Northern Territory
Environment Protection Authority

DIRECTION TO PROVIDE ADDITIONAL INFORMATION IN RELATION TO THE SER

This direction is given under regulations 124(1) of the Environment Protection Regulations 2020

Name of proposed action	Mandorah Marine Facilities
Proponent	Department of Infrastructure, Planning and Logistics (DIPL)
NT EPA reference	EP2022/014
Description of proposed action	To develop a safer, weather-resistant ferry berthing facility near the existing Mandorah ferry facility (within Lots 116 and 50, Hundred of Bray), to improve transport connectivity between the Cox Peninsula and Darwin, especially for the passengers requiring mobility assistance. The proposal area would cover approximately seven hectares comprising: • northern and southern rock armoured breakwaters • dredging of an access channel, turning basin and berthing areas (up to 30,000 m^3 of unconsolidated marine sediments, and 70,000 m^3 of rock material) • offshore dredge spoil disposal within the Darwin Harbour • a new boat ramp and car park modification • floating pontoon, gangway, jetty and rock armoured access causeway • a ferry terminal building. The proposal also includes: • maintenance dredging estimated to occur once every 5-7 years • development of a landside fishing facility.
Nature of proposed action	Coastal and marine
Method of environmental impact assessment type	Assessment by Supplementary Environmental Report (SER)
Direction	The proponent is directed to provide additional information in relation to the SER as detailed in **Attachment A**
Submission period	The additional information must be submitted to the NT EPA within 12 months of the date of this Direction
Document to be published	Additional information in relation to the SER

NOTICE OF DIRECTION

Person authorised to give direction	Paul Purdon – Executive Director, Environmental Assessment and Policy Delegate of the NT EPA under section 36 of the *Northern Territory Environment Protection Authority Act 2012*
Signature	
Date of direction	16 May 2023

Attachment A – Additional information in relation to the Supplementary Environmental Report (SER)

Department of Infrastructure, Planning and Logistics – Mandorah Marine Facilities

Table 1. Additional information to be provided in accordance with regulation 124

Item #	Context	Additional Information Required
1.	**Extent of the proposed action** There is no succinct summary of the extent of proposed actions to be delivered in Stage 2, including construction of a fishing platform and extension of the access road and car parking established over Stage 1.	1. Provide a table summarising the maximum extent of each proposal element to be delivered in Stage 1 and Stage 2, and the total maximum extent of the whole proposed action. 2. Provide spatial files for proposed Stage 2 works in an appropriate format (such as, kml, kmz, shp)
2.	**Modelling assessments** It is noted that the proponent has developed a suite of 2D models (Delft 3D and LITPACK) for impact assessment that predict changes to coastal processes (i.e., currents, waves, water levels) and associated coastal environment (i.e., sediment load transport and loads, sediments deposition and erosion). Uncertainty about the adequacy of the modelling approach remains, in particular, assumptions used, its parameterisation, calibration and results presented. *Uncertainties in model design* A number of inadequacies have been identified with the models parameterisation and assumptions used. It is not clear whether predictive models incorporate the combined effects of waves and currents (dry and wet season conditions) and climate change; the bathymetry change that may result from dredging and disposal actions; and representative grainsizes of sediments to be dredged or likely to be transported along the shoreline. Longshore sediment transport modelling (LITPACK) and plume modelling (Delft 3D) also present an uncertainty regarding modelling domain and simulation time. It is not clear whether these models have been run for sufficient time and extent, and are able to predict the full extent of environmental impacts (sediments erosion and deposition) in the vicinity of proposed work areas, such as potential damage to sacred sites located to the south (Restricted Work Area 2) and the north (250-300 m) of proposed work areas, and the fate of deposited and eroded sediments on the shoreline. The observed discrepancy between proposed on-ground activities and modelling run times augments this concern, e.g. for backhoe operation requiring excavation	To improve confidence in models outputs and impact predictions, and to assess the significance of potential impacts on the environment, provide additional information on the following aspects: 1. Provide details and sources of the baseline data that have been used in development and calibration of the models. Confirm that the timing of baseline data collection corresponds to the time of year that construction and maintenance works are proposed to occur. 2. Provide key inputs for all models in a table format, with the sources of input values including any data synthesis undertaken (as relevant). To address identified gaps in the models' design, describe and demonstrate how the following have been considered in the development of models and the prediction of impacts: • the model domain that should cover a wider potential impact area. Ensure that a finer grid is applied to the potential impact area and the model domain is the same for all modelling assessments. Display baseline conditions and predicted impacts for the impact area at an appropriate scale and a high resolution. • the combined effects of waves and tidal currents, cyclones, and sea level rise as a result of climate change. Ensure that the hydrodynamic model accounts for both dry and wet season conditions as this is critical for understanding inter-seasonal variations in sediment sources, transport rates and pathways. • the change in the sea floor profile created by dredging and dredge spoil disposal activities, and bedload transport that may affect waves and tide strength and sediment transport volumes. • the simulation time that would reasonably provide the full extent and magnitude of potential impacts (e.g. 50 years for longshore drift; 130 or more days for dredge

