Requested Questions for KASM and Greenpeace

30 January 2017

The following represents questions wished to be asked for Kiwis Against Seabed Mining, Inc. (KASM) and Greenpeace New Zealand, Inc. (Greenpeace). They are submitted together with Memorandum 5 from KASM.

The Decision-Making Committee (DMC) asked to be given: a. the person to be questioned; b. the topics to be covered and the question(s); and c. an estimate of the time required.

Since the questions were asked and given, the estimate of the time required depends on how long the witness takes to answer the question.

The questions are organised by topic, and then by person to be questioned.

Plume

Witnesses including Mark James and Shawn Thompson:

Do you accept that (Mead para. 23) that the revised plume model (Hadfield & Macdonald 2015) is based on laboratory tests done by HR Wallingford (2014, 2015) on three different sediment types with only one sample for each sediment type and that this violates basic principles for the design of meaningful tests and the interpretation of their results?

For instance, there are no replicates for the three sediment types, so it is not possible to establish whether the tested samples are representative of each specific sediment type? And do you accept that any test will always confuse the "sediment type effect" with the individual identity of the only replicate available for each sediment type? Do you accept that 3 samples were not enough for such a huge area of 65 sq km?

Do you accept that the use of low period waves in the modelling may lead to an underprediction of the amount of sediment leaving the pit (Greer para 15)?

Do you accept that the near field modelling used by the far field boundary conditions assumes a constant wave height and that the current and wave directions are at right angles to each other, a condition which maximises the amount of material that remains in the pit? (Greer para 15)

Do you accept that the wave period used in the model is very low (Greer para 15) and that in reality the quantity of sediment that leaves the pit in the form of a passive plume will vary over time leading to greater variability in the size of the plume than is represented in the subsequent far field modelling?

Do you accept that the NIWA higher settling fraction should have been calculated as this would have led to a considerably larger plume in the far field model, and that the model would need to be rerun to determine how much larger the plume would be. (Greer para 17)?

Do you agree that the an erosion rate of 8E-4 kg m^{-2} s^{-1} was typical, rather than conservative? (Greer para 22)

Do you accept that background levels may be underestimated in the model by up to a factor of two? (Greer para 23)

Do you accept that Background SSC levels referred to as 'natural' in expert evidence and in the main application are in fact anthropogenic and thus it is inappropriate to use them for comparison with the predicted plume. (Greer para 32).

Marine Mammals

Simon Childerhouse:

Why were no further marine mammal surveys undertaken?

Do you accept that the information provided by TTR includes a population survey which is inadequate for the purpose, and some habitat modelling based on anecdotal information (Slooten para 13)? Do you accept that problems include the small size of the area covered and a lack of data on sighting probability? (Slooten para 13)

In para 3 you say "If noise levels of the dredge are comparable to those of shipping as the literature suggests "

In para 10 you say that you have not undertaken any field studies in relation to this proposal. Why not?

Do you accept that noise produced by the mining operations may directly disrupt blue whale foraging, cause blue whales to move out of important feeding areas, interfere with blue whale communication causing loss of feeding or mating opportunities, cause changes in vocal behavior patterns with subsequent energetic consequences, and induce increased physiological stress that compromises blue whale health? (Torres para 9)

Do you accept that Tthe expected sediment plume from the mining operations may impact the distribution and availability of *N. Australis* (krill), thus reducing the foraging ability and efficiency of blue whales (Torres para 9)?

Do you accept that the STB is an important habitat and foraging area for blue whales?

Do you accept that Blue whales have extreme energy demands, and each disturbance to their feeding opportunities and success rate can impact their viability and reproductive capacity. Added noise, habitat impacts, prey disturbance and vessel density in the STB by the mining operation would add physiological and behavioral consequences and burdens to blue whales already living within an impacted and compromised ecosystem? (Torres para 9)

Do you accept that with every increase in anthropogenic activity in the STB region, the risk of vessel strike of a blue whale increases? (Torres para. 33)

Do you accept that the conservation status and cumulative impacts for Maui dolphin are of serious concern? (Slooten para. 18.1) Do you accept that there is still considerable overlap between Maui dolphins and fisheries in the area, which is likely to be exacerbated by the mining and the sediment plume resulting from the mining.(Slooten 18.1)

Do you accept that a detailed assessment of the conservation implications of the proposed mining, including cumulative impacts, will be essential in order to provide the DMC with enough information to make a science-based appraisal of the potential impacts of the proposed mining on marine mammals, in particular for Maui dolphins which are already at an extemely high risk of extinction (Slooten 18.1)

Do you accept that TTR have failed to provide either measurements of the noise made by the proposed mining operation (ships, generator and dredge to be used) or measurements of the background "ambient" noise off Taranaki? (Slooten para. 15)

Why did TTR perform no actual assessment of the ambient noise levels at the mining site? (Torres para 37) rather only of Lyttelton Port for only 15 minutes? Do you accept that the Lyttelton recorded sound is surprisingly high (Slooten para. 15.8)?

