

**BEFORE THE ENVIRONMENTAL PROTECTION AUTHORITY
AT WELLINGTON**

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

AND

IN THE MATTER of an application for marine consent under section 38 of the EEZ Act by Trans-Tasman Resources Limited to undertake iron ore and processing operations offshore in the South Taranaki Bight

BETWEEN **Trans-Tasman Resources Limited**
Applicant

AND **Environmental Protection Authority**
EPA

AND **Fisheries Inshore NZ, New Zealand Federation of Commercial Fishermen, Talley's Group Limited, The Southern Inshore Fisheries Management Co Limited and Cloudy Bay Clams Limited**
Fisheries Submitters

**SUPPLEMENTARY STATEMENT OF EVIDENCE OF
DR GREGORY MATTHEW BARBARA FOR FISHERIES SUBMITTERS**

Dated: 10th April 2017

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INTRODUCTION

1. My name is Dr Gregory Matthew Barbara. I am marine technical leader at Jacobs Australia Pty Limited in Adelaide Australia, (part of Jacobs Engineering Group).
2. I completed my primary statement of evidence for the Fisheries Submitters on 8 January 2017. My qualifications and experience are set out at paragraphs [3] to [9] of my primary evidence.
3. I participated in the first expert conference on Sediment Plume Modelling on 13 February 2017,¹ and the second expert conference on Sediment Plume Modelling – Setting Worst Case Parameters - on 23 February 2017.²
4. In preparing this statement of evidence I have reviewed the following documents:
 - (a) South Taranaki Bight Sediment Plume Modelling – Worst Case Scenario, NIWA prepared for Trans-Tasman Resources, dated 16 March 2017;
 - (b) Expert evidence of Dougal Greer on behalf of Kiwis Against Seabed Mining, dated 27 March 2017;
 - (c) Expert evidence of Dr Michael Dearnaley on behalf of Trans-Tasman Resources, dated 28 March 2017; and
 - (d) Expert evidence of Mr Joris Jorissen on behalf of Fisheries Submitters, dated 7 April 2017.

¹ Joint Statement of Experts in the Field of Sediment Plume Modelling, dated Monday, 13th February, 2017.

² Joint Statement of Experts in the Field of Sediment Plume Modelling – Setting Worst Case Parameters, dated Thursday, 23rd February, 2017

CODE OF CONDUCT

5. I have read the Environment Court Code of Conduct for expert witnesses and agree to comply with it.
6. I confirm that the topics and opinions addressed in this statement are within my area of expertise except where I state that I have relied on the evidence of other persons. I have not omitted to consider materials or facts known to me that might alter or detract from the opinions I have expressed.

PURPOSE AND SCOPE OF EVIDENCE

7. I have been retained by the Fisheries Submitters to prepare evidence for the assessment of the TTR 2016 activities on fisheries and the supportive ecosystem in the South Taranaki Bight (**STB**).
8. I am familiar with site of the application and surrounding environment having been involved in assessing the previous TTR application for the New Zealand Environmental Protection Authority.
9. I understand the Decision Making Committee (**DMC**) has requested (in addition to my primary evidence and the first and second Joint Witness Statements on Sediment Plume Modelling (**JWS**)) a further statement of evidence addressing the “*materiality*” of Sediment Plume Modelling.
10. The relevant parts of my primary evidence addressing Sediment Plume Modelling include
 - (a) Particle Size Distribution of sediments and suspended sediments; and
 - (b) Sediment redeposition and physico-chemical effects on benthic species.
11. This supplementary statement of evidence is prepared in response to the second expert conferencing session for the sediment plume model, and the development of the parameters for the ‘worst-case’ scenario model. In particular, I address the materiality of further modelling information in light of the issues raised during the first and second conference.

MATERIALITY OF MODELLING

12. The DMC requested a second conferencing session for the Sediment Plume Modelling be held on 23 February 2017, in order to define a worst-case scenario for the plume modelling in a second joint witness statement. However for a number of important parameters, such as percentage of fines in plume, agreement was not reached on what parameters constituted a worst-case scenario. Instead TTR proposed substituted “indicative” values in place of verified worst case values. Several other worst-case parameters for the model could not be determined due to lack of baseline data. This has resulted in the creation of an updated model that still does not represent a worst case scenario.
13. The second JWS on Sediment Plume Modelling – Setting Worst Case Parameters - states at paragraph [9] that *“the independent experts think the information regarding the mining process and the inter-relation with the ROM was not concisely collated for this application. Details of the mining operation and ROM have been revealed through the conferencing sessions which has made it difficult to fully assess the schematisation of the mining process in the models.”*³
14. TTR has referred to its operations throughout the hearings as being akin to large international dredge operation projects. I therefore consider that international best practise sediment plume modelling developed for dredge projects should be applied to the modelling undertaken in support of TTR’s proposal.
15. There are several accepted best practise international guidelines for dredging projects including the Great Barrier Reef dredging guidelines (GBRMPA 2012) and The Australian National Assessment Guidelines for Dredging. (Australian Government, 2009) (**Guidelines for Dredging**). I consider the Guidelines for Dredging provides international best practice guidelines for sampling and analysis of sediments, including testing methods for particle size distribution investigations. Specifically, the Guidelines for Dredging recommend the laboratory testing to be undertaken by experienced, registered laboratories that apply proven methods and have an appropriate

³ Ibid.

quality assurance and quality control system. With regards to reporting of sediment analysis, the guideline recommends that all field and laboratory data, including laboratory certificates should include a sediment analysis report. To date TTR have not provided this level of information.

