Department of
ENVIRONMENT, PARKS
AND WATER SECURITY

Level 1
Goyder Centre
25 Chung Wah Terrace
Palmerston NT 0830

PO Box 496
Palmerston NT 0831

E DevelopmentAssessment.DEWPS@nt.gov.au

T 08 8999 4446

Our ref: DEPWS2023/0043

Ms Holly Durrant
Department of Environment, Parks and Water Security
Floor 1, Arnhemica House, 16 Parap Street, Parap
Darwin NT 0801

Dear Ms Durrant

Re: Supplementary Environment Report - Mandorah Marine Facilities

The Department of Environment, Parks and Water Security (DEPWS) has assessed the information contained in the above application and provides the following comments:

<u>Flora and Fauna Division</u>

The Flora and Fauna Division has reviewed the Supplementary Environment Report (SER). The table in **Attachment 1** provides detailed comment on the adequacy of the additional information provided in the SER.

A number of inadequacies have been identified with respect to the quality of work and where the modelling outputs should be interpreted with caution.

Key issues for the Marine and Coastal processes stem from the inadequacies of the sediment transport model, which is in part a consequence of uncertainties around the hydrodynamic and wave models. These inadequacies are detailed in **Attachment 1**. The most likely consequences of these inadequacies are the volume and composition of sediment deposition and length of impact time relating to light availability both in the water column and as the result of deposition.

Impacts that may result from some of these issues may be dealt with by a thorough management plan, with appropriate monitoring and trigger values. The management plan provided with the SER requires more detail on the metrics to be monitored, sampling intensity and more appropriate placing of monitoring sites.

The Flora and Fauna Division identifies information gaps and inconsistencies in the information provided in the SER, refer to **Attachment 1**. It is recommended that the NT EPA consider this advice when deciding whether to issue an approval with conditions or requesting further information from the proponent.

<u>Environment Division</u>

Environment Division has reviewed the SER and has made the following comments in **Attachment 2**.

Rangelands Division

Land Assessment Branch

The development has the potential to create acid sulfate soils and consideration should be made to manage and mitigate acid sulfate soils during the development. Any proposed works should be undertaken in accordance with the National Acid Sulfate Soils Guidance and further information is available on the website[1]. Jurisdictional guidelines such as the Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines v4.0 (Dear et al. 2014) and the Western Australian Acid Sulfate Soils Guidelines Series (DER 2015) may also be referenced.

Essential to an investigation is the requirement for Chromium Reducible Sulfur (CRS) soil testing at an appropriate site density and to a soil depth immediately below the proposed disturbance. If acid sulfate soils are detected through CRS testing, and exposure of these soils is unavoidable then an acid sulfate soil management plan is required. Depending on the scale of the project, the acid sulfate soil management plan should include the following:

- exact location of the proposed disturbance;
- depth and volume of soil to be disturbed (m 3);
- clearly presented CRS results;
- acid base accounting results which clearly indicate an accurate liming rate;
- appropriately designed treatment pads; lime/soil mixing regimes; and
- an appropriate monitoring program

Environmental Approval Note

The development has the potential to create acid sulfate soils and consideration should be made to manage and mitigate acid sulfate soils during the development. Any proposed works should be undertaken in accordance with the National Acid Sulfate Soils Guidance and further information is available at https://www.waterquality.gov.au/issues/acid-sulfate-soils. Jurisdictional guidelines such as the Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines v4.0 (Dear et al. 2014) and the Western Australian Acid Sulfate Soils Guidelines Series (DER 2015) may also be referenced.

Weed Management Branch

The weed management precautions as listed section 14.2.7, rehabilitation section 15, and appendices of the Draft Construction Environmental Management are suffice for this project.

Should you have any further queries regarding these comments, please contact the Development Coordination Branch by email DevelopmentAssessment.DEPWS@nt.gov.au or phone (08) 8999 4446.