Do you accept that ambient ocean noise is highly site specific, as well as variable temporally? (Torres para 37, Slooten para 15.7))

Do you accept that Tthere is no information on local sound propagation conditions that will impact the distance sound will travel (because these local conditions were never measured) (Torres para 42) And do you accept that sound propagation depends strongly on underwater topography, benthic substrate and water temperature (Slooten para. 15.7)

Do you accept that each sound increase contributes to the behavioral and physical consequences to ocean animals, including blue whales (Torres para 49)?

You have not estimated sound levels and frequencies at various distances have you?

And do you accept without this information and without marine mammal surveys, you are unable to predict effects on specific marine mammal species at different distances?

Do you accept that the plume will cause impacts on ecosystem productivity through reduced light penetration and subsequent change to the zooplankton community, including Nyctiphanes australis (krill), the target prey item of blue whales in the region? (Torres para 51)

And do you accept that that with increased sediment in the water column dense patches of N. australis – needed by blue whales to survive – may be less numerous, more difficult to detect, and occur in unusual areas that reduce availability to whales (Torres para 51)?

Do you accept that there is an important biomass of N. australis in the STB with an unknown distribution (spatially or seasonally), yet the studies that do exist show increasing abundance toward the proposed mining site, and therefore, habitat disturbance that impacts prey availability for blue whales in this area should be considered and avoided? (Torres para 53)

Do you accept that in conclusion, "it is naive to think that a 35 year mining project within the STB region will not impact this population of blue whales, through elevated noise within their frequency range, habitat displacement, vessel impacts, and prey disturbance." (Torres para 58).

And do you accept that the absence of credible, scientifically robust data on background noise and the noise produced by the mining operation mean that it is not possible to determine the impact of the noise from the proposed mining operation on marine mammals, nor to develop conditions relating to noise (Slooten 15.9)

Benthic

Alison Macdiarmid

Why were no further surveys undertaken reviewing the benthic ecology?

You describe an experiment in Wellington harbour. Please describe the differences with the STB. Why was the experiment not conducted in the STB? You indicate that the role of iron concentration in re-colonisation would need to be confirmed. What if it is found to be significant? What other results may be different?

Do you accept that the experiment provides no indication relevant to the application (Mead para 38.5) because of the obvious differences in biota and physical environment between the Wellington Harbour and the STB, in addition to a number of artefacts associated with the experimental procedures?

You say that (para 7) "there should be negligible effects of mining 50 Mt per annum according to standard evaluation criteria". By this you mean the species live in other places, correct? Do you accept thtat there will be effects on the species in the area mined and affected to be mined? Do you also accept that there may be species that you have not found or that are affected in other ways? Such as if the plume is larger than forecast? Such as the eagle ray? (paragraph 8)

In paragraph 107 (d) on maui's dolphins you are relying on modelling, correct? Not on surveys? Why were no surveys undertaken? Does your conclusion stand that "mining 50 Mt per annum is likely to have negligible effects on this species" if one Maui's dolphin is killed or displaced or reproduction is affected by mining?

In paragraph 107 (a) you discuss blue whales. Do you accept Dr Torres findings that the STB is an important habitat and foraging area for blue whales? (Torres para 9)

Do you accept that the mining may affect *Nyctiphanes australis* (krill) and therefore blue whales? (Torres para 9)

Is your finding of negligible impacts affected if one blue whale was known to forage in the "in the vicinity of the proposed mining areas"?

At paragraph 108 ff you discuss cumulative impacts. Do you accept that noise can be a cumulative impact? Why did you not measure it?

How about other disruption by ship activities? You do not discuss ocean acidification. Can this be a cumulative impact?

At para 114 you give estimates of recovery times. What are these based on? How long would starfish take to recover? How long would coral take to recover? What may the impacts be on the eagle ray?

What do you know about the reproduction and early life history of the organisms which would be expected to recover (Mead para 38.4)

Do you accept that there is no evidence of responses of benthic communities to natural disturbance events in the STB because no study has assessed the temporal variability of these communities (Mead para. 25)? And that there is no strong ground for any solid inference into the stability, resistance and recovery capacities of these communities, especially in a high-energy, dynamic environment like the STB? (Mead para 25).