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	of about 70,000 m^3 at a rate of about 121.5 m^3/hour over 8 working hours every day, the simulation time modelled should be at least 36 days under a scenario run consecutively for neap-spring tidal cycles. Moreover, the draft Dredging and Spoil Disposal Management Plan suggests that the estimated time to remove rock material may be approximately 2-3 months which is inconsistent with the modelling run times. *Cumulative impact assessment of project* The SER presents independent assessment of natural conditions of suspended sediments, long-shore sediment transport along the eastern coastline of Cox Peninsula and plume modelling from dredging, rock wall construction, piling and dredge spoil disposal activities that appear to be modelled in isolation but not cumulatively considering all risk pathways and sources that may affect sediments suspension and deposition. For example, longshore sediment transport does not consider suspended sediment dispersion caused by maintenance dredging and *vice-versa*. The proponent should consider undertaking an integrated modelling approach to predict the overall proposal effects with greater confidence. Most importantly, maritime infrastructure including various dredging and construction activities spanned to occur over 4-5 months, must be modelled consecutively and cumulatively. *Model performance* In light of the above issues, as specified in the NT EPA Direction to provide addition information in the SER, there is still uncertainty whether the modelling represents post development environmental conditions with sufficient confidence and are fit for predicting environmental impacts. A robust qualitative and quantitative assessment (such as Root-mean-square Error) of modelling predictions is missing from all predictive models. Of all predictive models, only the hydrodynamic model appears to be calibrated. The calibration and performance of this model appear to be primarily assessed based on the visual assessment of observed data and modelled predictions but not statistical evidence (such as Root-mean-square Error) to demonstrate that the model is predicting waves, tides and currents accurately and is fit for use in advanced assessments, i.e. sediment transport and plume modelling. Further, the lack of sensitivity analysis of models adds to the uncertainty around the predictions of currents and waves strength or direction, sediment transport volumes and dredge plume dispersion.	plume dispersion) and define the time to reach equilibrium conditions (e.g., 2 weeks, 1 month, 5 years etc.). Revise the simulation time used in longshore sediment transport and plume dispersion modelling. • curved or non-linear areas along the coastline. For shoreline evolution assessment, consider using a number of shoreline locations and transects across the Mandorah beach, especially in the areas where there is a noticeable change in shoreline orientation. • grainsizes and settling rates of the sediments (both coarse and fine fractions) to be dredged and transported (post-development) across the Mandorah beach. Ensure that additional sediment samples are collected and analysed from the beach area to the north of the Mandorah facility, and model several representative grain sizes (rather than one D50 value) in sediment transport assessments. • the cumulative effects of coinciding marine processes that affect sediment deposition and suspension, e.g. suspended sediment transport from intertidal and dredged area, re-suspension and deposition of seabed and beach sediments etc. Ensure that the combined effects of all dredging and construction operations from where sediment plumes can occur, are also assessed, i.e. run a continuous simulation for the whole dredging campaign in a sequential manner as an additional scenario. If applicable, describe and include additional dredging method (e.g. blasting) that would be used to excavate high strength rock (possibly present) from the dredging footprint. 3. Describe the calibration process including the suitability of baseline data and the sensitivity of the models' input values. Provide the outcomes of qualitative and quantitative assessment (e.g. RMSE) used in the calibration and sensitivity analysis of models. Ensure that the baseline data used for the models' development and the data used for the models' calibration are independent. Justify why the deviation of modelled predictions from observed measurements is acceptable. 4. Describe how the models' design is consistent with the requirements of the WAMSI Dredge Science Node Guideline on dredge plume modelling for environmental impact assessment. 5. Report on the time duration, magnitude and full extent of modelled predictive impacts, e.g. impacts on sacred sites, marine water quality and benthic communities. 6. If necessary, review and update the Draft Dredging and Spoil Disposal Management Plan (DSDMP) and Draft Construction Environmental Management Plan (DCEMP) to reflect