Yours sincerely

Maria Wauchope

Executive Director, Rangelands

19 April 2023

[1] https://www.waterquality.gov.au/issues/acid-sulfate-soils

Attachment 1 - Department of Infrastructure, Planning and Logistics – Mandorah Marine Facilities

This submission is made under regulation 53 of the Environment Protection Regulations 2020

Government authority: Department of Environment, Parks and Water Security–Flora and Fauna Division

Section of SER	Theme or issue	DEPWS response
Land		
	Terrestrial Environmental Quality: ***Land and Soils***	
SER Section 7.1 and SER CEMP Appendix C Table 14-2, Table 14-3	Issue: Temporary stockpiling of Dredge spoil (coarse material): The Referral has not assessed the potential impacts from soil salinisation, and how this may influence the rehabilitation of this area. Request for further information DEPWS Further information is needed on how the proponent will manage and mitigate run off of saline water into the terrestrial ecosystem, especially if dredging occurs in the Wet season *and* run-off mitigation actions are implemented.	The SER, SER Draft CEMP have not discussed the potential impact of run-off and saline water intrusion into soils. Potentially, because run-off from dredge spoil storage area is not considered as a risk to the terrestrial environment (Draft CEMP Table 14-2). The Flora and Fauna Division considers that run-off (*and* saline water intrusion into soil) a potential risk to neighbouring parcels and may affect the rehabilitation of the dredge spoil storage area (30,000m^3). The CEMP does address run-off once entered into marine environment through water quality monitoring. However, the latter is designed to assess impacts from Mandorah harbour development activities (dredging, piling etc), and not terrestrial run-off *per se*. The Flora and Fauna Division recommends that additional information is sought by NT EPA and that mitigation actions are incorporated into CEMP; Soil salinity monitoring should include neighbouring parcels, in order to assess potential run-off issues. Monitoring should at least include monitoring during/after storm events where run-off is most likely to occur. Further, the Draft CEMP notes that *Photographs of access, laydown and stockpile areas should be taken at the commencement and completion of works to demonstrate no additional degradation of vegetation or appropriate reinstatement*. The Flora and Fauna Division suggests this could be undertaken as part of the weekly audit by the by site supervisor/HSE officer.

	Terrestrial Ecosystem: ***Species of threatened and significant terrestrial fauna***	
SER Section 7.1, 7.2 SER CEMP Appendix C	Issue — Temporary work area not assess for biodiversity values	Appendix E of the SER includes an assessment of the terrestrial biodiversity values for onshore facilities. The assessment identified that the vegetation communities include open woodland, mixed sparse shrubland understory and *Cenchrus* spp mixed low tussock grassland. These vegetation communities are common in the Greater Darwin region and are not considered significant and/or sensitive vegetation. The vegetation may support threatened species on occasions. The area being impacted is localised and unlikely to support important populations of these species.
SER Section 7.3 and SER CEMP	Request for further information Lighting design for above water infrastructure complies with the National Light Pollution Guidelines	The SER has adequately addressed in SER Section 7.3, with the proponent committing to follow National Lighting Guidelines.
Sea		
	Coastal Processes	
SER Sections 8.1, 8.1.1, 8.1.2, 8.1.3, 8.1.6 Appendices K and L Appendix D: CPMMP G: Bathymetry report	The NT EPA requested the following information: • Evaluate the combined effect of the current and wave regime by modelling maximum bed shear strength and orbital velocity and their combined effects on sediment movement, deposition and re-suspension. • provide a comparison of pre-development and post-development scenarios, and the net change at the appropriate spatial scale and detail for: Current strength and direction for spring tide incoming and outgoing tides, and wave regime for wet and dry season conditions. Bed shear stress,	Proponent addressed Coastal Processes comments in SER Sections 8.1, 8.1.1, 8.1.3, 8.2, Appendices B - DDSDMP, D – CPMMP, K - Metocean Report and L - Sediment Transport Report. SER Section 8.1.1 provides an overview of additional information and investigations undertaken after the Referral was submitted. The Appendices D, K, L provide details supporting Section 8 of the SER **Hydrodynamic Model: Currents and waves** *Hydrodynamic Modelling suite* SER Appendix k Metocean report Section 6.1.1 states that Delft3D was used as the hydrodynamic modelling suite. However, the hydrodynamic model was operated in 2D depth-average model; this does not follow WAMSI recommendations (Dot Point 8 of the NT EPA's Additional Information requirements). Whilst 2D mode may be acceptable for modelling current strength and direction, it is not best practice for modelling total suspended sediments (TSS), plume behaviour and sediment transport. Depth averaging 2D plane modelling produces unreliable estimates for plume behaviour and sediment transport. Given that one of the largest potential impacts of the proposed development will be changes to sediment transport characteristics within western part of Darwin Harbour, 3D hydrodynamic modelling would have created more certainty around modelling outputs and therefore should have been undertaken.

