BEFORE AN EXPERT PANEL **FTAA-2504-1048**

UNDER	the Fast Track Approvals Act 2024
IN THE MATTER	of a substantive application for marine consents that would otherwise be applied for under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012
BY	Trans-Tasman Resources Limited

EVIDENCE OF DR IAIN THOMAS MACDONALD ON BEHALF OF TRANS-TASMAN RESOURCES LIMITED IN RESPONSE TO COMMENTS RECEIVED

13 OCTOBER 2025

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EXECUTIVE SUMMARY

1. This evidence responds to submitter comments on the predicted infilling of pits and deflation of mounds resulting from Trans-Tasman Resources Limited's (**TTR**) proposed seabed mining operations in the South Taranaki Bight (**STB**). The predictions used by TTR in the assessment work are based on field measurements and well established sediment transport theory (Hume et al. 2013). The predictions indicate that pit infilling and mound deflation will occur over decades at shallower depths (around 20 m) and over centuries at greater depths (around 45 metres).

2. As set out in the Hume et al. (2013) report, while predicting the evolution of seabed features inevitably involves uncertainties, the predicted timescales are consistent with international observations and provide a sound basis for assessing long-term seabed change. I am of the view that it is the order of magnitude of the timescales that holds the greatest relevance, rather than any single specific prediction at any given location.

3. With respect to the wave modelling, I agree with the statement from Dr McComb on behalf of Taranaki Offshore Partnership, that the model used is fit for purpose and produces credible results for assessing potential coastal impacts in the far-field[1]. The modelling employed a well-established numerical tool, conservative assumptions, and a worst-case scenario, providing a robust and precautionary basis for evaluating far-field effects. These results support the conclusion that the proposed mounds and pits are unlikely to result in significant impacts at the coast.

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1 Paragraph 37 in Statement of evidence of Peter John McComb (Seabed Morphology) for Taranaki Offshore Partnership.

INTRODUCTION

Qualifications and experience

1. My name is Iain Thomas MacDonald. I am the group manager of the Coastal and Estuarine Physical Processes Group at National Institute of Water and Atmospheric Research Limited (**NIWA**)[2], where I have been employed since 2010. I was awarded a Bachelor of Engineering from the University of Auckland in 1997, a Master of Science with First Class Honours in mathematics from the University of Waikato in 2004, and a PhD in Civil and Environmental Engineering from the University of Auckland in 2009.

2. I am a coastal and estuarine physical processes scientist with over two decades of experience in marine science, specialising in sediment transport, oceanographic data collection, and the interaction of waves and currents with coastal environments. I have expert knowledge in the measurement, modelling, and theoretical understanding of sediment dynamics, and have published on topics including estuary infilling, wave-driven macrofaunal recovery, sediment re-mobilisation, and acoustic scattering from flocculated suspensions. My career at the NIWA spans more than 25 years, including six years as a technician prior to taking on research roles. During this time, I was primarily involved in the collection and processing of oceanographic and coastal datasets. Since rejoining NIWA in 2010, I have led research programmes and contributed to the development of novel measurement techniques, numerical models, and applied solutions for sediment transport and coastal dynamics. Over the past 25 years, I have led numerous investigations for commercial clients, addressing a wide range of applied research questions in coastal and estuarine environments. I have

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2 Now known as Earth Sciences New Zealand; referred to here as NIWA to avoid confusion.

authored numerous peer-reviewed publications and technical reports, and my contributions to marine science were recognised with the 2025 Pritchard Outstanding Physical Oceanography Paper Award, presented for the best physical oceanography paper published in Estuaries and Coasts over a two-year period.

3. I previously gave evidence for TTR before a Decision-making Committee (**DMC**) in 2017.

4. My evidence before the DMC comprised:

   (a) Expert Evidence of Iain MacDonald on behalf of TTR 17 December 2016;

   (b) Expert Rebuttal Evidence of Iain MacDonald on behalf of TTR 6 February 2017;

   (c) Joint Statement of Experts in the Field of coastal stability/processes, 15 February 2017;

   (d) Summary of Expert Evidence of Dr Iain MacDonald 20 February 2017; and

   (e) Oral evidence on 20 February 2017.

