUCTION

1. My name is Terry Martyn Hume.

2. I prepared Expert Evidence dated 15 December 2016 (First Statement) with respect to these proceedings on behalf of Trans Tasman Resources Limited.

3. My qualifications and experience as a marine geologist, coastal geomorphologist and coastal oceanographer are set out in paragraphs 1 to 4 of my First Statement.

4. I repeat the confirmation given at paragraph 5 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 Rebuttal Evidence is to correct one matter of fact included in my First Statement and to respond to the following two matters raised in the evidence of Mr Derek John Todd on behalf of the Fisheries submitters:

   (a) Coastal stability – beach profile surveys; and

   (b) Coastal stability – effects of extraction on sand transport.

CORRECTION OF FACT IN MY FIRST STATEMENT

6. In my First Statement (paragraph 26) where I describe wave modelling undertaken to determine the effect of seabed modifications on waves characteristics at the shore, I describe the seabed modifications for case 1 as being "9 – 10 m deep pits and 8 – 9 m tall mounds at the end and start (respectively) of every lane on every mining block, a scenario possible at the end of mine life".

7. The assessment (and modelling) on the pits and mounds and the effects these would have on waves, was based on a very conservative scenario of 9 m mounds. In reality the height of the mounds are less than 9 m, given the shallower

depth of mining on the periphery of the iron sand deposit. The mounds would be less than 5 m on average, in addition to this they will deflate the moment the sediment is discharged onto the seafloor.

8. This information does not affect conclusions in my first statement. In fact, it shows that I have provided a very conservative estimate of potential effects.

RESPONSE TO EVIDENCE OF DEREK TODD

Coastal stability – beach profile surveys

9. Mr Todd questioned "why there has been no effort to update the beach profile data since 2012 to provide a longer record of short term shoreline change" (paragraphs 10 to 12 in his statement of evidence).

10. Beach profiles were measured at eight sites between Ohawe and Kai Iwi, spanning a stretch of 70 km of coast. Some 352 profiles were surveyed during the 11-month survey period (June 2011 to April 2012).

11. Although the beach profile record is short, the South Taranaki Bight experienced a wide range of wave conditions, and therefore a wide range of beach change, over the 11-month period including sizable storm events. NIWA had wave measuring instruments deployed offshore in 10-12 m water depth for 4 months during this period. The record shows that in that time alone there were 10 events where significant wave height (the average of the highest one third of the waves in the record) exceeded 2 m and for five of these events wave heights were sustained at over 2 m for more than two days. Significant wave height exceeded 4 m during the weather bomb of 21-23 September 2011.

12. In my opinion the beach profile record captures a representative range of short term shoreline change.

13. It is my opinion that monthly beach profile monitoring be part of consent conditions. I recommend that beach profile monitoring be undertaken in the manner described by NIWA (MacDonald et al. 2015)[1], at the same 8 sites at monthly frequency. Monitoring should begin at the time consent is granted and continue until extraction begins. The data should be reviewed and reported annually and against the data from the earlier 11-month survey (June 2011 to April 2012). This will enable baseline (no extraction) conditions to be established and against which future change due to extraction can be assessed. Analysis of this record should be used to determine trigger or threshold conditions and also the frequency of profiling during extraction operations (which may be different to that of the baseline surveys).

Coastal stability – effects of extraction on sand transport

14. At paragraph [15] Mr Todd questioned "why the results of the updated sediment plume modelling (Hadfield & McDonald, 2015)[2] have not been used in the assessment of effects of the extraction on sediment transport? This is of relevance as the plume modelling results differ between those reported in 2013 and those reported in 2015. These differences are likely to have implications for the sediment transport results, and this raises uncertainty as to the accuracy of the results reported in the Coastal Stability Phase 2 Report."

15. The plume model was used in 2013 to examine the fate of de-ored sand at the extraction site. "Patch" simulations were run using the model by replacing a 3 x 2 km rectangular patch of seabed sand in the extraction area with sand

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[1] MacDonald, I., Ovenden, R., Hume, T. (2015) South Taranaki Bight iron sand mining: Shoreline monitoring data report. Report prepared for Trans Tasman Resources Ltd. NIWA Client Report No: HAM2012-085: 96.

[2] Hadfield, M. and McDonald H. (2015) Sediment Plume Modelling. Prepared for trans-Tasman Resources Ltd, October 2015. NIWA Client Report No: WLG2015-22.

representing one years' worth of ironsand extraction. Results from this modelling, reported in Hume et al. (2015)[3], were used to evaluate the potential for seabed sands to be transported away from the extraction area by waves and currents and therefore the connection between seabed sands at the site and sand on the shore. In summary, the patterns of deposition indicate that sediment of particle size similar to that on the beaches is not distributed far from the extraction site, and that the transport of sand to the shore from the extraction site (or a deficit therein) will take a lot more than two years (730 days was the duration of the model run). That is to say, the model results suggested there is no evidence of any significant connection between seabed sand at the extraction site and sand at the shore.

16. The "patch" simulation was repeated and revised in May 2015. Between the two (2013 and 2015) simulations there were small differences in the grain sizes and settling velocities for the fine sands (100 µm or less); these small differences arise from the revised treatment of flocculation. Flocculation is a process that has a strong influence on the settling velocities of the fine size fractions. No changes were made to the settling velocities for the coarse sand (500-1000 µm) and medium-fine sand (125-500 µm) fractions that are not affected by flocculation and are representative of the size of the sand on the beaches. For this reason, I consider that the results from the updated plume modelling do not alter my original interpretation.

17. Importantly, there are other factors that support the model results and my view that there is no evidence of any significant connection between seabed sand at the

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[3] Hume, T., Gorman, R., Green, M., MacDonald, I. (2015) Coastal stability of the South Taranaki Bight – Phase 2 Potential effects of offshore sand extraction on physical drivers and coastal stability. NIWA Client Report HAM2012-083: 135.

extraction site and sand at the shore. Firstly, current meter measurements show that the current drift directions at the mining site and inshore of the site are strongly orientated parallel to the shore (and not towards shore) for most of the time (Hume et al. 2015 pp 38-42). Secondly, the hydrodynamic model provided a finer scale view of water movements of depth-averaged velocity vectors averaged over 730 days, to show that the current in the extraction area is very weak (of the order of 1 – 2 cm/s) and is directed primarily south east and parallel to the shore. Similarly, between the extraction area and the shore south of Patea the mean current is weak (2 – 4 cm/s) runs to the south east and parallels the shore. These weak net currents and their net direction, tell us that despite large back and forth movements of water (and therefore sediment) net sediment transport will be weak and directed principally to the south east between the extraction site and the shore. That is to say, they do not support there being a significant connection in sand transport between the extraction site and the beaches some 22 to 36 km to the east.

CONCLUSIONS

18. The points raised by Derek Todd do not affect conclusions in my first statement.

Dr Terry Hume

1 February 2017