BEFORE THE FAST-TRACK EXPERT PANEL

IN THE MATTER of an application for approvals under section 42 of the Fast-track Approvals Act 2024 ("FTAA")

AND

IN THE MATTER of the application for approvals by Trans-Tasman Resources Limited for the Taranaki VTM Project, a project listed in Schedule 2 of the FTAA

JOINT STATEMENT OF EXPERT WITNESSES:

FATE OF TAILINGS BACKFILL

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18 November 2025

INTRODUCTION

1. Expert conferencing on the topic of fate of tailings backfill took place online via Microsoft Teams on 18 November 2025.

2. The conference was attended by the following experts:

   (a) Gary Teear ("GT") (Applicant); and

   (b) Carl Erbrich ("CE") (Jera Next BP).

3. Jason Welsh (ChanceryGreen) acted as facilitator.

4. Caitlin Todd (ChanceryGreen) assisted the experts to draft the Joint Witness Statement ("JWS").

CODE OF CONDUCT

5. The experts confirm that they have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023 and agree to comply with it. The experts confirm that the issues addressed in this JWS are within their area of expertise, unless stated otherwise.

SCOPE OF STATEMENT

6. In Expert Panel Minute 19 (5 November 2025), the Panel directed experts in fate of tailings backfill to conference regarding identified questions, recording matters that are agreed or disagreed and any unresolved matters or uncertainties.

7. The scope of this statement is limited to responding to the questions posed by the Panel in Appendix B of Minute 19.

8. Appendix B of Panel Minute 19 formed the basis of an agenda for conferencing.

9. In this JWS, we report the outcome of our discussions in relation to each item (below), including by reference to points of agreement, disagreement, and unresolved matters or uncertainties. Where we are not agreed in relation to any issue, we have set out the nature and basis of that disagreement.

QUESTIONS FROM THE PANEL

1. Characterisation and Understanding of Tailings Backfill

a. What methods and evidence have been used to assess the physical and geotechnical fate of tailings backfill?

10. GT notes that the scope of his report is limited to whether an oil and gas-type jack-up can be placed on dredged material. Beyond this, GT has not assessed the fate of tailings in detail in his report. For example, he has not prepared a particle size distribution curve.

11. GT's views beyond the scope of his report are based on his experience and investigations of the existing seabed, including diving experience.

12. CE's report, in contrast, covers two parts: a) a geotechnical qualitative assessment; and b) a geomorphological qualitative assessment (noting that b) is not relevant to this conferencing). Part a) included an assessment of the pre- and post-mined sediment properties and critical engineering parameters, and an assessment of potential liquefaction and densification of post-mined material, consideration of post-mined slope stability, and a discussion on jack-up operability covering static pre-loading and storm and seismic stability. Assumptions are made for geotechnical parameters in lieu of site-specific data for the backfilled mining tailings.

13. GT agrees with what CE has done in the absence of site-specific data for the backfilled tailings.

14. In GT's experience, the in-situ material is dense material to go through. GT notes that it is a high wave energy environment with persistent long period background swell which can be unrelated to local weather. GT considers the existing seabed is naturally hard and compact and sand compacts well under wave action. From his interpretation of the CE report, GT notes that compacting under wave action does not occur with the processed material dumped back on the seabed. It is still essentially fine sand with up to 10% of courser material still removed and an indeterminant amount of fines added. This may float away in the sediment plume discharge. The material placed back on the seabed, according to the CE report, remains loose for a very long period (geological timeframe). GT does not agree with that.

15. CE agrees that the in-situ sand is in a very dense state. However, CE does not consider that it is a 'known' how quickly the original seabed was densified to its current state. CE's report presents calculations that show that densification may be minimal under ambient conditions, but liquefaction and densification can be expected progressively when larger storms are applied (1 yr return period and above were considered). Densification is also shown to develop more quickly in the upper few metres than near the base of the backfill – which may then become the critical 'weak' layer where a flow liquefaction event may initiate at longer time scales. Any new infrastructure would need to be designed for the 100-year return period event occurring at any point, including on 'Day 1'. The specific claim in CE's report is only that the soil may remain in a loose state for the lifetime of offshore infrastructure associated with offshore wind farm; the reference to geological timescales is only intended to reflect the ultimate end point (see paragraph 2 of Section 4.2).

b. *Is the backfill fate (e.g., final density, consolidation rate) sufficiently well understood given the nature and duration of proposed mining and backfilling?*

16. GT does not consider the backfill fate is sufficiently well understood because there is no final particle distribution or testing; rather, it is based on assumptions. However, GT considers this is the best that can be achieved presently.