5. I also helped to prepare various reports which formed part of TTR's application, which are listed here:

   (a) MacDonald, I., Budd, R., Bremner, D., Edhouse, S. 2012. "South Taranaki Bight Iron Sand Mining: Oceanographic measurements data report" NIWA Client Report No: HAM2012-147, Updated November 2015a.[3]

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[3] Refer to Supplementary Technical Report 12 - NIWA South Taranaki Bight Iron Sand Mining: Oceanographic Measurements Data Report – November 2015.

(b) MacDonald, I., Gall, M., Bremner, D. 2013. "Nearshore Optical Water Quality in the South Taranaki Bight" NIWA Client Report No: HAM2013-040, Updated November 2015c.[4]

(c) MacDonald, I., Ovenden, R., Hume, T. 2012 "South Taranaki Bight Iron Sand Mining: Shoreline Monitoring Data Report" NIWA Client Report No: HAM2012-085, June 2012. Updated November 2015b.[5]

(d) Hume, T., Gorman, R., Green, M., MacDonald, I., 2013. "Coastal stability in the South Taranaki Bight - Phase 2 - Potential effects of offshore sand extraction on physical drivers and coastal stability" NIWA Client Report No: HAM2013-082. October 2013. 135 pp. Updated November 2015.[6]

Code of Conduct

6. I have been provided with a copy of the Code of Conduct for Expert Witnesses contained in the Environment Court's Practice Note dated 1 January 2023. I have read and agree to comply with that Code. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

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4 Refer to Supplementary Technical Report 13 - NIWA Nearshore Optical Water Quality in the South Taranaki Bight – November 2015.

5 Refer to Supplementary Technical Report 14 - NIWA South Taranaki Bight Iron Sand Mining: Shoreline Monitoring Data Report – November 2015.

6 Refer to Supplementary Technical Report 6 - NIWA Coastal Stability in the South Taranaki Bight – Phase 2 – Potential effects of offshore sand extraction on physical drivers and coastal stability – November 2015.

Scope of evidence

7. I have been asked by TTR to respond to aspects of the technical evidence submitted by other parties invited by the Fast Track Approvals Act 2024 (**FTAA**) Panel that fall within my area of expertise, specifically those relating to predictions of the timescales over which pits are expected to infill and mounds to deflate under the influence of waves and currents in the STB . In addition, I respond to questions concerning the scenarios used in the far-field wave modelling undertaken to assess the potential impacts at the coast. This assessment is based on the information contained in Gorman (2015).

8. The planned sand extraction operations in the STB will create elongated lanes approximately 1 m deep, with mounds less than 10 m high and pits less than 10 m deep located at opposite ends of each mined lane. TTR's proposed consent conditions specify conditions associated with the pits and mounds that the operation must adhere to. The relevant conditions are Condition 26 for mounds and Condition 28 for pits.

9. Condition 26 stipulates: *"All mounds remaining at the beginning of each lane must be no higher than four (4) m above the level of the original seabed."* This requirement sets a clear upper limit on the elevation of the mounds. Condition 28 complements this by addressing the morphology of pits, stating: *"The Consent Holder must ensure that all pits remaining at the end of each mining lane must be no more than ten (10) m maximum depth and five (5) m average depth below the pre-mined seabed level."*

10. Additional requirements under Conditions 26 and 29 mandate recording of mound and pit dimensions and locations and specify that de-ored sediment must be discharged via a dedicated pipe at a nominal height of 4 m above the seabed.

11. The infill/deflation method is an adaptation of methods published in the scientific literature that involve the application of formulas for the transport of sediment under waves and currents. The method is underpinned by detailed sediment transport measurements. The method was developed in collaboration with my NIWA colleague Dr Malcom O. Green. Dr Green is a co-author of Hume et al. (2013).

12. In preparing this evidence, I have reviewed the material presented by Dr Peter McComb and the Taranaki Offshore Partnership (**TOP**). The TOP evidence largely comprises the work presented by Dr McComb, and accordingly, my responses are directed primarily to his evidence. Therefore, the reference to specific paragraphs are those of Dr McComb's.

13. While not contained in this evidence brief, I have also provided further response comments in the response tables provided as part of TTR's wider comments response package to the FTAA Panel. I confirm that I contributed to comments in the following two response tables (1) the Sedimentation Matters Response Table and (2) the Coastal Processes Matters Response Table. The comments that I provided are within my scope of expertise.