Do you accept that sediment discharge from the proposed activities will have no downtime 'press' type impact) and will constantly superimpose its effects on natural disturbance and that this will result in an altered disturbance regime which could last up to 35 years. Predicting the responses of benthic communities to this unprecedented event is impossible given our lack of understanding of their current dynamics under normal conditions? (Mead para 26)

Do you accept that current sediment levels in the STB are not natural and that elevated sediment inputs from the rivers result from anthropogenic degradation of freshwater quality through intensive land use, and that this is a cumulative impact (Mead para 27).

Do you accept that there are different locations and volumes to sediment loading and that this has not been taken into account? (Mead para 28).

Do you accept that there has been no mention of how PPA biodiversity compares to that of similar systems in New Zealand or elsewhere (Mead para 29)

Do you accept that we cannot predict whether or not the communities are at their natural stress loads already? (Mead para 32), and that we have inadequate information on benthic organism tolerance limits and sensitivities to the effects of suspended sediment?

Do you accept that there is uncertainty as to the long term effects of elevated nickel and copper on larval stages of aquatic biota from the mining? (Ngaire Phillips para. 87)

Operational Management

Alan Eggers

Does TTR undertake to mine directly or will (or may) it sell any marine consents gained?

He said (para 26) that TTR have spent $18m from October 2013 to October 2016, and in paragraph 22, that Since inception TTR has spent more than $70 million. Yet TTR claimed in paragraph 9 of their letter of 26 August, which appears as exhibit 5 to Paul Johnston's affidavit

in the KASM v EPA hearing, that they have spent in excess of $30 million. Which figure is correct?

Shawn Thompson

If TTR intend to undertake the mining itself, would there be other partners involved?

How many people will TTR actually employ?

Has TTR undertaken a full video and survey of the area? Can it guarantee that there are no unidentified areas of coral and other vulnerable marine ecosystems in the area that may be affected?

You have said the IMV will be New Zealand flagged. What flag will the transhipment and other vessel used fly?

Why did TTR not carry out a hydrodynamically driven model of phytoplankton and microphytobenthos production as requested by EPA (see Mead para 40)

Do you accept that is a significant difference in the particle size distribution between discharged and extracted sediment? (Mead para. 39.1)

Would shell debris be destroyed as part of the mining operations or screened and returned to the surface layer of the seabed as a hash as previous? (Mead para. 39.1)

Matthew Brown

How much vanadium and titanium are in the sands? Is it possible either or both may be extracted? Would TTR pay royalties in such a case?

Oceanography

Iain MacDonald

You describe 7.1 metre waves in 2012 (para 30). Do you accept that warmer oceans and climate change will lead to more intense storms?

You don't discuss climate change in your evidence. Do you accept that warmer oceans and climate change also lead to changed currents?

Ecology

Mark James

In paragraph 3 you say that "Recovery of early successional stages and smaller biota would occur at a timescale of weeks-months once extraction and redeposition has ceased in that area, but up to several years for late successional and larger biota." But Alison MacDiarmid said that (para 55) recovery of some taxa such as polychaete would be expected to start within a few weeks of the iron sand recovery operations moving elsewhere within the consent area. However she said that larger, long-lived biota could take months to several years to fully recover in the excavation area."

So why do you say that recovery of early successional stages and smaller biota would occur at a timescale of weeks, when she says that recovery would only start in that timescale? And why do you not say that long-lived biota may take several years to recover?

Do you accept that recovery may remain influenced by high sedimentation levels (Mead para 38.2)

In para 5 you say that reductions in carbon flux to the benthos has been conservatively estimated as up to 40% close to the source (< 2 km) and that effects of light attenuation on primary production (PP) as a result of the plume will be minor within 5 km of the coast and minor to moderate for a small distance downstream of the ISR site.

Please quantify minor to moderate. Do these depend on the Wallingford modelling? Do you accept that they may inaccurate? By what factor do you estimate they may be inaccurate? How would that affect your evidence?

In para 29 you say that reductions in light reaching the seabed over the modelled domain will average 1.9% and 1.6% for iron sand recovery at the inner and outer source locations (Locations A and B respectively) though may be up to 25% within the plume up to 20 km downstream.

What would the impact of 25% reduction in light reaching the seabed be on biota?

Do you accept that if the plume estimates are wrong, these figures may be higher?

In para 64 you say that the total area directly impacted will be 66 km2. Do you accept that it may be larger than that?