	orbital velocity and combined effect for wet and dry season conditions. • Review the methodology used to determine the sediment budget, and revise inputs so that sediment movement is modelled with a high degree of confidence • Apply research and resources developed by WAMSI DEPWS also recommended the inclusion of: • sediment transport intertidal and subtidal environments • fate of predicted eroded sediments along southern beaches • uncertainty around sediment transport volumes • calibration and validation of sediment transport model • cumulative effect of coinciding activities that affect TSS • hydrodynamic model statistical validation (RSME etc) • Wave model only calibrated with Wet season data • combined effect of wave and currents on sediment transport	Consequently, the results presented in the SER and associated Appendices will need to be considered with caution. *Hydrodynamic Model - Calibration / Validation* <u>Calibration/Validation data:</u> Section 6.1.3 of the Metocean report (Appendix K) discusses the hydrodynamic model calibration and validation, and undertook a model skill assessment. The model is calibrated using Mandorah ADCP data for 1/9/17-7/10/17; 12/12/19-22/4/20; 24/12/12-20/3/13 Sept – April (no Nov) over multiple years. These dates suggests that no Dry season data was used to calibrate the hydrodynamic model. Wind data from the BOM airport monitoring site was used for modelling wave characteristics. Although this data is often used for modelling wind and wave characteristics in Darwin Harbour, there is another long-term monitoring data set collected at the Darwin National Reference Station (DNRS) located in the mouth of Darwin Harbour that may be more appropriate and relevant. Based on wind data from 2010 – 2019 the wind rose for the DNRS site is predominantly from the east (Streten et. al. 2021[2]), whereas the SER identified varying wind directions from the west, north and east. The discrepancy between the two data sets raises some concern around what the implications are for wave modelling, and all facets of sediment transport characteristics. <u>Model Performance</u>: The performance of the hydrodynamic model was visually assessed by graphically comparing modelled results with collected time series data (solely Wet season data). Section 6.1.3 of Appendix K concludes that the hydrodynamic model achieves good agreement with the measurements at all of the measurement location. However, Figure 8.2 of the SER seems to indicate that the predicted tidal height has shifted by about -0.5 m across the tidal cycle when compared to field data. This is a large amount in comparison to other projects undertaken in Darwin (e.g., INPEX, Ship lift, Sun Cable), which have an error of an order less. Further, current strength seems to be underestimated as well. There is concern around the ability for the hydrodynamic model to predict current strength and direction accurately. In particular, when using 2D depth plane the hydrodynamic model creates even more uncertainty around modelling outputs. Understanding current strength and direction characteristics and having confidence that the model is predicting these parameters accurately is critical for plume modelling and sediment transport modelling. The SER and Appendix K would have benefited from providing robust statistical evidence that hydrodynamic model is predicting current direction and strength accurately. *Hydrodynamic Model – bathymetric data* Section 8.1.6 of the SER and Appendix G states that the bathymetry/DEM was updated for the project area and ZOI. Lidar, MBES data (depth and backscatter) and Side Scan Sonar was collected. Nor the SER or Appendix G provide an explanation what the maps represent (e.g., SER Appendix G part B), how the