14. My evidence will begin with some general comments, followed by more detailed and specific commentary.

RESPONSE TO SUBMITTER COMMENTS

Dr Peter McComb and TOP

General Comments

15. Conditions 26 and 28 set clear limits on seabed modifications, requiring that mounds at the beginning of each mining lane be no higher than 4 m above the original seabed, and that pits at the end of each lane be no deeper than 10 m

maximum and 5 m average below the pre-mined seabed level. To achieve this, de-ored sediment will be discharged via a dedicated pipe positioned 4 m above the seabed. Mound and pit dimensions and locations will be recorded and reported in accordance with Conditions 26, 29, and 103, ensuring that seabed features remain within the specified limits.

16. Table 1 and Table 2 show the results of the calculations, which are the predicted times of pit infilling and mound deflation, these were present in my 2016 evidence. Table 1 shows predicted pit infilling times for different combinations of initial pit depth and mean water depth where the pit is located. Table 2 shows predicted mound deflation times for different combinations of initial mound height and mean water depth where the mound is located. T_{50} is the predicted time it takes for the pit depth to reduce by 50% of the initial pit depth or the mound height to reduce by 50% of the initial mound height. Likewise, T_{90} is the predicted time it takes for the pit depth to reduce by 90% of the initial pit depth or the mound height to reduce by 90% of the initial mound height. T_{1m} in the case of a pit is the predicted time it takes for the initial pit depth to reduce to 1 m. T_{1m} in the case of a mound is the predicted time it takes for the initial mound height to reduce to 1 m.

17. As an example of how to read Table 1: It is predicted that a pit with initial depth of 8 m located in 35 m water depth will reduce to 1 m depth in 83 years under the waves and currents typical of those experienced in the STB; the pit will reduce by 50% of its initial depth (i.e., to a pit depth of 4 m) in 44 years; and the pit will reduce by 90% of its initial depth (i.e., to a pit depth of 0.8 m) in 86 years.

18. Based on Table 1 and Table 2, I interpret the predictions as indicating that pit infilling will generally occur over decades at shallower depths (around 20 m) in the STB, and over

centuries at greater depths (around 45 m). A similar pattern is observed for mound deflation, although occurring over slightly shorter timescales.

Table 1. Predicted T_{50}, T_{90} and T_{1m} (in years) for a range of initial pit depths (2–10 m) at each of the three mean water depths 20 m, 35 m and 45 m.

Water depth (m)	Initial pit depth (m)								
	10	9	8	7	6	5	4	3	2
	T_{1m} (years)								
20	71	63	55	48	40	32	24	16	8
35	104	94	83	72	61	50	39	27	14
45	359	319	279	239	199	160	120	80	40
	T_{50} (years)								
20	39	35	31	27	24	20	16	12	8
35	53	49	44	39	35	30	25	20	14
45	199	179	160	139	120	100	80	60	40
	T_{90} (years)								
20	71	64	57	50	43	36	29	22	15
35	104	95	86	78	68	59	49	39	28
45	359	323	287	251	215	180	144	108	72

Table 2 Predicted T_{50}, T_{90} and T_{1m} (in years) for a range of initial mound heights (2–10 m) at each of the three mean water depths 20 m, 35 m and 45 m.

Water depth (m)	Initial mound height (m)								
	10	9	8	7	6	5	4	3	2
	T_{1m} (years)								
20	22	20	19	18	16	13	11	8	4
35	20	18	17	15	13	11	9	7	4
45	227	210	191	171	148	123	96	67	35
	T_{50} (years)								
20	8	9	9	8	8	7	7	6	4
35	8	8	8	8	7	7	6	4	4
45	104	100	95	89	81	72	61	49	35
	T_{90} (years)								
20	22	21	20	19	18	16	13	11	8
35	20	19	18	17	15	13	11	9	7
45	227	214	198	182	163	142	119	93	65

19. Notwithstanding some criticism of the predictive modelling (which I address in this evidence), the timeframes referenced above align with that mentioned in Dr McComb's final conclusions, wherein pit infilling is projected to occur over century-scale durations. I am firmly of the view that it is the

order of magnitude of the timescales that holds the greatest relevance, rather than any single specific prediction at any given location. In that regard, I consider the presented predictions for pit infilling and mound deflation to be fit for purpose, as they provide an appropriate basis for assessing the long-term fate of these features.

