BEFORE THE ENVIRONMENTAL PROTECTION AUTHORITY AT WELLINGTON

IN THE MATTER	of	the	Exclusive	Economic	Zone	and
	Continental Shelf (Environmental Effe					ects)
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AND

IN THE MATTER of a decision-making committee appointed to reconsider a marine consent application by Trans Tasman Resources Limited to undertake iron ore extraction and processing operations offshore in the South Taranaki Bight

EXPERT REBUTTAL EVIDENCE OF DR SIMON JOHN CHILDERHOUSE ON BEHALF OF TRANS TASMAN RESOURCES LIMITED

23 JANUARY 2024

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INTRODUCTION

- 1. My name is Dr Simon John Childerhouse.
- I prepared expert evidence dated 19 May 2023 (First Statement) with respect to these proceedings on behalf of Trans-Tasman Resources Limited (TTR).
- My qualifications and experience as a marine biologist specialising in marine mammals are set out in paragraphs 8 – 16 of my First Statement.
- I repeat the confirmation given at paragraph 17 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 respond to matters raised in submitter evidence relevant to my area of expertise, marine mammals.
- 6. I respond to matters raised in the evidence of:
 - (a) Captain Andrew Peter Smith;
 - (b) Dr. Gregory Matthew Barbara;
 - (c) Professor Emeritus Elisabeth Slooten;
 - (d) Natasha Sitarz; and
 - (e) Dr. Leigh G Torres.
- 7. This evidence is structured with some general comments responding to statements made by one or more of the submitters, followed by some additional comments specific to particular submitters.

GENERAL COMMENTS

No new information available

- 8. Several submitters commented on a lack of new data on marine mammals since the 2017 Committee decision. There has been a wealth of new material since the original consent was filed in 2016 including:
 - (a) more than 50 new published scientific papers covering marine mammals within the region (refer to Appendix 1 of my First Statement);
 - (b) new abundance estimates for both blue whales
 (Barlow et al. 2018) and Hectors and Māui dolphins
 (Roberts et al. 2019);
 - Acoustic monitoring (e.g. Wright & Tregenza 2019; Nelson & Radford 2019; Warren at al. 2021a,b; Barlow et al. 2023a, b);
 - (d) nearly 700 new sightings included in the DOC MarineMammal Database; and
 - (e) new information on marine mammal distributions from comprehensive spatial modelling work (Stephenson et al. 2020; Roberts et al. 2019, Deville et al. 2016).

Overall, there is a huge amount of new material available to better characterise and understand marine mammals in the South Taranaki Bight (STB) region. This includes information about marine mammals within the proposed mining area.

Best available information

9. There appears to be a common theme amongst submitters that if you do not understand everything completely and fully, then you cannot assess potential effects due to uncertainty. This expectation of perfect knowledge of all aspects of the consent is simply not realistic nor practical. Where the best available information may include gaps or uncertainty, it is still possible to proceed in making sensible judgements while accounting for uncertainty and including a precautionary approach if required.

Uncertainty and data gaps

- 10. All submitters commented on uncertainty in the available data on marine mammals and how that this would preclude any accurate assessments of impact. While I agree that there is some uncertainty with some aspects of the available data, I believe that there is sufficient data upon which to make robust and accurate assessments with respect to marine mammals. Where the best available information includes gaps or uncertainty, it is still possible to proceed in making sensible judgements while accounting for uncertainty and implementing a precautionary approach if required.
- 11. While agreeing with the submitters about some respects of the potential impact of uncertainty on decision making, I also note that there is a strong tendency for submitters to simply state than an issue is uncertain or has some degree of uncertainty without actually providing any indication of what information would be required to address this uncertainty. Just saying something is uncertain doesn't necessarily make it so. Both scientific process and risk assessments move forward by assessing the level and extent of uncertainty inherent in an issue and then make expert judgements about the potential impacts of that uncertainty. Decision makers are not required to have perfect knowledge of all issues under consideration before they can reach decisions. In my opinion, the best available information presently before the decision makers is sufficient to form some reasonable conclusion about the likely impact of this project.

Significance of the proposed mining area to marine mammals

12. Several submitters did not agree with my assessment that there is nothing to suggest that the mining area is of any significance to any marine mammal species and that the area is highly unlikely to be an area of any special biological significance to marine mammals. I based this conclusion on a range of available data including the data identified in paragraph 8 above plus dedicated aerial survey data for marine mammals collected in the proposed mining area (Cawthorn 2015). Based on these data and a pattern whereby the probability of presence of a species within the proposed mining area was estimated to be consistently lower than many other parts of the STB region, I conclude that while the wider STB region represents an important area for marine mammals, the proposed mining area is highly unlikely to be an area of any special biological significance to marine mammals.

