

SUMMARY STATEMENT OF BRETT BEAMSLEY (HYDRODYNAMIC MODELLING)

1. My name is Brett James Beamsley. I am the General Manager of MetOcean Solutions.
2. My qualifications and experience, together with those for the other co-authors of the reports attached to Northport's application are set out in my evidence in chief.
3. I have been involved in the Project since 2017. I helped to prepare the three reports that are attached to the application Appendix 9. I also assisted with the response to the councils' request for further information.
4. Over the last 11 years, MOS has undertaken several modelling studies of Whangarei Harbour. This includes the characterisation of the physical environment of Whangarei Harbour and the establishment of wave, current and sediment dynamics numerical models initiated in 2015-2016 with the Channel Infrastructure NZ Limited's proposed deepening of the shipping channel to its Marsden Point site. The MetOcean Reports are informed by each of these previous studies and draw from this existing knowledge and previous model setups and development.
5. The MetOcean Reports consider the new proposed layout and include the following modelling studies:
 - Hydrodynamic modelling: we updated the bathymetry with the proposed dredge footprint and ran a full month of hydrodynamics (two spring/neap tide cycles).
 - Morphodynamic modelling: we modelled morphological change in the vicinity of the proposed dredge footprint and reclamation over a five-year period.
 - Sediment plumes modelling: we modelled sediment plumes which may be generated during the proposed dredging operations.
6. With regards to hydrodynamics, the results of the modelling showed only a minor effect of proposed layouts on the current field in the nearshore area surrounding the port. Small decreases in current speed near the reclamation area indicates a potential for an increase in sedimentation. Calibration and validation of the hydrodynamic model suggest the model satisfactorily reproduces the range of hydrodynamic conditions in the environs.
7. The effect of the proposed design on the morphodynamics is expected to be limited to the immediate port environs. Significant differences observed between the existing and design scenarios are mainly attributed to the combination of dredging (deepening), slope

changes, and the transport of sand wave features previously characterised in this region. Despite some predicted changes to the sediment transport and bathymetry within Marsden Bay, model results suggest these will not alter the bay morphology.

8. With regards to dredging, sediment plume and deposition footprints are, in general, elliptical, centred on the release sites, and follow a northwest-southeast pattern consistent with the hydrodynamics. The proposed reclamation has a limited impact on general plume dispersion patterns with a slight flow deflection in its vicinity. Predicted deposition fields for the proposed bathymetry (i.e., post-dredging) indicate possible sediment accumulation near the northwest and southeast edges of the new turning basin.
9. The outcomes of these reports have provided information to assist other experts engaged by Northport on a range of relevant aspects of the receiving environment (marine ecology, coastal processes, avifauna, and marine mammal effect assessments).
10. The statement of evidence of Professor Karin Bryan questions the approach used to calibrate and validate the hydrodynamic modelling carried out by MetOcean Solutions (MOS), and how this might affect the interpretation of the results and their application in downstream reports that rely on MOS data.
11. I acknowledge that there are valid points made by Professor Bryan and I have taken steps to address these concerns.
12. Having extensive measurements is always valuable for minimising uncertainty. However, in this particular context, what is required is a level of certainty in our modelling that is sufficient for assessing the effects by comparing existing with modified scenarios. Given that the validation metrics meet the necessary criteria for validating the site effectively, I have confidence the model is representing well the hydrodynamics near the site and water volume changes within the inner and outer harbour.
13. Our results show that effects resulting from the modified layout are limited to the port area. As we move further away from the port, the changes between the existing and proposed conditions become negligible.
14. In terms of the level of changes taking place to the west of the proposed reclamation site, the modelling results from MetOcean Solutions (2022) demonstrate that the proposed layouts have a minor impact on the current field in the nearshore area west of the port, around Blacksmith Creek. The minor changes are mostly visible during spring

tide. There are no potential changes to the current field in these areas during a neap tide.

15. In regard to the assessment of bed shear stress in the numerical modelling, it is important to note that sediment was not included in the hydrodynamic modelling and that the analysis of bed shear stress, mentioned in paragraph 4.6 of Professor Bryan's statement, used a value of 200 μm for demonstrative purposes only. A considerably more detailed approach was taken in the morphodynamics modelling to incorporate a realistic sediment distribution into the model. It included the complex sediment interactions and bio-stabilization, particularly in areas like Mair Bank. I believe the bed shear stress was well represented in the morphological modelling.
16. Professor Bryan commented that the impact of sea level rise (SLR) on the effects of the proposed reclamation should be investigated (refer paragraphs 1.4 and 4.5 of her evidence). Overall, the impacts of SLR near the entrance to Whangarei harbour are likely to be limited but are expected to be more significant further into the estuary than near the entrance where the port is located.
17. Upon careful consideration, the evidence presented by Professor Bryan has not led to any changes in my position. I maintain my position as originally stated in my primary submission.

Dr Brett James Beamsley
MetOcean Solutions

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