

**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 New Zealand Limited, New Zealand Federation of Commercial Fishermen Inc, Talley's Group Limited, Southern Inshore Fisheries Management Company Limited and Cloudy Bay Clams Limited**
Fisheries Submitters

**SUPPLEMENTARY STATEMENT OF EVIDENCE OF
BRUCE PATERSON CLARKE FOR FISHERIES SUBMITTERS**

Dated: 19th May 2017

In response to DMC Minute 41

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INTRODUCTION

1. My name is Bruce Paterson Clarke.
2. I completed my primary statement of evidence for the Fisheries Submitters on 23 January 2017. My qualifications and experience are set out at paragraphs [2] to [5] of my primary evidence.
3. I participated in the first expert conference on Conditions and Planning on 2 March 2017.
4. This is my second statement of evidence in relation to the operational risks posed by Trans-Tasman Resources Limited's (**TTR**) proposed mining activities.

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 on the risk posed by TTR's proposed mining activities on fisheries and their supporting ecosystem within the South Taranaki Bight (**STB**).
8. This supplementary statement of evidence is prepared in response to:
 - (a) my review of the reports entitled Operational Risk Review prepared by Transfield Worley, 2013, and Risk Assessment TTRL Mining Vessel, prepared by Vuyk Engineering Rotterdam BV, Rev B, 2014 reports; and

- (b) Dr Mitchell's Supplementary Evidence in Response to Questions from the Decision Making Committee (**DMC**), dated 2 May 2017 pertaining to the revised marine consent conditions.

RISK ASSESSMENT REPORTS

Operational Risk Review

9. The Operational Risk Review report is based on a *“HAZID workshop which was focused on identifying hazards related to the area of operation while normal production and concurrent activities are undertaken”*.¹ The report states that:

As the project is in the feasibility stage, the workshop focused on the identification of major and significant hazards rather than development of an exhaustive list of all possible hazards. The Hazard Register should become a live document for the project and be revisited and updated at key stages in the lifecycle of the project.

10. I consider the Hazard Register should have been updated prior to the DMC hearing, and at least by now, given that there have been changes to the proposed activity since with the Operational Risk Review was completed in 2013.
11. The Hazard Register identifies the hazard, threat/cause, consequence of the hazard and the likelihood of the hazard occurring as a raw unmitigated risk. It then applies a series of proposed mitigation actions or controls, and then reviews the hazard severity and likelihood of occurrence of the hazard to reassess the level of risk having applied the mitigation actions.
12. The risk workshop identified 15 hazards as Extreme Risks and 14 hazards as having High Risk prior to mitigation being applied. With mitigation applied all the Extreme and High Risks are reported as being reduced to High, Moderate and Low. The workshop assumed that all the mitigation proposed would be

¹ Marine Operations Risk Review, prepared by Transfield Worley, dated November 2013, section 2.1, page 2

applied. However, the report does not provide any detail on the design of the proposed mitigation measures, or how they would be given effect.

13. For a number of the hazards assessed, the likelihood of the hazard occurring cannot be altered by mitigation. Only the consequence (effect/impact) of the hazard occurring can be mitigated. For example, the likelihood of a high sea event occurring in the STB cannot be mitigated. The risk of occurrence is constant irrespective of the proposed mitigation. However, the Hazards Register for item 3 "*high sea state hazard*" records the likelihood of risk as shifting from "*likely to occur*" to "*unlikely to occur*" even though the mitigation proposed does nothing to alter the frequency of occurrence of high sea states.
14. The proposed mitigation includes²:

FPSO [Floating Production, Storage and Offloading Unit] designed for sea-state of 4 meters, crawler operations are in relatively shallow areas and sea-state restrictions on operation of crawlers, wave rider buoy or equivalent and discussion with neighbouring installations.
15. Relying on the above statement, the level of consequence is reduced under the report to "minor". However, the likelihood of risk does not change to "unlikely to occur". Accordingly, using the report's Risk Matrix the likelihood of risk should remain at High as opposed to the report's classification of Moderate. This is just one example, of numerous inconsistencies within the report, which bring into question the validity of the report's risk assessment outputs.
16. The Hazard Register does not use a consistent approach to describing hazards, and inter-changes the use of the term hazards with threats/causes. Furthermore, the fatality values for people are very permissive compared to industry norms. For example, the major consequence descriptor for people used is 1 to 3 fatalities, whereas the industry norm for people working on-site is one fatality. The use of such permissive descriptors highlights the level of uncertainty in the Operational Risk Review conducted to date.