Levels of underwater noise from the operation

13. Many submitters commented that given the estimated noise from the operation couldn't be accurately characterised (e.g. as there is no identical operation anywhere in the world from which to measure it), any assessment would contain a high level of uncertainty which would therefore preclude undertaking a robust assessment of any impacts. It is my opinion that it is not essential to be able to predict the underwater noise levels of the operation for the simple reason that TTR have proffered Condition 11 that sets the maximum allowable level of underwater noise from the operation. If this condition is implemented, then the operation will be limited in the amount of noise it is allowed to make and therefore the maximum noise levels possible from the operation are known and can be assessed robustly through quantitative modelling as has been done by Humpheson (2017).

Potential physiological impacts of underwater noise on hearing

- 14. Both Professor Emeritus Slooten and Dr Torres have raised concerns about the approach taken to assess physiological effects (i.e., Temporary Threshold Shift (TTS) and Permanent Threshold Shift (PTS)) on hearing of marine mammals and the resulting impacts. In response to their concerns, I have provided an updated assessment of TTS and PTS that uses marine mammal specific estimates of underwater noise (i.e., frequency weighted Sound Exposure Level (SEL) or mweighted SELs) which represents the most recent international best practice as described in Southall et al. (2019). Previously, I had only applied this technique to Hector's and Maui dolphins but have now adopted the approach for all species of marine mammals. For this assessment, I have relied on analysis and estimates provided to me by Mr Humpheson, the author of Humpheson (2017), and have attached his full memo as **Appendix 1** to this statement.
- 15. This analysis replaces and improves upon my previous analysis and assessment (i.e., Table 2 and Table 4 of my First Statement) as it uses data that reflects the different spectral sensitivities of each marine mammal group rather than the previous approach of assessing broadband noise levels irrespective of the different sensitivities of each marine mammal group. This approach provides a better understanding of any potential impacts on individuals.
- 16. The outcome of the comparison of the new noise data (Table A1 in Appendix 1) with the m-weighted thresholds for TTS and PTS provided in Table 3 of my First Statement indicate clearly that there is no risk of either TTS or PTS for any marine mammal species at 500 m or further from the operation even if they spend 24 hours in the area. This updated analysis replaces the conclusions provided in paragraph 88 of my First Statement

although the descriptions are still useful in describing the updated approach.

17. We have not attempted to assess impacts within 500 m of the operation as it is unrealistic to define a specific point source for the combined noise sources given all the noise sources are spread over a large area (e.g., the integrated mining vessel (IMV) and the floating storage and offloading vessel (FSO) are both greater than 300 m in length, the crawler will be up to 45m below the IMV on the seafloor and the vessels are likely to be spaced significantly apart). Notwithstanding these results at 500 m from the operation, it is possible for TTS or PTS to potentially occur within 500m of the operation.

EVIDENCE OF CAPTAIN ANDREW PETER SMITH

- 18. Captain Smith in his paragraph 51 states that there are 406 records of sightings of Hector's and Māui dolphins in the project area. This is incorrect in that the 406 sightings¹ refers collectively to all the sightings for the entire STB region rather than just the project area. There are no confirmed sightings of Hector's or Māui dolphins within the proposed consent area and only a single sighting recorded within 10 kilometres of the proposed consent area. Following on from this, his paragraph 52 is also factually incorrect with respect to the proposed consent area.
- 19. My assessment, as outlined in paragraph 3 of my First Statement, is that the proposed consent area, is highly unlikely to be suitable habitat for Māui dolphins, is an area where Māui dolphins will be found very rarely and, if they are present, are likely to be in very low numbers.

¹ I am assuming that this number comes from Appendix 2 of Childerhouse First Statement 19 May 2023.

20. Captain Smith in his paragraphs 53 and 54 notes that the Government has put restrictive measures on fishing in the general area of the application and that, in his opinion, allowing the TTR project to proceed would be both counterintuitive and counterproductive. The reason that fisheries have been restricted in the area is that they are well documented as killing both Hector's and Māui dolphins. For example, in the last 12 months alone five Hector's dolphin have been killed in set net and trawling operations around New Zealand.² There is nothing to suggest that the proposed TTR operation represents a significant mortality risk to Hector's lack foundation.