17. CE agrees with GT and considers that the lack of tailing samples is a major limitation of all work conducted. CE considers that, as in all geotechnical matters, there will inevitably be a range of parameters even after samples are obtained and hence *a priori* it will always be difficult to definitively characterise the behaviour in a singular manner. Therefore, a range of engineering assumptions will need to be made for final assessments. As with all engineering, these will need to be selected to be conservative for the matter under consideration.

c. *What matters underpin confidence or uncertainty in the backfill characterisation?*

18. CE notes that his report identifies the uncertainties and assumptions that have been made. CE states that although necessary assumptions have been made, where possible these are based on Kupe-specific testing on in situ material albeit this does not cover the mined backfill which will be altered. CE states that the necessary assumptions for the mined backfill are referenced to industry literature

on loose sandy materials generally, which CE considers is the best that can be done at this stage.

19. GT states there are no test results specific to the tailings which leads to inherent uncertainty as to the backfill characterisation.

2. Settlement, Densification, and Material Behaviour Over Time

a. What processes and timeframes govern the settlement and potential densification or ongoing looseness of the backfilled tailings?

20. CE and GT agree that there are two fundamental processes (which are discussed in CE's report):

(b) MetOcean and/or seismic loading; and

(c) the propensity of the soil to densify when subject to cyclic loading.

21. CE and GT do not address settlement of the backfilled tailings but have considered settlement of jack-up spud cans.

22. In relation to timeframes, CE states that this is principally associated with the frequency and timing of MetOcean and seismic events. CE notes that these are inherently unpredictable and can only be assessed on a statistical basis e.g. storm with return period of one year will occur on an average of once per year whereas a storm with a return period of 100 years may occur once every 100 years. However, CE states that engineering design generally requires that a foundation system be capable of sustaining a 100-year return period storm that may occur at any point over its design life.

23. CE and GT agree that ambient conditions will occur continuously, including long period swell background.

24. However, CE notes that CE's calculations explicitly considered a range of ambient conditions and, with the conservative assumptions made at this stage, these were not found to be sufficient to significantly densify the tailings at this site. CE notes that this calculation/process is highly sensitive to water depth (35m water depth has been assumed).

25. GT considers that the long period swell is constant and will densify the soil, e.g. the 13 second period has a deep-water wavelength of 264m. This is based on

GT's practical experience of the environment and conditions out at the site, and GT notes he has not done specific calculations on this.

26. CE notes that GT's position is a judgment and is not based on calculations/data. CE states that CE's calculations explicitly calculate long swell waves (1-2m significant wave height with periods of 12-15 seconds) and more traditional waves (with 2-3m significant wave height with periods of 6-8 seconds).

27. GT has not reviewed CE's calculations.

b. What models or assessments are available to predict the fate of tailings backfill? What are the key assumptions and limits of these predictions?

28. These matters are generally addressed in the above questions.

29. CE also covers this in his report. CE also notes that CE's calculations are not predictions; rather, they are calculations aimed at achieving safe design outcomes but not excessively conservative.

30. GT notes that he has not reviewed the calculations so cannot comment on CE's calculations. In GT's opinion, CE's calculations are very conservative.

31. CE notes the main limitations are the geotechnical input data.

32. GT agrees that a limitation is the geotechnical input data; however, it is the best that is available in the absence of site-specific data.

c. Which factors could alter the predicted outcomes (physical, operational, environmental)? How sensitive are predictions to assumptions and model/assessment limitations?

33. CE notes that site-specific data from the pre-mined site could be collected, and subject to preparation into an estimated post-mined tailings state. These prepared samples could then be subjected to geotechnical tests and the outcomes of these tests used to update the calculations in CE's report. CE notes this would likely alter the currently predicted outcomes.

34. The experts agree that factors that could alter the predicted outcomes include physical and operational mitigation measures that can be put in place, which will be addressed below.

35. CE considers the calculations are sensitive to the assumptions.

36. Both experts agree that the material will initially be loose, but do not know how loose or how readily it will densify when subject to metocean or seismic loading.

3. Geotechnical Stability and Long-Term Performance

a. How well are risks to long-term stability (e.g., slope failure, liquefaction, shear failure, settlement risks) assessed?

37. CE and GT have answered this question by addressing slope stability (covered in CE's report) and jack-up stability (covered in both CE and GTs' reports).