² Marine Operations Risk Review, prepared by Transfield Worley, dated November 2013, Appendix 1 – Risk Register

Risk Assessment TTRL Mining Vessel

17. The purpose of the Risk Assessment TTRL Mining Vessel report, by Vuyk Engineering Rotterdam BV was to support an application to the classification society ABS to perform an “Approval In Principle” (**AIP**) for the design of the mining vessel. This risk assessment was undertaken to identify potential risks and precautionary measures to mitigate design risks, or propose an approach for further investigation and mitigation in the design and building process that will follow after the AIP.
18. In my opinion, the risk assessment described in the report, is high level and for the specific purpose of mitigating design risk. It does not contain detailed analysis of the operational risk posed by the vessels within the STB during the mining operation.
19. The risk of grounding is assessed, but does not include the potential of grounding on a mound created on the sea floor at the start of each mining trench (with mounds being up to 9 metres in height), or on the shallow reef in the mining areas which has a depth of just 16 metres. Neither does it adequately address the potential for the hull to come into contact/collision with the crawler during heavy weather events. Both these events have the potential to damage the Integrated Mining Vessel (IMV) hull and could result in an oil spill.
20. Little information has been provided by TTR on the actual plans of the mining vessel or other vessels to be used by TTR as part of the mining operation. The potential impact of the failure of these vessels and equipment working in shallow water at times of extreme weather conditions and sea states could have significant adverse effects on the STB receiving environment. Information provided to date and the high-level nature of the risk assessment provides little assurance that the vessels, equipment and safety measures are fit for purpose.

REVISED MARINE CONSENT CONDITIONS

21. Dr Mitchell has, on behalf of TTR, now included conditions that specify both “end-of-pipe” discharge limits and receiving environment Suspended Sediment Concentration (SSC) limits. These have been provided for as Condition 5 (end-of-pipe limits), and Condition 6 (receiving environment SSC limits) in the Revised Marine Consent Conditions attached to Dr Mitchell’s supplementary evidence.³ In addition to his supplementary evidence, Dr Mitchell has prepared a separate document⁴ which answers questions raised by the DMC concerning his evidence in chief.
22. The Pre Commencement Environmental Monitoring Plan (PCEMP) conditions 43 to 46 and Environmental Management and Monitoring Plan (EMMP) conditions 49 to 50 set out how the environmental monitoring in respect to determining compliance with the SSC limits (as set out in Condition 6) will occur and what actions TTR would take if a limit was found to be exceeded. For the discharge limits (as set out in Condition 5) very limited supporting operational information has been supplied by TTR in regard to how this condition will be implemented. For example, no information has been provided as to where the samples will be taken to determine the discharge limit and what actions will be taken in the event of a measured exceedance of the limits.
23. This lack of operational information as to how the condition will be implemented and managed during the mining project by TTR is in my opinion a significant gap in the information provided to date. I would have expected this information to be supplied by TTR in the form of a sediment discharge monitoring procedure / plan which would ultimately be included into TTR’s Environmental Management System (EMS) for the proposed mining activities.
24. Proposed condition 5.c provides a discharge limit for de-ored sediment having a particle size <38 microns which shall not exceed:

- i. 130 cubic metres per hour (“m³/hr”), averaged over any 48 hour period; and

³ Supplementary Evidence of Dr Philip Mitchell, dated 2 May 2017, Appendix 1 – Revised Proposed Consent Conditions.

⁴ Memorandum prepared by Dr Philip Mitchell, titled ‘Response to Minute 41, Appendix 1, Questions 1, 2 and 7, dated 27 April 2017.