EVIDENCE OF DR. GREGORY MATTHEW BARBARA

- 21. Dr Barbara in his paragraph 26 assumes that specific concerns raised by him in 2017 form part of the information gaps identified by the Supreme Court. My understanding of the Supreme Court decision is that the Court has not provided the level of detail inferred by Dr Barbara and that his statement is therefore speculation.
- 22. Dr Barbara in his paragraph 27 states that there has been no new evidence provided by TTR on marine mammals within the proposed mining area. This is incorrect as noted previously in my paragraph 8 above. Furthermore, there are three draft management plans relating to marine mammals (i.e., Marine Mammal Baseline Monitoring Plan, Marine Mammals Monitoring Plan, Marine Mammal Management Plan)

² Data from Fisheries New Zealand website. Available at: https://www.mpi.govt.nz/fishing-aquaculture/sustainablefisheries/managing-the-impact-of-fishing-on-protected-species/seabirdsand-protected-marine-species-caught-by-commercial-fishers/

proffered by TTR which cover all marine mammals (i.e., no species are excluded from consideration within these plans).

- 23. Dr Barbara in his paragraph 32 states that, in his view, without acoustic monitoring data for marine mammals collected from the proposed mining area, the information available to assess effects on marine mammals is both uncertain and inadequate. I do not agree with his assessment but do agree with Dr Barbara in that acoustic monitoring would be useful and note that pre-commencement acoustic monitoring is proposed to be undertaken by TTR and is proffered as a condition. Furthermore, there has been considerable acoustic monitoring for blue whales and Hector's and Māui dolphins undertaken in the STB region since the original application was made (e.g. Wright & Tregenza 2019; Nelson & Radford 2019; Warren at al. 2021a,b; Barlow et al. 2023a, b) which provides useful information for the assessment of presence within the area and any potential effects.
- 24. Dr Barbara in his paragraphs 59 and 60 comments on the utility of spatial modelling in assessing marine mammal distribution. I also noted in my First Statement that while there are caveats with the application and interpretation of spatial modelling approaches, as there are with most scientific methods, the new research provides useful, new information about the distribution of marine mammals within the area. I would also note that the new data summarised in my First Statement represents, (a) a significant improvement on the data available to the original consent application and (b) these data plus the other new information included in my First Statement, represents the best available information. There is nothing to suggest that these data are inadequate, unreliable or are underestimating marine mammal use of the proposed mining area and almost all the new research cited has been published in international, peer reviewed scientific journals.

EVIDENCE OF PROFESSOR EMERITUS ELISABETH SLOOTEN

- 25. Professor Emeritus Slooten discusses public sightings in her paragraphs 9 to 11. In general, there is agreement between us relating to the potential limitations of these data. However, notwithstanding these limitations, these data can and do provide useful new data on marine mammal distribution in the STB region and, when interpreted correctly, can provide a useful insight into marine mammal presence. I note that Dr MacDiarmid also provides some detailed responses to issues raised by Professor Emeritus Slooten about the spatial models (e.g., her paragraphs 7 and 8).
- 26. Professor Emeritus Slooten states at paragraph 16 that habitat models are not a substitute for marine mammal surveys. I agree with that statement but would note that this doesn't mean that habitat and/or spatial models do not provide useful information that can be used as part of an assessment. The fact that Stephenson et al. (2020) is published in an international, peer review journal provides confidence that, when interpreted correctly, the modelling can and does provide useful information on marine mammal distribution.
- 27. With respect to Roberts et al. (2019) SEFRA model for Hector's and Māui dolphin distribution, I note the issues identified by Professor Emeritus Slooten and the Scientific Committee of the International Whaling Commission (IWC) (at Professor Emeritus Slooten's paragraph 18) were listed as additional work that was suggested to improve the model. The overall conclusion of the Scientific Committee's was that: "The premeeting did not identify obvious flaws in the SEFRA and its application that would preclude its application to support management. However, considerable additional work should be conducted to better explore uncertainty and understand which parameters are both uncertain and consequential in

terms of management-related outcomes."³ While there are clearly areas where the model can be improved, the IWC agreed that in its present form it was suitable for use in management and, in my opinion, is therefore also suitable for use in this assessment.