20. It appears that Dr McComb has consistently assumed pit and mound dimensions greater than those specified in consent Conditions 26 and 28. Nowhere in his evidence does he refer to features less than 8–9 m in depth or height. As shown in Tables 1 and 2, we present infilling and deflation rates that span the full range of possible pit and mound dimensions. A potential consequence of this assumption is that Dr McComb may have overestimated the near-field effects of the pits and mounds.

21. In paragraph 60, Dr McComb suggests that sensitivity testing should have been carried out to assess the robustness of the model predictions under varying input conditions. While that could have been done, it is my view that it is unlikely, that it would have materially changed the interpretation of the timescales involved with pit infilling and mount deflation.

22. Furthermore, I am of the opinion that Dr McComb has placed too much emphasis on the estimates presented for a water depth of 35 m, which are based on data collected at Site 7 (MacDonald et al. 2012), potentially overstating their representativeness in the broader context of the study. A strength of our approach lies in its foundation on field observations, which at least to some extent capture the natural variability in sediment transport characteristics within the STB. This variability is then reflected in the assessment of timescales when considered in their entirety.

23. Dr McComb also highlights, regarding pit migration, that no empirical, analytical, or numerical assessments were

undertaken. While such approaches, such as coupled hydro-hydrodynamic, sediment-transport and morphodynamic modelling can resolve small-scale features (including more detailed representations of hydrodynamics within the pit), it is not necessarily correct to assume that they will yield more reliable predictions than the rates derived from our literature review. On this point, van Rijn et al. (2005) noted that "*modelling of morphodynamics is not very accurate due to the absence of accurate field data of sand transport processes. In the absence of such data, the uncertainty margins are relatively large (up to a factor of 5).*"

24. Based on published values, the rate of pit migration is estimated to be around 10-15 m per year. With the direction of migration in the direction of residual sediment transport, which for the STB is towards the southeast. However, the residual sediment transport direction and therefore, the pit migration direction, depends on the relative occurrence and magnitude of NE and SE winds.

25. Under TTR's proposed monitoring and management framework (for example, Conditions 87 and 98), bathymetric surveys will be conducted on a six-monthly basis, as specified in Condition 103(c). These surveys are intended to detect any changes in the bathymetry of the pit and associated mounds, including potential migration, infilling, or deflation. I consider these bathymetric surveys to represent the most robust and accurate means of calculating the rates of pit migration, and for that matter infilling, and mound deflation and the sharing of this monitoring information and surveys with the Kupe Operator and the EPA will ensure that the seabed morphology, and its changes over time, within the mining area will be well documented. Any new activities (such as offshore wind) which are proposing to be located within the mining area or its surrounds would need to carry out their own feasibility assessment on the environment.

26. I agree with Dr McComb's assessment that the wave model used is fit for purpose, and that the results it produces are appropriate and credible for assessing the potential impacts at the coast[7]. However, I note that Dr McComb also highlighted that the results are subject to the assumptions made regarding the dimensions of the pits and the suitability of the modelled scenarios, which I now discuss in further detail.

27. The wave modelling scenarios were based on a selection of eight hypothetical seabed configurations representing various stages of the mining operation. Importantly these assumptions include a "worst-case" scenario involving mounds and pits of maximum expected depth/height along every lane.

28. In paragraph 27, Dr McComb also suggests that the pits and mounds resulting from the mining operation could be larger than those modelled. For the wave modelling (see Gorman 2015 for details), pit depths of 9–10 m and mound heights of 8–9 m were simulated. This exceeds the dimensions specified in the proposed consent conditions, which limit pits to a maximum depth of 10 m and an average depth of 5 m, and mounds to a maximum height of 4 m. Accordingly, the assumptions used in the modelling are considered conservative, in the sense that they overpredict the likely impact on the far-field wave climate.

29. Furthermore, the simulations were run using vertical pit and mound walls, rather than the more realistic sloped sides that would likely exist. This simplification likely overstates the influence on the wave climate, as the actual seabed would be smoother (Gorman 2015).

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[7] Paragraph 37 in Statement of evidence of Peter John McComb (Seabed Morphology) for Taranaki Offshore Partnership.

30. Given the points discussed above, it is my view that the wave modelling provides a robust and credible assessment of the potential coastal impacts associated with the proposed mining operation. The modelling was undertaken using a suitable and well-established model (as agreed by Dr McComb in paragraph 37 of his evidence), supported by conservative assumptions and an appropriate number of scenarios, including a worst-case configuration.

