AECOM New Zealand Limited +64 9 967 9200 tel
8 Mahuhu Crescent +64 9 967 9201 fax
Auckland 1010
PO Box 4241
Auckland 1140
New Zealand
www.aecom.com

16 May 2017

Gen Hewett
Senior Advisor Consenting - EEZ
Environmental Protection Authority
Level 10, 215 Lambton Quay
WELLINGTON 6140

Dear Gen

Review of TTRL Response to DMC Minute 41

AECOM is pleased to provide these comments, prepared by Ian Baxter, in response to the Environmental Protection Authority's request of 9 May 2017. In providing these comments, Ian has:

- Read Decision Making Committee (DMC) Minutes 41 and 43.
- Reviewed the relevant (to benthic ecology) additional information provided by Trans Tasman Resources Ltd (TTRL) in response to the request by the DMC in Minute 41, namely:
  - Pinkerton M 2017, Optical effects of proposed iron-sand mining in the South Taranaki Bight region - worst case update. NIWA, April 2017
  - TTRL maps and explanatory memorandum, submitted to DMC on 5 May 2017.
- Reviewed the relevant (to benthic ecology) expert supplementary evidence of:
  - Dr Lawrence Cahoon on behalf of TTRL (11 April 2017)
  - Dr Mark James on behalf of TTRL (27 April 2017)
  - Alison MacDiarmid on behalf of TTRL (1 May 2017).
- Prepared written comments that are considered necessary for the DMC to be aware of in relation to the additional information provided by TTRL, as it relates to benthic ecology.

In accordance with the DMC directions in Minute 43, written comments are limited to review or rebuttal of the further information provided in response to Minute 41. No new matters have been raised and other matters already raised in the hearing are not addressed.

Responses to the specific questions in Appendix 2 of DMC Minute 41, as they relate to benthic ecology, are as follow.

1. *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.*

   a. Reduced seafloor irradiance and euphotic zone depth will inevitably result from decreased light penetration through the water column due to the elevated suspended sediment concentration (SSC) levels in turbid plumes arising from the mining operation. Where benthic flora are present beneath the plume, some reduction in primary productivity will occur if SSCs are sufficiently high.

   b. The reductions in primary productivity predicted by Pinkerton (2017) are considered to be of minor consequence as the turbid plumes will be transient; their distribution being driven by currents induced by oceanographic and meteorological influences, and by settling of sediments out of suspension. Hence the only benthic flora communities that would be exposed to prolonged reductions in light penetration would be those (if any) that are present in the immediate vicinity of the mining operation. As these would represent only a relatively small proportion of primary producers in the South Taranaki Bight region, it is considered that any changes would be of negligible regional environmental significance.

   c. Further, if it can be demonstrated that the sediments returned to the seafloor after processing are resuspended to a sufficiently low extent to preclude the formation of chronic

plumes of high turbidity, then effects on benthic communities due to light attenuation would be expected to progressively diminish once the mining activity has ceased.

d. However, it is emphasised that these conclusions are drawn from model outputs; hence the veracity of the conclusions will be dependent upon how accurately the models portray the actual turbid plume characteristics and behaviour (dispersion, mixing, stratification, etc.) which will need to be determined through model verification once extraction activities commence.

e. It will be imperative that the Environmental Monitoring and Management Plan for the Project contains - Response and Compliance Limits for benthic communities that are based on a robust baseline dataset; and auditable management measures that are to be implemented in the event that these limits are exceeded. That is, the risk must be on the Proponent to manage the mining activity in such a way that the risk of actual environmental impacts is no greater than those predicted on the basis of the modelling.

