

Project: Mandorah **Project No:** 304500951
To: Travis Kelly **Date:** 10 July 2023
From: Eng. Dan Strickland, Eng Chris Scraggs, Dr Glenn Shiell

RE: AAPA Submission in relation to the SER, received 28 June 2023

Dear Travis,

The following memorandum provides details regarding the longshore drift modelling applied at Mandorah, as well as the monitoring and mitigation strategies available to DIPL post construction.

The memo follows our meeting of the 6 July 2023 between Jay Corrick, Shane Dahlhelm and Shrijana Chaulagain of DIPL, Amber Evans and Glenn Shiell of Stantec and Travis Kelly of AAPA. The information provided below is intended to provide confidence to AAPA that the potential changes to coastal features north and south of the proposed Marine Facilities are manageable under a Coastal Processes Monitoring and Management Plan (CPMMP), once approved by all vested parties.

1.1 Rigor of the Modelling Applied at Mandorah

From our discussion with AAPA on 6 July, it is clear there is some confusion between the types of models applied at Mandorah, surrounding their intent, rigor and uncertainty. Stantec concedes this could have been communicated more clearly in the SER.

The model presented in the original submission was a 'high level' first pass approach based on an empirical model and an assumed net transport rate. This model had a lower level of confidence with a tendency to over predict the extent of erosion and accretion, including the northward extension of a sand bar on the northern side of the facility. Subsequent modelling, undertaken for the SER, was more rigorous with increased confidence. The model was well calibrated to waves and currents but as with all models, maintained some uncertainty with regard to the natural processes that may occur post construction i.e. cyclones.

Our frank but objective response to the initial round of EPA comments was that *"it is widely acknowledged in the industry that shoreline evolution modelling over long time periods is difficult/inaccurate, due the number and complexity of physical processes that cause it"*. While this is true, the comments were of a general nature and intended to emphasise the important role of the CPMMP, as a 'safety net' for model uncertainty. This is standard practice in any modelling project.

1.2 Extent of Predicted Impacts

It was also clear that some confusion arose because of the different approaches to modelling and the fact they generated very different outcomes.

- The model presented in the original submission assumed a straight coastline, an unlimited supply of sand and that the breakwater would block 100% of the longshore drift – all highly conservative assumptions. This model does not allow for a reduction in the longshore drift as sand accumulates on the breakwater, and therefore produced a material area of accretion north of the facility, which is unlikely to transpire in reality.
- The second model was developed using the LITPACK coastal process and shoreline model. While the model also assumed an unlimited supply of sand at its boundary, it included a more realistic appreciation of the coastal morphology and allowed for variations in longshore transport in response to beach curvature and shoreline changes. Outputs from the second model including the levels of accretion and erosion, are considered more accurate, but are nonetheless still conservative (see dot point 3).
- A key feature of the LITPACK software is that the model assumed the coastline was 100% sand. It did not account for the rocky substrates beneath or inland of the beaches. This again, is a highly conservative assumption, since the

presence of rock will (a) limit the sand available for transport and (b) halt the extent of erosion once the erosion reaches the rocky features. Both are expected to mitigate the erosion south of the facility. Monitoring in the first two years following construction is expected to confirm the conservative nature of the modelling.

1.3 Proposed Monitoring and Mitigation Strategies

As discussed at our meeting of 6 July, the CPMMP forms an important component of the ongoing management strategy. Initial comments from AAPA fairly highlighted the coarse nature of the original monitoring frequency, which was projected to occur every 5 years. If amenable to AAPA and the EPA, DIPL proposes to increase the frequency of the shoreline modelling upon completion of the works.

The proposal is for quarterly monitoring to be conducted by the Contractor for first 2 years, followed by yearly monitoring up until year 5 subject to the outcomes of years 1 and 2. Monitoring may also be extended to 7 years if the previous 3 years of monitoring warrant it. The outcomes of the monitoring will determine the need for coastal protection measures and effectively validate the outcomes of modelling. The collected data will become part of the wider Darwin Harbour database, to provide better historical inputs at this and may other harbour wide sites.

Should a bypassing system be required, there are a number of ways this could be implemented. Commonly, this could be using land-based equipment. However another way would be to use a floating (or on-land) pipeline and bypass the sand as a slurry mixture and rainbowed onto the beach. This would require a jet at the borrow area to agitate the sand first which could then be transported through a slurry pipe and discharged downdrift of the harbour. We understand the latter option is preferable to AAPA.

1.4 Final Remarks

Stantec, together with DIPL is confident that changes to coastal processes following the construction of the Mandorah Marine Facilities are manageable under a revised CPMMP. We note particularly the increased sensitivity of the CPMMP following the changes in monitoring frequency, which is expected to provide early warning of changes and help with the validation of the modelling outcomes in the initial years following development.

For further context, we have also attached further details of the consultation process including the anecdotes / evidence of the high level of support for the facility.

We are hopeful the above provides confidence in the likely impacts and proposed mitigation strategies and subject to AAPA review and ongoing consultation, allows DIPL to move forward with the EPA assessment.

Yours sincerely



Dr Glenn Shiell

Stantec Australia Pty Ltd

Attachment A – Current Images of Shoreline Illustrating Rocky Substrate

Attachment B - Section 24KA Documents

Attachment C – Information from Cardno Geotechnical Report - 2022

Attachment D - Stakeholder Engagement