- 28. I also note that TTR have proposed to undertake marine mammal surveys as part of proffered conditions so this research would be undertaken if the project was to proceed.
- 29. Professor Emeritus Slooten states in paragraph 21 that, in her opinion, the average outer limit for Māui dolphin distribution is the 100m depth contour. It is likely that Māui dolphins can occur in waters that deep (although the data she cites is all from Hector's not Māui dolphins), but this would first require dolphins to be present in the area. All the data presented in my First Statement and earlier Statements provides good data which suggests that it is highly unlikely for there to be any Māui dolphins along the south coast of Taranaki where the mining is proposed and therefore the extent of their offshore movements is not relevant.
- 30. Professor Emeritus Slooten states in paragraph 23 that the Roberts et al. (2019) model estimates that there are between 15 and 17 Hector's and/or Māui dolphins in the Taranaki to Kapiti area. It is surprising to see her cite these numbers given her considerable criticism of this model in her previous paragraphs. I agree that the impact of one mortality would be highly significant to a population of this size but again reiterate my previous conclusions that it is highly unlikely that they are in the proposed consent areas and, even if they are, there is nothing to suggest that the proposed TTR operation

³ International Whaling Commission 2023. Report of the Workshop on Hector's and Māui Dolphins in New Zealand: Consideration of spatial risk assessment of threats. Available at:

represents a significant mortality risk to Hector's or Māui dolphin.

- 31. Professor Emeritus Slooten provides some of her conclusions about potential impacts of the sediment plume on Hector's and Māui dolphins in paragraph 37. In responding, I draw on the First and previous Statements of Dr Helen Macdonald and Dr Alison MacDiarmid with respect to impacts from the plume and sedimentation. Some broad conclusions:
 - Based on the plume modelling, impacts will be highly localised (e.g. 1-2 km) around the activity;
 - (b) As noted previously, it is highly unlikely that there will be any Hector's or Māui dolphins within the proposed mining area; and
 - (c) Given the potentially large home ranges of these dolphins, any impacts from the proposed operation will only affect a very small proportion of their total home range.
- 32. Professor Emeritus Slooten discusses potential underwater noise impacts in paragraphs 38 to 56. I have some general statements in response:
 - (a) Much of the information provided by Professor Emeritus Slooten is not relevant to the consideration of underwater noise impacts from this operation. For example, seismic surveys are several orders of magnitude louder than the allowed underwater noise from this operation. Similar issues relate to the consideration of military sonar which has an acoustic frequency range and energy level very different from this project.
 - (b) The noise produced by the operation cannot be known until it actually starts, although Humpheson

(2017) has attempted to estimate the likely sound levels. Fundamentally, I would argue that it is not essential to be able to predict the underwater noise levels of the operation for the simple reason that TTR have proffered Condition 11 that sets the maximum allowable level of underwater noise from the operation. If this Condition is implemented, then the operation will be limited in the amount of noise it is allowed to make and therefore the maximum noise levels possible from the operation are known and can be assessed (i.e., estimated as 172 dB @ 1m in Humpheson 2017). As stated in my previous Evidence, the amount of noise generated by this operation when applying Condition 11 will be, at its loudest, comparable to shipping noise which is already a very common source of noise in the STB region. In my opinion, the implementing of Condition 11 will mean that it is possible to assess the effects of the operation and furthermore that there will be no material harm from the activity on the local marine mammal populations.

33. Professor Emeritus Slooten in her paragraph 40 raises concerns about Humpheson (2017) and his estimation of the noise produced by the proposed mining operation including identifying some limitations of the Coley (1995) report. In response, I would note that Humpheson (2017) provides a detailed description of how the noise from the operation was estimated including using a range of different references as well as Coley (1995). The estimated spectra of the noise combines the noise from each component of the operation (e.g., crawler, IMV with dynamic positioning system in operation, FSO) and provides a good approximation of the overall underwater noise expected to be produced by the operation.

- 34. Professor Emeritus Slooten states that Hector's and Māui dolphins have a 50 km alongshore home range and that they may not choose to move away from the noise source in paragraph 42. This is of course possible however, there are several reasons why it is plausible to expect any noise effects on Hector's and Māui dolphin to be of minimal impact, even in the unlikely event that they are found in the area. These include:
 - (a) the crawler and IMV move very slowly (e.g., several km per hour) and therefore it is highly likely that either the operation will move away from any marine mammal that remains in the same location and/or that any marine mammal could easily move away from the operation during that time if they wish;
 - (b) to receive long term exposure to the noise of the operation, a marine mammal would have to choose to stay with the moving operation or follow it for extended periods. This seems very unlikely as the most likely biological response to potentially negative stimuli is to move away from it or, worst case scenario, remain in place in which case the operation will move past and away from in;
 - (c) If there are actually any Hector's or Māui dolphins around the mining area, then their 50 km home range provides them plenty of area to move away from the operation while still remaining inside their home range. Also, the operation will be more than 12 nautical miles (~22 km) offshore at all times (and regularly much further offshore than this) which means that the area of dolphin home range between the shoreline and 22 km offshore will be unimpacted by the operation and provide areas for dolphins to move

to in the unlikely event that they are disturbed or displaced by the offshore operation; and