In para 35 Do you accept that fish may be attracted to disturbed invertebrates and rather than swim away be attracted to the mining site?

In para 36 you say that the area of disturbance will be limited to 5 km2 per year thus compared with the foraging area for fish, seabirds and mammals the area affected is negligible. Do you really mean "is"? What is that based on? Is that not instead a projection?

At para 111 you say that the minor effects on benthic animals at distances greater than 2 km from the ISR operations means that there will be no more than minor, if any effect on higher levels in the food web. This is based on the modelling?

At para 112 you discuss the effects on penguins. You say firstly that

"like other seabirds and mammals these animals forage over wide areas, with penguins feeding mostly on surface schooling small fish, squid and crustaceans. These resources will not be affected at the levels of SSC and sedimentation predicted".

Do you accept that there are penguins living and breeding in the area (John Cockrem para. 14)? Do you accept that there have not been any systematic surveys of the Taranaki and Whanganui coastlines to search for little penguins along these coastlines, so the full extent of little penguin breeding along the Taranaki and South Taranaki Bight coastlines is currently not known. c

Do you accept that Little penguins generally forage within 20 km of their nests when feeding chicks, so penguins breeding on the south Taranaki coast are dependent on feeding areas that would be affected by the proposed sand mining? (Cockrem para. 16) And do you accept that The STB may be an important feeding area for the continued survival of populations of little penguins that breed in the Marlborough Sounds (Cockrem para. 17)?

Do you accept that Pinkerton and Gall (2015) Fig. 6.21 that on average sand mining would cause light intensity at the seabed to be reduced over an area of more than 600 km2 extending from south of Hawera to south of Foxton? (Cockrem para. 19)

And do you accept that little penguins are visual foragers, so any reduction in light intensity in the water and any reduction in visibility in the water caused by sand mining would reduce foraging opportunities for little penguins? (Cockrem para. 20)

Do you accept that the estimated population of 2.8 million fairy prions that breed on Stephens Island may depend on the availability of food in the STB for successful breeding, and that whilst the extent to which sand mining would adversely affect fairy prions in the STB cannot be determined, any reduction in food availability due to sand mining could affect large numbers of prions? (Cockrem para 29)

Do you accept that indirect effects would be due to reductions in the ability of the birds to see and catch fish, and indirect effects would come from reductions in the availability of prey fish which themselves might be adversely affected by a reduction in water visibility (Cockrem para 30)?

You then say that "as discussed in MacDiarmid et al. (2016) the area impacted is negligible compared with their foraging area, they are not very common in the area of the ISR operation and there would be no minor effects on food resources even 20 km away from the ISR site."

Does Ms MacDiarmid discuss penguins in her evidence?

Have there been any studies on penguins in the impacted area?

May small fish, squid and crustaceans. be affected at the levels of SSC and sedimentation predicted? And may they be affected if levels are higher than predicted?

At para 116 you accept that there may be other rocky reefs affected but that "predictions are that even the closest reefs will receive less than 1 mm of sedimentation over five days and will be unlikely to settle for long." But you haven't done a survey of reefs have you?

Have you read the evidence of Shaw Mead for KASM and Greenpeace?

Do you accept that the updated predictions on the impacts of the mining activities on benthic systems are not based on a better understanding of the benthic ecology of the area, but mainly on revised models of sediment dispersion (Hadfield & Macdonald 2015), optical effects Pinkerton & Gall (2015) and primary production (Cahoon et al. 2015).? (Mead para 10) Do you accept that no effort has been made to gather more information about benthic habitats and communities of the STB and to combine the modelling information with field observation and experimental data (Mead para 12).

Do you accept that your evidence in effect represents the best case scenario (Mead para 15)? And that do you accept that the worse-case scenario is that the operations will cause wide-spread ecological change that is disruptive, causes cascade impacts which change community structures and ecosystem function, reduces biodiversity, contributes to cumulative impacts that displace key species (e.g. canopy-forming kelp), and results in a large reduction in productivity over a large area of the STB for the duration of the activity and potentially beyond (e.g. permanent changes to the benthic ecology of the mined area, permanent displacement of some species/communities, etc..)? (Mead para 15)

Do you accept that since no information is provided about how the operations will move through the proposed project area (PPA), it is unclear where the plume will originate at any given time? (Mead para 19)

Do you accept that it is impossible to establish whether increased sedimentation down-current from the excavation site will keep impacting areas already mined (thereby affecting the recovery process) and/or non-mined areas (which are expected to act as a source of larvae to repopulate the mined areas). (Mead para 19)