Slope stability

38. CE's report considers the risks and consequences of flow liquefaction in undensified tailings. Note there are two types of liquefaction – flow liquefaction which may result in landslides; and cyclic mobility liquefaction which can cause lateral spreading (limited lateral movement but not landslides). Flow liquefaction is the relevant type considered in CE's report. Seabed slopes are generally very shallow and there are relatively few zones where flow liquefaction may initiate and pose slope stability risk. However, a run out from any such failure may impact a much larger area. These are identified in CE's report (see Plates 14 and 15), separated into low-risk and high-risk paths. In all cases, the high-risk paths cases initiate from areas of steeper slopes (generally around 2 degrees) and mostly head to the south and southwest. If the soil densifies to a medium dense state, CE does not consider that flow liquefaction would continue to pose a risk. The key geotechnical input parameter to this assessment is the post-liquefaction residual strength which has been determined based on literature in lieu of site-specific data. No run out modelling to predict the length of the flow path has been conducted at this stage, hence the length of the flow paths in Plates 14 and 15 are speculative and for illustrative purposes only.

Jack-up stability

39. The experts agree that there are two aspects to jack-up stability: a) leg penetration and pre-loading; and b) storm/seismic stability. Both CE and GT's reports cover leg penetration and pre-loading. CE's report also addresses storm/seismic stability (qualitative discussion).

40. There is disagreement between the experts as to the static spud can penetration as outlined below, including the appropriate guidelines that should be used in the calculations.

41. GT outlines that spud can penetration and pre-loading calculations in his report are based on his experience of undertaking 30m boreholes in the existing seabed. Based on those results, using the Society of Naval Architects and Marine Engineers (SNAME) Guidelines, GT estimates around 6m penetration to the widest section of an oil and gas jack-up. GT notes that his calculations were based on parameters from SNAME for very loose sands.

42. CE's calculations are based on ISO 19905-1 2023 international standards for jack-ups (as referenced in his report). CE calculated 2m penetration to the widest section. CE recommends the ISO standards – which represents the latest industry best practice. CE considers that the SNAME Guidelines include outdated recommendations for loose sands.

43. GT has reviewed the latest version of SNAME and does not consider there is a material change between the earlier version of the SNAME Guidelines which were used in GT's calculations. GT considers the use of the SNAME Guidelines is appropriate based on his experience.

44. CE considers that even if SNAME has not changed their parameters in the latest edition, the ISO standard is still best practice.

45. CE states that GT's jack-up calculations are purely static penetration calculations. GT agrees with this.

46. CE's report covers seismic and storm as well and that is where CE considers there is a fundamental difference between CE and GT's calculations and reports. CE states that a qualitative assessment shows that storm or seismic loading stability may transition the soil drainage conditions and this may lead to additional penetration to the base of the backfill.

47. GT considers that if you are at 6m penetration having gone through very loose material, the spud can will sit on compacted material capable of taking the high bearing capacity loads required. There is a pressure bulb under the spud can taken at approximately 1.5 times the spud can width/diameter, and that pressure bulb would sit on the undisturbed material.

48. CE disagrees with the above. CE considers GT's position does not account for the transition of drainage conditions that may occur during a storm or seismic loading condition which may lead to a much lower undrained bearing capacity. This contrasts with the drained bearing capacity that CE anticipates to be the likely bearing mechanism supporting the previously applied pre-load. Examples

of this type of transitional drainage behaviour, where initial static stability has reduced, include jack-up spud cans in the Bass Strait Australia and free-falling piles that were in the process of being installed for wind turbines offshore Taiwan.

49. Fundamentally, there is disagreement between the experts on the applicable soil mechanics in this case:

a. CE considers that GT's view is informed by traditional binary drained (sand) / undrained (clay) soil behaviour. However, CE considers the mining tailings may be a silty sand and for such materials transitional drainage conditions apply that are much more complicated and can lead to unexpected outcomes. Such outcomes can include shallow penetration due to high drained bearing capacity under static slowly applied loading, e.g. spud can pre-loading, followed by additional penetration under smaller loads when applied rapidly, e.g. storm waves and seismic. CE refers again to the example cases in Australia and Taiwan discussed above.

b. GT does not accept how a very loose material that has not consolidated with depth can sustain high pre-loads at the very shallow penetrations that CE is suggesting. GT's calculations using the SNAME Guidelines, results in significantly greater penetration, albeit still 4m above the base fill.

c. GT notes that, in practice, before any jack-up goes to site, a site survey comprising Cone Penetration Test (CPT) and sampling bore holes to 30m will be required which may be used to define in situ condition.

d. CE agrees with (c) but notes that if the soil conditions are not suitable then jack-ups will not be able to operate at that site.

e. GT notes that there may be significant time delay between mining and offshore wind farm construction which may assist in densifying the soil.

b. Is the backfilled material expected to be stable over relevant operational and environmental timescales (including seismic events or storms)?