- (d) While the project is proposing 24-hour seven day a week operations, this is very unlikely to be the case. In reality, it is expected that the operation will only be running for an estimated 71%⁴ of the time due to stoppages related to weather, sea state and other issues. This means that the project won't be operating at full capacity and therefore at the maximum allowable noise levels, for almost a third of the time.
- 35. Professor Emeritus Slooten discusses some concerns in paragraphs 68 and 69. She states that none of the issues she previously identified have been resolved since 2014. I disagree with that assessment for the following reasons:
 - Underwater noise levels as noted above in my paragraph 32, it not necessary to know the noise that will be produced by the operation as it will be limited by Condition 11 and therefore impacts can be and have been assessed robustly;
 - (b) Underwater noise impacts there has been considerable advances in the assessment the impacts of underwater noise on marine mammals which confirm that if the operation adheres to Condition 11, there is likely to be little impact on marine mammals;
 - (c) Lack of survey data there are now abundance estimates available for both Hector's and Māui dolphins (Roberts et al. 2019) and blue whales (Barlow et al. 2018) in the region. While there are no estimates

⁴ TTRL 2016. South Taranaki Bight Offshore Iron Sand Extraction and Processing Project Impact Assessment August 2016. Section 2.3.2.1.

for any other species, these were the two species that submitters most commonly expressed concerns about. There are also now distribution maps available for most of the species commonly found in the region (Stephenson et al. 2020, Roberts et al. 2019); and

- (d) Sediment plume Updated reviews by Drs Macdonald and MacDiarmid have confirmed that impacts are most likely to be localised and any impacts will avoid material harm.
- 36. Professor Emeritus Slooten suggests in paragraph 73 that a map of expected underwater noise levels in the STB region be developed. This was provided in 2017 and remains available.⁵

EVIDENCE OF DR LEIGH TORRES

- 37. Dr Torres provides some useful summaries of new research on the impacts of seabed mining on marine ecosystems in paragraph 11. However, most of these reports are of impacts from deep sea mining which are generally based on sites deeper than 1,000m (including Washburn et al. 2023). While there may be some parallels with the proposed mining area in the STB region, it is important to note that the TTR site is not deep sea but rather a highly mobile and active inshore, shallow water site (less than 50m) and, therefore any conclusions drawn from impacts at deep sea sites are unlikely to be the same as for the TTR site.
- 38. In paragraph 16, Dr Torres disagrees with my assessment that there is a low likelihood of marine mammals being present in the proposed TTR consent area and there is nothing to suggest that the mining area is of any significance to any marine

⁵ Childerhouse S. 2017. Memo to Decision Making Committee. 23 May 2017. Subject: Reponses to additional questions provided by the DMC to Simon Childerhouse on 22 May 2017. 10 p.

mammal species and provides her rationale in subsequent paragraphs. Some responses to her statements:

- (a) Paragraph 17 the data Dr Torres refers to actually supports my conclusion that there is a low likelihood of marine mammals being in the proposed area. I have never stated that blue whales or Hector's and Māui dolphins cannot and will not be found in the proposed mining area, only that based on Torres' and other modelling data, they are unlikely to be found there as the model predictions identify the site with very low probability of presence;
- (b) Paragraph 18 I agree with Dr Torres in that there are limitations of applying large scale models, such as Stephenson et al. (2020), to finer spatial scales. However, that doesn't necessarily mean that the models are uninformative or incorrect only that any interpretation must include consideration of potential limitations as would be the case in any scientific study. I would also note that there appears to be reasonable agreement between results from Torres' own published spatial models and results from Stephenson et al. 2020 for blue whales providing at least some measure of confidence in the approaches.
- (c) Paragraph 20 I agree that it is important to consider impacts that may occur beyond 10 km. This has been undertaken during assessments of the impacts of both underwater noise modelling and sediment plume modelling and have been presented by TTR previously.
- (d) Paragraphs 21 and 22 I have never stated that marine mammals will not be found in the proposed mining area only that I believe that the probability of

them being there is low based on an assessment of the best available data. During previous assessments of impact, TTR has always considered that marine mammals may be present in the area and hence have specified a range of different conditions to ensure any potential impacts are mitigated or avoided including implementing underwater noise limits, aerial and acoustic surveys, Marine Mammal Observers and operational shutdowns for marine mammals.