[2] Streten, C. (editor), 2021. Revised predictive benthic habitat map for Darwin Harbour. Report prepared for Department of Environment, Parks and Water Security. Australian Institute of Marine Science, Darwin, 127 pp. including appendices.

		data was analysed and integrated into existing bathymetric data sets. Section 8.1.6 would have also benefitted by including a methods and results section. Appendix L of the SER (Section 5.5) mentions that the acquired bathymetric data set was compared with existing data. No results were provided with the SER (see further sediment transport comment). Appendix K of the SER (Metocean report - Section 7) mentions that *Where applicable, the model was updated with more recent bathymetric survey, and refined as required*. It is unclear if this implies that that the existing bathymetric data was not up to date with all of the collected bathymetry for the project? This then raises the question of how the modelling has dealt with potential changes to bathymetry due to shifting bed loads, e.g., sand dunes and sand sheets. *Hydrodynamic Model – predicted current strength and direction, Current vector maps* Appendix K of the SER (Metocean report Section 6.3 Figure 6-18): To assist the assessment, the current vector maps could have been displayed for the full ZOI and relevant scales for the dredge spoil disposal area and Mandorah harbour. The overview has been lost with solely Mandorah plots Figure 6-14 seems to indicate that the hydrodynamics about 200 m north of Mandorah are complex, with 'interesting' high current areas and mixed current directions. This seems to indicate that the model is having trouble accurately predicting currents in this area. The SER and Appendix K have not mentioned additional ADCP data that was collected (either at a single site or, preferably, transects) to understand what is happening in this area. Given that this area is where sediment will accumulate (see below sediment transport comments) it is expected that the model would have been fined tuned for this area. Not understanding the currents in this area provides another layer of uncertainly around the predicted sediment transport estimates. Further, the SER provides no insight of current behaviour further north and towards Charles Point, around the disposal site, and around Woods Inlet. No figures have been presented, nor has it been discussed in either Appendices K or L. Appendix K of the SER (Section 6.3. Figures 6-14 to 6.19) show hydrodynamic model derived current vector plots pre, post development and the change in current strength between pre and post development. The plots show that there are no areas where current strength has increased (i.e., no positive / red grid cells) This seems unusual. The same amount of water has to go somewhere within a reduced amount of space due to the creation of the harbour. This can only happen by increasing the current speed. However, there is no evidence of this in the plots. Nevertheless, a review of Figures 6-14 to 6-16 seems to suggest that this is actually happening. Figure 6-15 shows higher currents near the rock walls in comparison to Figure 6-14. So therefore Figure 6-16 should show positive values (i.e., higher currents after the development). However, this not the case, it is unclear what is causing the discrepancy.