50. The experts agree that this depends on whether it densifies sufficiently to transition to a state where liquefaction is of cyclic mobility-type liquefaction (rather than flow liquefaction). If it densifies then it will be stable and if it does not densify it will not be stable. Densification must be sufficient to ensure that the residual undrained strength is greater than the static shear stress that must be mobilised

to sustain the slope angle. The experts refer to the discussion above regarding disagreement as to densification.

c. *What uncertainties or knowledge gaps remain regarding stability under both static and dynamic loading, and what could be the consequences if instability occurs?*

51. CE and GT have addressed uncertainties and knowledge gaps in discussions above.

52. In relation to consequences if instability occurs, CE and GT agree that flow liquefaction could have catastrophic consequences for jack-ups and any infrastructure along a slope failure path. Cyclic mobility liquefaction may still pose a risk to jack-ups but not slopes. If the soil were to densify back to, or close to, in situ conditions, it is unlikely to pose a risk.

4. Key Uncertainties and Consequences

a. *What are the main sources of scientific, engineering, or modelling uncertainty regarding the fate of tailings backfill?*
b. *Where uncertainties or disagreement remain, what are the potential consequences for seabed stability, environmental integrity, or future uses?*

53. The experts did not have sufficient time to address this matter.

5. Mitigation, Monitoring and Proposed Conditions

a. *What measures are proposed to mitigate risks associated with unexpected consolidation, settlement, or instability of backfilled tailings?*

54. CE's report recommends 'no mining exclusion zones' on and adjacent to the steepest slopes. GT agrees where densification has not been proven.

55. CE's report also suggests in situ vibro compaction as a possibility. However, CE has doubts as to the practicality of this. GT considers that situ vibro compaction is not practicable.

56. CE's report also recommends that jack-ups should not be placed on backfill unless it is confirmed first that it has densified sufficiently to avoid flow liquefaction, or general undrained shear failure (monotonic or cyclic) that results in bearing capacity less than the previously applied pre-load. GT agrees with this.

b. *What monitoring strategies are proposed to confirm backfill behaviour over time?*

57. CE's report has recommended CPT testing of the backfill and reassessment 'on the fly' (Observational Method – make observations then update the design in response – a standard method in geotechnical practice). This could commence at the first area mined and be repeated over time to validate the rate of soil densification. This could be used in conjunction with temporary or permanent no mining exclusion zones, that could be dynamically updated if the soil is demonstrated to densify sufficiently to avoid flow liquefaction. GT agrees with this.

c. *Are the proposed conditions related to mitigation and management appropriate, sufficient, and likely to be effective for addressing uncertainties and ensuring ongoing stability and for providing early warning of unexpected behaviour?*

58. CE considers that the exclusion zones measures recommended in CE's report for protecting future offshore wind farm infrastructure should be sufficient if fully enacted. CE reiterates that he considers jack-ups should not be placed on backfill unless it is confirmed first that it has densified sufficiently. It is noted that before any jack-up operation, a geotechnical assessment, as discussed above at paragraph 49(c), would be required anyway. GT agrees with this.

59. CE, however, notes that in respect of existing Kupe infrastructure, if future jack-up operations may be required (e.g. for plugging and abandoning of wells), exclusion zones sufficient to encompass a jack-up footprint should be enacted until sufficient densification is confirmed. GT agrees, if future jack-up operations are required.

d. *Do you consider that changes to these conditions are necessary? If so, describe what these changes are.*

60. The experts were not in a position to address conditions, and it was unclear what this question related to.

6. Residual Risks and Recommendations

a. Are there residual risks that cannot be mitigated with current knowledge or proposed conditions?

61. From a geotechnical perspective, CE does not consider there are any residual risks beyond those discussed in CE's report. GT agrees with this.

62. GT considers that with site-specific testing, the underlying assumptions can be updated and incorporated into design. CE agrees but notes that there will still be a range from better to worse due to the inherent variability of natural soil.

63. GT notes, in respect of jack-ups, the site-specific CPT/borehole has to be undertaken, which he considers will mitigate geotechnical jack-up risks.

7. Advice for Interdisciplinary Effects Assessment and Decision-Making

a. What advice or caveats should be communicated to other experts who may rely on information on the fate of tailings backfill and to the decision-making panel to ensure that uncertainties, risks, and management related to the fate of tailings backfill are understood and adequately considered across the broader assessment?

64. The experts are not in a position to address this question since they are not familiar with what other experts may rely on. Where geotechnical caveats do apply, these are stated in the relevant reports.

SIGNATURES OF EXPERTS

Gary Teear

C. Erbrich

Carl Erbrich