- 39. Dr Torres raises concerns with the estimation of underwater noise expected to be produced by the operation and states that my conclusions are flawed in paragraph 26. I provide some comment on her statements:
 - (a) As with Professor Emeritus Slooten, Dr Torres also appears to make the same error in assuming that because we do not have a highly accurate and detailed description of the noise of the operation, then we are unable to assess potential impacts. As noted above in my paragraph 32, it not necessary to know the noise that will be produced by the operation as it will be limited by Condition 11 and therefore impacts can be and have been assessed robustly on that basis;
 - (b) My assessment of impacts has been based on detailed underwater acoustic propagation modelling provided by a specialist acoustician, Mr Humpheson, and was reported previously in Humpheson (2017) and other supporting material. Mr Humpheson applied models utilising the best available data, following best international practice, using data based on real world examples, and assuming that any TTR operation would be adhering to the details of

Condition 12. This allowed him to develop robust and comprehensive models of sound propagation that could be used to assess impacts on marine mammals.

- (C) Dr Torres claims in paragraph 28 the source levels used in the acoustic models to approximate the potential noise production by the TTR mining operation are outdated, from a different region and an entirely different operation. This statement is correct. In the absence of an active operation from which to collect empirical data, it is necessary to use data from other similar operations. Humpheson (2017) provided a detailed rationale in his selection of the source noise and spectra used in his modelling. The characteristics of the noise source were further described by Condition 12, with which TTR must abide if they wish to operate. By combining both these pieces of information, Mr Humpheson provided a robust estimate of the source noise to use in further modelling. I have yet to see any specific technical details from Dr Torres, or any other submitter, about how she believes the source modelling could be improved or any reason why she believes it is inaccurate.
- (d) Dr Torres continues to say in paragraph 28 that, following her previous statement in the paragraph above, the foundation of all subsequent noise propagation estimates is based on incomparable source level estimates. As I have explained above, Humpheson (2017) used the best available data and therefore results from the propagation modelling should be robust, accurate and useful in assessing potential effects and represent the best available information.

40. In paragraph 30, Dr Torres correctly identified an error in Table 2 of my First Statement. I have included the corrected data as Table 1 below and this should be used for future consideration. This error only effects the broadband SEL for marine mammals if they remain in the area for more than 24 hours (i.e., 24 hr column) and there is no change to the rest of the Table. All my other conclusions remain the same.

Table 1: Revised Sound Exposure Levels (SEL) and Sound Pressure Level (SPL) estimated for differing exposure periods and distances from the underwater noise generated from the crawler unit and integrated mining vessel combined. Source: Humpheson (2017)

		SEL dB re 1µPa².s					
Distance	SPL re 1µPa	10 sec	10 min	1 hr	3 hr	24 hr*	
500 m	135	145	163	167	170	184	
1000 m	130	140	157	162	165	179	
1500 m	129	139	156	161	164	178	
2000 m	128	138	155	160	163	177	

* These 24 hr values have been updated from my First Statement where incorrect values had been transcribed. The rest of the Table remains the same.

- 41. As noted previously in my paragraphs 14 to 17 above, this analysis has now been updated by Mr Humpheson (Appendix 1) and Table 1 above has now been superseded by Table A1 of Appendix 1. Using the m-weighted SEL values in Table A1, it shows clearly that there is no risk of either TTS or PTS for any marine mammal species at 500 m or further from the operation, even if they spend 24 hours in the area.
- 42. As Dr Torres refers to the error in Table 2 of my First Statement in her paragraph 30 and draws some conclusions on the basis of this. I have corrected the error she identified and, given the updated and improved analysis provided by Mr Humpheson, Dr Torres' previous conclusions are no longer consistent with the best available information.
- 43. In paragraph 32, Dr Torres provides a summary of her previous Statements relating to noise and highlights area where she believes no new work has been provided. I have provided a

response to all of these issues previously in this statement and therefore will not repeat them again here.