- ii. 83 m³/hr, averaged over any seven (7) day period; and
 - iii. 66 m³/hr, averaged over any three (3) month period.
25. The proposed discharge limit refers to the fine sediments (<38 microns) contained in the de-ored sediment. The HR Wallingford report titled 'Source terms and sediments properties for plume dispersion modelling', dated October 2015, identifies two sources of fines, as a result of the proposed ironsand mining, which are discharged back to the seabed from the mining operation. These are:
- (a) de-ored sediment, consisting predominantly of coarse sand at a discharge rate of 1863 kg/s which contains 0.4% fine sediment less than 38 microns in size; and
 - (b) a discharge from the hydro-cyclone operation, consisting predominantly of fine material at a discharge rate of 86 kg/s containing 67.4% fine material less than 38 micron in size.
26. My concern is that proposed condition 5.c as currently worded only accounts for the de-ored fine material <38 microns. In my opinion the condition would need to address the discharge of fine material from both sources (de-ored sediment and the hydro-cyclone). I consider this is very important given that the discharge rate of fine sediments from the hydro-cyclones discharge is higher than that for the de-ored sediment.
27. The HR Wallingford report provides a sediment discharge rate in kg/s. However, the proposed discharge limits in Condition 5.c for sediment less than 38 microns are expressed in m³/hour. I understand that the discharge limit will be determined on the basis of the:
- (a) measured flow rate of the pump (in m³/hour) discharging the slurry (de-ored sediment and hydro-cyclone discharge) to the seabed; and
 - (b) concentration on a weight for weight basis (kg/m³ or g/m³) of fine sediments <38 microns as measured by a grab sample of the discharge collected on a daily basis.

28. Using these two data points, (i.e. pump rate (m^3/hour) x sediment concentration (kg/m^3)) results in a fine sediment <38 microns discharge rate in kg/hour . In my opinion converting the discharge rates from kg/hour to m^3/hour , as proposed by condition 5c is not necessary and adds unnecessary complexity when determining compliance with the standard.
29. A mass discharge rate in kg/hour is normally applied to discharges, such as those from wastewater treatment plants, based on the concentration (g/m^3) of the parameters and the flow rate of the discharge (m^3/hour). I would recommend that the discharge limit for sediment is in kg/hour rather than m^3/hour and that proposed condition 5.c. is amended to reflect this change.
30. Proposed condition 5 goes on to state *“for the purpose of (c) of this condition, the average value shall be derived from the analysis of one daily composite sample.”* This means that only two samples are collected to determine the 48 hour average discharge limit, and seven samples for a seven day average. In my opinion, one composite sample per day to determine an averaged discharge limit is not statistically robust. I am further concerned that the condition does not address how the composite sample will be collected. Is it made up from a number of samples collected hourly, or more frequently, from the discharge over the course a day? Is it made up from just one or two random grab samples taken over the day, or is it just a sample of the de-ored discharge and the hydro-cyclone discharge? The lack of information concerning how sampling is to be conducted leaves significant room for differences in result depending on the approach taken.

CONCLUSIONS

31. The risk assessment reports provided are relatively high level documents, and do not provide the requisite level of certainty that:
- (a) all the hazards, and their associated level of risk have been adequately analysed; and
 - (b) the level of mitigation provided by the design and operation of the mining activity is appropriate to prevent significant environmental impacts should a failure event occur.

32. The proposed conditions in regard to setting a sediment discharge limit for sediment less than 38 microns need to be reworded to provide more rigour and clarity as to what the limit covers (i.e. de-ored sediment and sediment from the hydro-cyclones), and how these limits will be measured to provide a sound and statistically robust method of demonstrating compliance.
33. In my opinion, TTR have not provided enough information about the operational aspects of the proposed mining extraction and discharge processes to enable a proper assessment of whether the operation is capable of achieving compliance with consent conditions 5 and 6. There remains significant uncertainty regarding how these conditions will be implemented and managed.

Dated this 19 day of May 2017



Bruce Paterson Clarke