Specific comments

31. In paragraph 69, Dr McComb suggest that unconsolidated de-ored sediment cannot be considered a direct source for pit infilling. The underlying assumption in my model is that the sediment particles contributing to pit infilling have properties (e.g. grain size and density) that are consistent with those measured in the field. This does not mean that a constant set of sediment transport characteristics have been used for all predictions; measurements were taken at several sites, allowing us to capture some of the natural variability in particle properties. Observations of suspended sediment flux within the mining area have shown that large amounts of sediment are naturally transported and mobilised through the project site each passing storm event. These frequent high-energy conditions are likely to play a significant role in redistributing native sediment and interacting with the de-ored material. Over time, this process is expected to produce surficial sediment with characteristics similar to those observed prior to mining. Considering the time-scales associated with pit infilling, it is reasonable to expect that surficial sediment characteristics will approach pre-mining conditions on a shorter time-scale than the rates of pit infilling thus providing sediments with similar characterises to those observed by MacDonald et al. (2012).

32. In paragraphs 53–60, and summarised in paragraph 64, Dr McComb suggests that the sediment density and grain size

used in the modelling are not reasonable and may lead to significant overprediction. I do not agree with this assessment for the following reason.

33. Figures 6.3a to 6.3d in Hume et al. (2013) present near-bed wave-orbital velocities (*Uw*), classified according to whether sediment was observed to be in full suspension, intermittent suspension, or immobile at the time of measurement. These classifications were derived from acoustic backscatter data (MacDonald et al. 2012). Also shown in the figures is the critical wave-orbital velocity (*Uw,crit*), as predicted by a widely used analytical model. Key inputs into the *Uw,crit* formulation include particle density and grain size.

34. The figures clearly show that *Uw,crit* effectively separates the full-suspension data points from the others. This is significant because it provides independent validation of the *Uw,crit* formulation and, by extension, supports the appropriateness of the selected particle size and density. If these parameters had been incorrectly specified, *Uw,crit* would not have reliably distinguished the full-suspension observations from the rest. As it does, this supports the conclusion that the selected values are appropriate.

35. In paragraph 63, Dr McComb questions the appropriateness of the bedform height used at Site 7; however, all bedform heights were derived from in-situ observations, including diver surveys. A height of 12 cm was adopted at Site 7 based on these observations, compared to 2 cm at other sites, which Dr McComb considered appropriate. The higher suspended sediment concentrations observed at Site 7 further support the conclusion that bedform geometry at this location differs from the others. The use of site-specific, observed bedform heights validated by both direct measurements and sediment concentration data provides a sound basis for the model inputs as it reflects some of the spatial variability in seabed conditions.

36. I disagree with the conclusion drawn in paragraph 64. The larger slope correction factor simply relates to the higher levels of suspended sediment concentrations observed at Site 7 (MacDonald et al. 2012).

37. In paragraph 68, Dr McComb highlights an apparent inconsistency between the predicted infilling of a 10 m pit over ~100 years and the persistence of bathymetric undulations in the Rolling Ground, I question the appropriateness of directly comparing naturally occurring features to anthropogenic pits created by mining. The undulations in the Rolling Ground span much larger length scales and have formed under long-term geological processes, whereas mining pits are relatively small, steep-sided, and introduced abruptly. I think what's more relevant is the summary provided by van Rijn et al. (2005) on infilling rates of existing extraction pits in coastal waters of the USA, Japan, UK, and the Netherlands, as reproduced in Table 3.

38. While it is difficult to directly compare my predictions to (van Rijn et al. 2005), due to the lack of reported initial pit depths and the imprecise definition of "*filling*" there are nonetheless useful parallels. My predictions for pit infilling at 20 m depth in the STB suggest timescales comparable with van Rijn's summary indicating a filling timescale of about 100 years at depths of 15–25 m. Thus, giving confidence in our predictions. For depths greater than 25 m, infilling is only "*minor*" according to van Rijn, which also corresponds to our prediction of pit infilling in 45 m of about ~350 years.

Table 3. van Rijn et al.'s (2005) summary of observations of infilling rates of existing extraction pits in the coastal waters of the USA, Japan, UK and the Netherlands.