- 44 Dr Torres considers the IUCN Important Marine Mammal Area (IMMA) designated in the STB region in paragraph 35. I agree with this designation as I was the lead advocate and drafter of the application for this IMMA. While the purpose of IMMAs is to raise awareness and conservation of marine mammals within its boundary, its aim isn't to halt all development within its boundaries. Rather its aim is to ensure that any developments with the potential to impact marine mammals are given due consideration with any impacts mitigated or avoided. I would argue that this has been achieved through a very detailed consideration of the potential impacts on marine mammals as part of this consent process and the proposal of Conditions to protect marine mammals by TTR. I would also note that an IMMA confers no formal protection under either New Zealand domestic law or international law.
- 45. Dr Torres states (at her paragraph 37) that I claim in paragraphs 102 to 113 of my First Statement that the proposed conditions are too challenging to achieve and therefore should not be required. This is incorrect. I support the draft conditions and have simply provided some suggested revisions to improve and support the existing proposed Conditions to better protect marine mammals and ensure that they are workable and enforceable.
- 46. I disagree with Dr Torres's statements at paragraph 39 that my First Statement presents contradictions or shortcomings, for the reasons that follow:
 - (a) 39(a) The data in Barlow et al. (2022b) and Barlow et al. (2023) does not confirm that the area near the proposed mining area is frequently used by blue whales. For example, the acoustic recorder is 19km

from the most northern point of the area and whales were detected approximately 70 to 80 kms from the recorder with the authors confirming that they did not know what direction they were from the recorder. Dr Torres' statement is therefore simply conjecture. Also, the area I am referring to is the proposed mining area not the STB region which I have always recognised as an important area for blue whales.

- (b) 39(b) While the STB region is an important area for marine mammals, not all of the region is equally important as can be seen from the spatial modelling results (Stephenson et al. 2020; Roberts et al. (2019)). My opinion is that the proposed mining area is likely to be less important than other parts given the available distribution and spatial modelling data suggests that there are less likely to be marine mammals there.
- (c) 39(c) Revised as noted in paragraphs 40 to 42 above.
- (d) 39(d) There is a multitude of data available on marine mammals in the region including the recent addition of more than 50 new published scientific papers plus abundance estimates for both blue whales and Hectors and Māui dolphins. It is not necessary to have perfect knowledge of all species to reliably and robustly assess impacts on it. It is possible to make rationale and reasonable conclusions based on the best available data which is what has been done in this case.
- (e) 39(e) My statement reflects that the scope of the condition as proposed would be impossible to monitor while being supportive of the intent. I would also note that TTR are committed to undertaking

surveys and acoustic monitoring if the consent is approved.

(f) 39(f) – I am left with the distinct impression that Dr Torres expects perfect knowledge of all aspects of the consent to be available which is simply not realistic nor practical. Where the best available information includes gaps or uncertainty, it is still possible to proceed in making sensible judgements and accounting for uncertainty and taking a precautionary approach if required.

EVIDENCE OF NATASHA SITARZ

- 47. Ms Sitarz concludes in paragraph 14 that uncertainties and gaps in information make it such that it is not possible to conclude that the conditions would favour caution and environmental protection. With respect to marine mammals, I believe that there is sufficient data to make robust assessments about potential impacts on marine mammals. In particular, I draw attention to my paragraphs 8, 9 and 11 which address these issues.
- 48. Paragraphs 36 and 37 of Ms Sitarz First Statement concludes that there is uncertainty about effects on marine mammals, especially with regard to noise and sediment and disagreement about the importance of the proposed mining area to marine mammals. While I agree that there is some uncertainty with some aspects of the available data, I believe that there is sufficient data upon which to make robust and accurate assessments with respect to marine mammals. As noted previously, where the best available information includes gaps or uncertainty, it is still possible to proceed in making sensible judgements while accounting for uncertainty and implementing a precautionary approach if required.

- 49. Ms Sitarz states in paragraph 43, that she does not consider that it is possible for the uncertainties she identifies to be overcome with conditions of consent. I disagree with her conclusion and believe that the present set of conditions provides a meaningful and useful control on the proposed operations while avoiding, remedying or mitigating adverse effects on marine mammals.
- 50. I can confirm that in reaching my assessment of potential impacts from the proposed operation, I gave consideration to Policy 11 of the NZCPS as questioned by Ms Sitarz in paragraphs 55 and 56. I believe that both policy 11(a) and 11(b) apply to this application as is consistent with the judgement in the Supreme Court decision. Furthermore, I believe the activity with the proposed conditions will meet the terms of those provisions. Specifically, this means that if there are any threatened or at-risk marine mammals in the area of the proposed activity I do not think there will be any adverse effects on them nor any significant adverse effects on their habitat as I have discussed in my previous statements of evidence and supporting documents.
- 51. I note that Ms Sitarz provides some consideration of the updated evidence on marine mammals in her Appendix 1 and 2. I have not attempted to respond to each of her interpretations of the conclusions of the different experts but will note that I have directly responded to most of the items already under the section for each expert.