2. *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*.

a. The HR Wallingford 17 March 2017 modelling has not been provided for review. However, the expert supplementary evidence summarises the key differences between the two tranches of modelling as they relate to potential physical effects on benthic biota. The following conclusions provided in the expert supplementary evidence appear reasonable, especially in light of the experts' research and knowledge in their respective areas:

i. Cahoon - Microphytobenthos (MPB) are adapted to the 'natural' deposition of sediment upon them and additional deposition due to mining-related SSC would only result in very minor effects.

ii. James – The levels of SSC generated by the mining activity are predicted to be insufficiently high to elicit significant changes in the benthic community in very close proximity (<2 km) to the activity, with even lower risks of impacts upon benthic biota at sensitive sites such as Graham Bank, the Traps and inshore reef areas.

iii. MacDiarmid – Based upon model predictions, some physical effects on benthic fish from mining-related increases in SSC could occur within an area around the mining activity of between 47.5 km^2 (original modelling) and 61.7 km^2 (revised modelling). This may appear to conflict with James' view, but it should be noted that MacDiarmid is referring to 'effects on individual fish' whilst James is referring to 'significant changes in benthic communities'. MacDiarmid also notes that the mining activity is predicted to not add significantly to the inshore SSCs to which kaimoana species are currently exposed.

b. As indicated in 1(d) and (e) above, it is important to recognise that the conclusions presented in the expert supplementary evidence are based upon model outputs. Therefore model verification, and the implementation of robust reactive monitoring programmes and auditable management measures, will be key to managing actual environmental impacts to levels that are no greater than those predicted on the basis of the modelling.

3. What issues of materiality, in terms of ecological effects, do you perceive between the original modelling and the HR Wallingford 17 March 2017 modelling?

a. In the absence of the HR Wallingford 17 March 2017 modelling report, the following differences from the original modelling have been ascertained from information in Pinkerton (2017), the expert supplementary evidence and the interactive maps provided by TTRL.

b. Pinkerton (2017) predicts reductions in the total amount of light received by the seabed (averaged across the model domain) of between 21% and 30%. These represent increases of 6-7% above the reductions predicted in previous modelling (Pinkerton & Gall 2015[1]).

[1] Pinkerton MH and Gall M 2015, *Optical effects of proposed iron-sand mining in the South Taranaki Bight region.* NIWA client report WLG2015-26 rev 2 for Trans Tasman Resources. Project TTR15301.

c. Pinkerton (2017) also calculates that, on average, predicted optical effects at eight selected locations are 41% greater than in Pinkerton and Gall (2015). Optical effects are considered in relation to the depth of the euphotic zone, and the horizontal visibility, number of high visibility days, and number of days per year with >1% light at the seabed (i.e. the number of days per year that the euphotic zone extends to the seabed and MPB is unaffected).

d. In his supplementary evidence, James indicates that:

   i. The biggest differences in predicted SSCs are in the 'extreme' statistics (maximum, 95th and 99th percentiles) rather than in medians, in which changes are deemed 'insignificant'.

   ii. The predicted area of higher SSC is only discernible within ~3 km of the mining activity.

   iii. Differences in predicted sedimentation rates are small and predicted rates are deemed 'insignificant' compared with tolerances of benthic biota.

   iv. As the plumes from the mining operation will be dynamic and transient, the highest SSC concentrations are predicted to only overlie areas of seabed for periods of days up to one week.

   v. The differences in predicted SSCs between the two model outputs are hard to detect away from the mining location and are considered to not be 'ecologically meaningful'.

   vi. The revised modelling did not change the assessment presented in his first statement of evidence.

e. In her supplementary evidence, MacDiarmid indicates that:

   i. The predicted area of seabed with SSC elevated to above 3 mg/l (the threshold used by MacDiarmid to assess potential impacts upon benthic fish species) was calculated as 47.5 km^2 from the outputs of the original modelling and 61.7 km^2 on the basis of the revised modelling. Despite the more extensive potentially impacted area predicted by the revised modelling, it was considered that the area was still small compared to the areas occupied by the species evaluated.

   ii. The revised modelling did not alter the conclusions in her primary evidence.

f. From a consideration of the information in Pinkerton (2017) and the expert supplementary evidence, it appears that the revised modelling does not predict a significantly higher risk of impacts upon benthic ecology than the original modelling. Regardless of the veracity of their opinions, the model will require verification via monitoring if the Project is approved.

We trust that the review presented in this letter meets your current needs. However, if any clarification or further information is required, then please do not hesitate to contact the undersigned.

Kind regards

Maurice Marquardt
Principal Consultant Sustainability
maurice.marquardt@aecom.com

Mobile: +64 21 2174319
Direct Dial: +64 4 896 6095
Direct Fax: +64 4 896 6001