Pit location	Infill characteristics
Pit at foot of beachface (2 to 5 m depth contour)	Infill from beachside and from seaside (annual infill rate is not more than about 3% of initial pit volume; infill rates are

	between 5 and 15 m^3/m/yr, depending on wave climate; filling time scale is 20 to 30 years).
Pit in upper shoreface zone (5 to 15 m depth contour)	Relatively rapid infill of extraction pit with sediments from landside (beach zone); annual infill rates up to 20% of Initial pit volume in shallow water (filling time scale is 5 to 10 years).
Pit in middle shoreface zone (15 to 25 m depth contour)	Infill of extraction pit mainly from landside with sediments eroded from upper shoreface by near-bed offshore-directed currents during storm events; annual infill rate is about 1% of initial pit volume (filling time scale is 100 years).
Pit in lower shoreface zone (beyond 25 m depth contour)	Minor infill of sand in extraction pit; only during super storms.

39. In paragraphs 72 to 74, Dr McComb provides an example of a relict mound at Port Taranaki, where repeat bathymetric surveys over 20 years indicate deflation at approximately 10,000 m³/year. He notes that the mounds in my predictions have volumes of 900,000 m³ and are expected to lose 90% over 22 years, equating to an annual loss rate of 37,000 m³/year nearly four times higher than the rate observed at Port Taranaki. He also states that the two sites are broadly comparable based on water depth and estimated wave climate.

40. Sediment transport can be understood as a two-stage process: first, sand is lifted from the seabed into suspension; second, the suspended sediment is carried horizontally by water movement. Both waves and currents contribute to these processes. Observations by MacDonald (2015) collected within the proposed mining location indicate that the site is not subject only to large waves, but is also exposed to strong currents of up to 1 m/s. While Dr McComb provides an estimate of the wave climate, he does not present any information regarding current speeds at the Port Taranaki site,

making direct comparison between the two locations difficult.

41. In addition, the initial height of the mound is also relevant. Dr McComb's assessment was based on a mound height of 10 metres. However, the maximum mound height proposed in Condition 26 is 4 metres, which provides a more appropriate basis for comparison. Repeating Dr McComb's analysis for a 4 m high mound would result in an annualised loss rate of approximately 25,000 m^3/year. This corresponds to a rate about 2.5 times faster, not nearly 4 times faster as stated by Dr McComb. This discrepancy could be explained if the currents at Port Taranaki site were less energetic than those presented in (MacDonald et al. 2012).

42. To provide context to the above in terms of actual timescales, Table 2 predicts a T_{90} of 13 years for the 4 m mound. If this prediction were incorrect by a factor of 2.5, the T_{90} would be approximately 32.5 years. This remains consistent with the interpretation presented throughout, namely that pit infilling and mound deflation occur over decades at shallower depths (around 20 m) and over centuries at greater depths (around 45 metres).

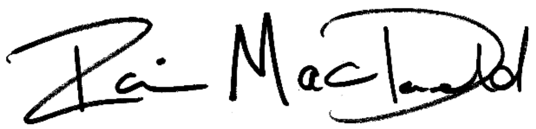
CONCLUSION

43. In conclusion, I reaffirm the key findings and opinions expressed in both my previous and this evidence. That the predicted timescales for pit infilling and mound deflation spanning decades at shallower depths (around 20 m) and centuries at greater depths (around 45 m) are consistent with international observations and grounded in field measurements, established sediment transport theory, and conservative assumptions. While predicting the evolution of such seabed features inevitably involves uncertainties these predictions provide a robust and appropriate basis for

assessing the long-term evolution of seabed features associated with the proposed mining activities.

44. With respect to the wave modelling, I agree with Dr McComb that the model used is fit for purpose and produces credible results for assessing potential coastal impacts. The modelling was conducted using a well-established numerical tool, supported by conservative assumptions regarding pit and mound dimensions and seabed configurations. The inclusion of a worst-case scenario further strengthens the robustness of the assessment. Accordingly, I consider the wave modelling to provide a sound and precautionary basis for evaluating the far-field effects of the proposed operations.

45. Based on the discussion above, the specified limits on pit depth and mound height are unlikely to result in any measurable impact at the shoreline. In that regard, the proposed consent conditions relating to pit depth and mound height, specifically Conditions 26 and 28, are appropriate and do not require amendment. Furthermore, a six-month interval between surveys, as required by Condition 103(c), is appropriate for detecting changes in seabed morphology, including pit migration, infilling, and mound deflation.



Dr Iain MacDonald

11 October 2025

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