CONCLUSIONS

52. Overall, while the Submitters provide some useful new material in their submissions, there is nothing sufficiently new or updated for me to change any of my previous views. The notable exception to this is my error reported in Table 2 of my First Statement, which has now been corrected, and the additional new modelling by Mr Humpheson which confirms that there is no risk of either TTS or PTS for any marine mammal species at 500 m from the operation, even if they spend 24 hours in the area.

Sphillerh

Dr Simon John Childerhouse 23 January 2024

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APPENDIX 1

CONSULTANT'S ADVICE NOTE

CAN SUDJECT:	TIRL - weighted underwater sound exposure levels				
Project/site:		Date:	23 January 2024		
Client:	TTRL	TT Project No:	-		
To:	Dr Simon Childerhouse				
Copy to:					

Unweighted sound exposure levels were presented in the AECOM assessment dated 2 May 2017 which was prepared by Mr Darran Humpheson. The data presented in Table 4 of the AECOM assessment were derived from underwater sound level modelling using sound source data for the crawler and integrated mining vessel (IMV)⁶. The data was presented at various distances and for a range of exposure durations ranging from 10 seconds to 24 hours. As crawler and IMV sound would be relatively constant (steady state), the sound exposure level is an accumulation of the sound level energy summed over the exposure duration.

At the request of Dr Childerhouse the data has been weighted to represent the five marine mammal hearing groups using the frequency response relationships provided in Southall et al 20197 (Southall weightings are the same as those in the NOAA 2018 guidance). The sound source frequency data in Table 1 of the AECOM assessment has been used. Figure A1 shows the sound source data for the crawler and IMV (unweighted) and the weighted sound source frequency data.

CAN-001

⁶ Other sources such as the FSO were not included in the model - only those sources which operate continuously.

⁷ Southall B L, Finneran J J, Reichmuth C, Nachtigall P E, Ketten D R, Bowles A E, Ellison W T, Nowacek D P, Tyack P L (2019). Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. Aquatic Mammals 2019, 45(2), 125-232, DOI 10.1578/AM.45.2.2019.125.



Figure A1 : Sound source frequency spectra weighted and unweighted

Table A1 below duplicates the Table 4 AECOM data and then provides the weighted sound pressure level and SEL data for the five marine mammal hearing groups. The weighted SEL data can then be used to compare against the relevant PTS and TTS thresholds for each marine mammal hearing group.

Marine mammal	Distance m	Sound pressure level dB re 1µPa	SEL dB re 1µPa².s				
hearing group			10 sec	10 min	1 hr	3 hr	24 h
Unweighted –	500	135	145	163	167	170	184
AECOM Table 4 data	1,000	130	140	157	162	165	179
	1,500	129	139	156	161	164	178
	2,000	128	138	155	160	163	177
Weighted Low	500	126	136	154	158	161	175
frequency cetaceans (LF)	1,000	121	131	148	153	156	170
	1,500	120	130	147	152	155	169
	2,000	119	129	146	151	154	168
Weighted High	500	97	107	125	129	132	146
frequency cetaceans (HF)	1,000	92	102	119	124	127	141
	1,500	91	101	118	123	126	140
	2,000	90	100	117	122	125	139
Weighted Very high frequency cetaceans (VHF)	500	94	104	122	126	129	143
	1,000	89	99	116	121	124	138
	1,500	88	98	115	120	123	137
	2,000	87	97	114	119	122	136
Weighted Phocid carnivores in water (PCW)	500	113	123	141	145	148	162
	1,000	108	118	135	140	143	157
	1,500	107	117	134	139	142	156
	2,000	106	116	133	138	141	155
Weighted Otariid carnivores in water (OCW)	500	113	123	141	145	148	162
	1,000	108	118	135	140	143	157
	1,500	107	117	134	139	142	156
	2,000	106	116	133	138	141	155

Table A1 – Unweighted and NOAA weighted sound exposure levels

APPLICABILITY

Where this Consultant's Advice Note is issued to a person who is not our Client, it is intended to assist that person in carrying out their work on the project. It is not an instruction, and it is not to be construed as relieving any party of its responsibilities.

Tonkin & Taylor Ltd Environmental and Engineering Consultants

Prepared by:

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Darran Humpheson Technical Director, Acoustics

24-Jan-24 https://tonkintaylormy.sharepoint.com/personal/dhumpheson_tonkintaylor_co_nz/documents/documents/weightedsel_table4data_230124.docx