Do you accept that no sampling was systematically repeated through time, and that these snapshots do not provide any information about seasonal changes in benthic habitats and communities and about their responses to natural disturbance events? (Mead para 19.1) And do you accept that there is a seasonal bias for the core sampling, so differences in benthic habitats and communities among regions are potentially confused by natural seasonal changes? (Mead para 19.2)

Seabirds

David Thomson

Economics

Jason Leung-Wai

At 59 you say that activity is not visible from the shore and so is unlikely to directly affect tourism. Do you accept that tourists may be aware of activities that they cannot see, but hear about? Do you accept that tourists may feel differently about visiting an area which is the subject of seabed mining even if they do not see the mining? You say that recreational fishers may be inconvenienced but are free to fish in different areas.? May those recreational fishers include tourists? And may recreational fishers not being able to fish in an area not decide to fish in Taranaki at all?

Para 75: do you accept that tourists and others may consider that the project is contrary to New Zealand's clean green image, even if there are other industries that likewise undermine it?

At para 65 you estimate royalties at royalties at $6.15m? Do you accept that is a small percentage of export earnings of around $400 million a year (Alan Eggers para 29)? Do you accept that royalties revenue received by New Zealand, are supposed to represent the economic compensation for the permanent loss of the mineral resource? (Binney para 12)

At para 67 TTR is a New Zealand company. What do you mean by that? What percentage of beneficial ownership is held by New Zealand residents? Have you undertaken a study of to

where dividends would be remitted? You say that TTR has 42 shareholders, of which 19 are from New Zealand. How many of those are nominee shareholders? Are they all beneficial owners? Who are the beneficial owners of Minvest Securities (New Zealand) Limited, the largest shareholder? Do you accept Mr Binney's analysis (para 36) that the consequence of this oversea financing strategy is that the bulk of the return on investment from the project will also flow directly overseas, significantly reducing the benefits accruing to New Zealanders?

Para 86: even if it is difficult to monetise benefits and costs over a defined time period, do you accept that it should be attempted? Do you dispute that environmental cost is a cost?

You discuss 'double counting' environmental costs. But you have not even attempted to count them have you?

Have you read Jim Binney's evidence for KASM and Greenpeace? He said that (para 9) he is of the firm view that a comprehensive benefit-costs analysis (BCA) is the only appropriate economic assessment methodology to inform the regulatory approvals process. This should include all relevant environmental and social values that could be adversely impacted by the project.

Do you disagree with this? Do you accept that your analysis cannot be used to demonstrate the net worth of the project to New Zealanders

Do you consider that environmental and social values need not be valued? Do you accept that (Binney para 38) no significant attempts have been made by the project proponents to evaluate the potential value of the costs to the environment attributable to the project? Do you accept that the ocean produces goods as well as ecosystem services? (Binney para 39)? That these include exchanges of matter, energy and biodiversity? Are you aware that the ocean creates 50% of the oxygen we breathe? And recycles most carbon? And has absorbed over 93% of anthropogenic heat? Are you aware of provisioning services, regulating services, habitat, and cultural services? (Binney para 43)

Mr Binney also said (para 10) that you have adopted an I/O approach and that is generally considered to be an inferior approach to estimating impact assessment as it tends to overestimate impacts. Do you accept that?

Do you accept that environmental risks do have economic values? (Binney 12) He estimated a range of the present value of the environmental damage could be in the range of $28 – 543 million. (para 12) Do you accept that?

Do you accept that the flow on effects identify a measure of activity, not a measure of net benefits from the project, which needs to include social and environmental effects? (Binney 35)

Mr Binney concluded (para 13) that the use of an inappropriate approach to the economic analysis, a lack of transparency, and no real attempt to incorporate environmental risks into the economic analysis, means that the economic analysis does not demonstrate that the project would deliver a net benefit to New Zealanders. Do you accept that? Do you accept that the economic analysis undertaken by Martin Jenkins and Associates on behalf of TTR does not provide a solid economic argument that the project should be approved? (Binney para 48), and that the application of the I-O modelling has not been done in a transparent fashion and any results should be treated with extreme caution?

Do you accept that biodiversity is underestimated due to sampling issues (Mead para 19.3)?

Do you accept that rocky reefs areas were not adequately sampled? (Mead para 19.4)?

Do you accept that reports give no indication of the distribution and abundance of microphytobenthos (MPB)? (Mead para 19.5) Do you agree with the criticisms of experimental design and data analyses in Mead para 19.6?