16. The mining program is proposed to run from 15 up to 35 years yet the run time of the model is for a period of only 2 years. A two year period would not capture worst case global climatic events such as the transition between El Niño and La Niña. They occur when the Pacific Ocean and the atmosphere above it change from their neutral ('normal') state for several seasons. El Niño events are associated with a warming of the central and eastern tropical Pacific, while La Niña events are the reverse, with a sustained cooling of these same areas. These changes in the Pacific Ocean and its overlying atmosphere occur in a cycle known as the El Niño–Southern Oscillation (**ENSO**). The atmosphere and ocean interact, reinforcing each other and creating a 'feedback loop' which amplifies small changes in the state of the ocean into an ENSO event. It is not uncommon for multi-year La Niña events to occur. For example, the 1998–2001 La Niña affected three consecutive years from autumn 1998 to autumn 2001 (ABOM, 2017).
17. It is noted that Dr Hadfield is recorded as acknowledging in the DMC's first TTR decision that *"2 years' model output is not sufficient to define the seasonal cycle to a high degree of accuracy"*.⁴ I consider that this should have been rectified in the most recent application made by TTR.
18. The experts set an upper limit of 2.25% ultra-fines that could be mined. This was based on information provided by Mike Dearnaley, during the expert conferencing session, which due to economic reasons TTR would not consider mining material that contained more than 2.25% ultra-fines for more than a week and mud lenses would not be mined. This mine process information has not, however, been validated through an independent review.
19. The uncertainty around the fines content to be mined is also highlighted in the TTR 2014 Marine Consent Decision, which records Mr Brown having stated that *"the revised particle size distribution used for the expert conferencing plume modelling session was due to increases in the assumed mud content*

⁴ *Trans-Tasman Resources Ltd Marine Consent Decision*, Environmental Protection Authority, dated 17 June 2014, at paragraph [151].

(to take into account the expectation that some mud lenses would be mined)
... ”.⁵ This uncertainty has not been addressed in the latest application through independently validated information on mine process.

20. Mike Dearnaley advised during the drafting of the second JWS that a significant fraction of the fines content is retained in the mined material, minimising its return to the seabed. The experts were unable to confirm this as information on the mining process efficacy could not be provided by TTR. Therefore, a worst case scenario for failure to retain fines could not be defined.
21. The suspended sediment concentration (**SSC**) model assumed flocculation rates within the mining area would be high due to the results from the laboratory testing by HR Wallingford (HRW, 2014). These laboratory trials were, however, based on the sediment characteristics of only three subsamples of sediment from processed material. The trials were run within confined beakers without resuspension effects. Three samples from an area the size of the Proposed Project Area (**PPA**) is insufficient to provide a representative dataset to account for natural variation in sediments. It is therefore not possible to determine the worst case settlement rates (fall velocities) or resuspension criteria.
22. The uncertainty regarding the particle size distribution (**PSD**) percentages of fines expected to be produced by the mining operation has still not been resolved. TTR have not provided the bore logs and verified laboratory reports for the PSD analysis upon which the SSC modelling has been based. What was presented to the experts during the conferencing session were a number of tables extracted from excel spreadsheets with averages of PSD and pooled data, along with a word document that summarised the data but did not detail the methods. This type of data is not considered best practise or even verifiable scientific results. It is therefore not possible to determine the worst case fines % from the PSD data.

⁵ *Trans-Tasman Resources Ltd Marine Consent Decision*, Environmental Protection Authority, dated 17 June 2014, at paragraph [167].

CONCLUSION

23. As stated in my primary evidence, the sediment plume is a fundamental component of the proposal. The majority of TTR's impact assessment is based on the assumption that the SSC will be low. This assumption is based on predictions from the TTR SSC modelling which assumed that less than 4% of the sediments redeposited within the PPA will be fines (muds, silts or clays). These assumptions to date have not been backed by any independently verified data or written information on the TTR mining processes. The ramifications to TTR's impact assessment if the plume modelling parameters do not capture the worst case scenarios are wide reaching in terms of significant potential adverse effects. E.g. muds and clays can travel further than sand in the water column and once settled form anaerobic barriers in even thin layers (<2cm).

Dated this 10th day of April 2017



Gregory Matthew Barbara

REFERENCES

Australian Government Bureau of Meteorology (2017)

<http://www.bom.gov.au/climate/enso/> accessed March 2017

EPA Decision Making Committee, Trans Tasman Resources Limited Marine Consent Decision, June 2014

GBRMPA (2012) The use of Hydrodynamic Numerical Modelling for Dredging Projects in the Great Barrier Reef Marine Park. Guidelines

http://www.gbrmpa.gov.au/_data/assets/pdf_file/0018/26532/Guidelines-on-Hydrodynamics-Modelling-15-Aug-2012.pdf

HRW (2014) Support to Trans-Tasman Resources Laboratory testing of sediments report full version. Client Report No: DDM7316-RT002-R01-00

The Australian National Assessment Guidelines for Dredging (Australian Government, 2009)