		Hydrodynamic + Wave Models – 'hydrodynamic energy' The SER and Appendix K have identified the individual current and wave characteristics for waters around proposed Mandorah harbour. In terms of evaluating the changes of hydrodynamic characteristics the analysis and discussion has focussed on how well the harbour performs in creating a safe harbour for boating. However, the hydrodynamic changes can potentially also change benthic community structure due to the changes to the combined current and wave energy characteristics. This additional information was requested as part of the response to Referral. The SER has not addressed this request for additional information. The Flora and Fauna Division believes that this information together with an adequate benthic habitat map, sediment deposition / erosion characteristics and light availability at the seafloor are one of the most important data layers needed to assess the impact from the development to benthos and therefore, should be provided. **Sediment transport model** The Flora and Fauna Division has considerable concerns around the modelling approach, assumptions used, parameterisation of the model(s) and the conclusions the SER and Appendices presents. The Flora and Fauna Division acknowledges that the SER has identified that sediment transport volume estimates have a wide range and that therefore additional monitoring is required once the harbour has been built. The proponent proposes to address this through a CPMMP, however, given the large number of uncertainties around sediment transport results outlined in Appendix L, the Flora and Fauna Division considers the proposed CPMMP is inadequate. In the SER's own concluding remarks (Section 10) it highlights the inadequacies of the modelling and lack of existing data and that *"targeted, long-term validation datasets (e.g., repeated intra-annual and inter-annual surveying, broad scale characterisation of available sediment volumes and characteristics)"* is required. The proponent should have at least incorporated these facets into the CPMMP. In addition to this, the Division's comments and suggestions provided below and summarised above, should be incorporated into the CPMMP. The SER and Appendix L should be transparent and clearly state which component it is referring to when discussion conclusions around sediment transport mechanisms and results, as currently it reads as if it assessing the cumulative effect of modelling sediment transport. This is clearly not the case. *Modelling approach* WAMSI and Great Barrier Reef Marine Park guidelines recommend that sediment transport modelling uses a 3D assessment tool. Modelled outputs are severely constrained in accuracy by using a 2D depth average approach (See hydrodynamics section above). The modelling solely considers available sediment within the modelled system, but does not take into account sediment input and output from its modelled boundaries. This can be an important parameter for bedload and longshore sediment transport.

		The overall components of a sediment transport model include the combined effect of suspended sediment transport and associated sedimentation of characteristics, re-suspension and deposition of seabed sediments, sediment bed load transport and longshore sediment drift. The SER and Appendix L have undertaken characterisation of natural conditions of suspended sediment, plume modelling from dredging, piling, rock wall creation and dredge spoil disposal activities and long-shore sediment transport along the eastern coastline of Cox Peninsula. Each component was assessed independently but not cumulatively. Further, the proponent has not provided a bed load sediment transport nor has it assessed the fate of deposited TSS sediments from dredge spoil disposal and harbour creation activities (see below). As such, the modelling approach is incomplete. *Modelling parameterisation, calibration and validation* The models used to understand sediment transport pathways and estimate net sediment transport values do not appear to have been calibrated or validated. Further advice on the use of models is provided below. <u>Natural sediment transport characteristics.</u> Appendix L of the SER (Section 5.3) mentions: *The sand fraction has been specified as 70% of the overall sediment composition and the clay fraction has been selected as 30% of the composition. Coarser grained sediments recovered from the geotechnical field investigations have been excluded from the morphological modelling simulations, given their low mobility*. This suggests that 70% of the available sediments have been excluded from the sediment transport model. Even though the mobility of coarser sediments is low in comparison with fine sediments, they do move due to strong tidal currents at the seafloor and can change the benthic environment considerably. It is one of the defining geomorphic characteristics for Darwin Harbour and presents itself by extensive intertidal and subtidal sand waves, dunes and banks. It is also the reason why maintenance dredging regularly occurs for shipping channels in Darwin Harbour. These shifting sediments vary seasonally and annually in spatial extent and height, with the greater variation between seasons. Appendix L of the SER (Section 5.4) suggests: *that sediment transport pathways at the site are generally consistent throughout the year, indicating strong dependency between morphological response and tidal currents*. This may be true, but is only applicable to the TSS fraction of the sediment transport component. The SER's own modelling seems to suggest that sands are moved into Darwin Harbour and thus against the dominant tidal force. By not assessing the bed load component within the sediment transport model and ignoring 70% of the overall sediment composition limits the assessment of sediment transport characteristics within the intertidal and subtidal areas, in particular those areas that are important to benthic primary producers. The models need to be revised to include these sediment components. Further, the TSS was assessed for nearshore environments, which the SER defined as subtidal areas (Appendix L - Section 5). It is unclear if TSS was considered / assessed for intertidal areas. This needs to be considered as current velocity and wave orbital velocity selectively shift coarser sediments (i.e., sands) to the beach line and finer sediment