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	Conclusion Overall, large uncertainties exist for sediment transport models. There is a high likelihood that these models are currently under-predicting the volume and composition of sediment deposition and suspended loads. Refer to submission on the SER from AAPA and DEPWS.	any changes arising from points 1-5 above. Ensure that survey and mitigation actions are planned appropriately at the rate of predicted impacts.
3.	**Management Actions: Triggers and thresholds** *Relationship between environmental variables* As specified in the NT EPA Direction, the proponent has developed an algorithm for converting local turbidity (NTU) values to TSS concentrations, and depth averaged TSS concentrations to PAR using the water quality data from 15 sites collected over a 12-hour period (October 2022). Due to its importance in deriving triggers for management actions, an explanation of how these relationships were established is critical. It is also unclear whether collected data used in the assessment is representative of the conditions dominating the proposal area. *Triggers and thresholds* A revised suite of trigger criteria and thresholds also lacks a robust discussion on how these were derived and developed. It is not clear how triggers relate to thresholds, and the time duration and frequency of disturbance. Besides corals, these do not appear to consider impacts on other sensitive receptors (natural and dredge induced), such as mangroves, macroalgae and seagrass. This raises an uncertainty about whether established triggers and thresholds are the most conservative and suitable to be used for management actions. *Zones of impact and influence* The SER lacks an explanation of how the TSS zones of impact and influence were calculated and how they relate to zone thresholds. There appears to be disagreement between zone thresholds and TSS ranges of impact zones, e.g. wet season threshold range (20.61-55.39 mg/L) for moderate impact area is lower than the given TSS range for the respective zone (23.32-80.80 mg/L). This raises a concern about how thresholds would likely be met if predicted TSS concentrations are higher. The current boundaries of the impact area appear to be solely based on the sedimentation thresholds for corals. Like thresholds and triggers, the	Include the following additional information in the SER. 1. Describe the methodology for established relationships between environmental variables and explain its application to management actions (triggers and thresholds). Discuss the suitability of monitoring sites including any data quality control undertaken to remove outliers (see DEPWS comment). Provide a locality map for monitoring sites overlying the predicted plume extent with this assessment, based on updated modelling. Ensure that PAR attenuation is also expressed as a percentage of sea surface light intensity. 2. Provide detailed analysis of data and the methodology for setting triggers and thresholds that should include discussion on: • frequency, duration, TSS/NTU, sediment deposition, light intensity at seafloor and species mortality. • appropriate triggers and thresholds for managing potential impacts • association between triggers and thresholds • time duration linkage between disturbance and triggers/thresholds. The discussion must cover all established triggers and thresholds for specific benthic communities including corals, seagrass, macro algae and filter feeders, confirmed during field survey. Interim triggers and thresholds for these benthic communities can be established with consideration of the WAMSI Dredge Science Node research reports at https://wamsi.org.au/research/programs/dredging/ until sufficient site-specific monitoring data is available. 3. Considering the combined effects of sediment deposition, TSS values and light availability on benthic biota, delineate the boundaries of zones of impact and influence. Describe the potential impact area for the combined various dredging and construction activities (see item 2).

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	delineation of the impact area should consider other environmental variables, i.e., TSS and light availability at the seafloor. *Conclusion* Given the importance of the triggers and thresholds to implementing management responses, it is critical that this section is well documented and reasoned. Refer to submission on the SER from DEPWS.	4. Review and update the DSDMP to reflect any necessary changes arising from points 1-3 above. Ensure that survey and mitigation actions are planned appropriately at the rate of predicted impacts.