		into the water column which is transported through currents elsewhere. It is the reason why waters close to the coastline are more turbid than deeper waters under certain circumstances. In light of this, the conclusion that the SER makes in Appendix L (Section 5.3) that [t]*he assumptions of sediment composition and availability are considered to be conservative, such that the modelling demonstrated sediment movement may be exaggerated* are not supported and are more than likely underestimated rather than overestimated. Further comments that may require further clarification are provided below: • Appendix L and the SER (Section 5.4) mentions: *Notable areas of high sediment mobility include the water column adjacent to the nearshore reef immediately north of harbour.* This may be true, however, no evidence (e.g., model outputs, maps) was provided to support this observation. • Appendix L and the SER (Section 5.4) concludes: *Conversely, the potential sediment transport pathways show low sediment mobility in the nearshore area, surrounding the proposed harbour.* It is unclear how this can be concluded. Intertidal areas were not modelled (see above) nor was the sand fraction modelled. • Appendix L and the SER (Section 5.5) mentions: *An initial investigation was carried out to validate the morphological modelling results, based on available bathymetric datasets within the modelling domain. The bathymetric datasets used for comparison were dated approximately three-years apart, at similar times in the annual cycle (September 2017 and October 2022). A comparison of the surveys shows that the nearshore seabed is relatively stable, with very localised elevation changes rarely exceeding ±0.2 m.* This infers that *net* natural sediment mobility is low and does not affect bathymetry greatly. The conclusion that elevations rarely exceeding ±0.2 m can only be made as a comparison between years. However, the SER and Appendix L have not provided evidence of this bathymetric comparison between years (see above hydrodynamic section comment). Further, there is no evidence that this holds between seasons and anecdotal evidence suggest the opposite is true and thus the conclusion that sediment mobility is low cannot be made. <u>Shore line evolution assessment (i.e., longshore sediment transport)</u>. Appendix L of the SER (Section 7) deals with long-shore sediment transport. The SER applied LITDRIFT and LITLINE to model longshore sediment transport. It used the average grainsize (D50, 1.221 mm) of sediment samples from the beach south of Mandorah and a single beach profile that runs due east from Mandorah. It also used the dominant wind/wave pattern for a year. The Flora and Fauna Division has some concerns around the parameters used for the model. Firstly, to inform which grainsize should be modelled, sediment samples were taken from the southern beach (Appendix L of the SER - Section 3.1.2, Figure 3-1). Appendix L of the SER (Section 7.4.2) mentions that erosion of the southern beach occurs naturally. In other words, this is a transgressing shoreline. Typically, these sediments are well sorted (see Grainsize Analysis sheets); fine sediments are being removed from the site through wave action and transported away to deeper areas where hydrodynamic energy is less, and coarser grainsizes remain at the beach. In short, the sediment samples are biased towards coarser material. This is an issue, because the greater the grainsize, the more energy is required to move these sediments and thus will only be transported during strong longshore currents and large waves. Therefore, under calmer weather and current conditions less sediment will be transported, so the modelling will underestimate longshore sediment transport. A more appropriate approach would have been to

		sample across the beach domain (including north of Mandorah) and model several representative grainsize classes, rather than a single D50 value. Secondly, the grain size distribution for the sediments in the shallow waters, where waves can resuspend sediments, have smaller D50 (e.g., sites MS3 and MS4 - Appendix -L Section 7.2 Table 3-2). These sediments may not play a role in beach forming, but certainly are an important component of the overall characteristics of net sediment transport. This should have been modelled, because it represents a large proportion of the sediment composition and distribution (see above comments Natural Sediment Transport Characterisation). These sediments are more likely to be influenced by changes in seasonal environmental conditions (waves, currents and wind) and therefore would have provided more detail around seasonal sediment transport characteristics. Finally, the transport of these medium to fine sands and silts are an important aspect when assessing the risk to Benthic Primary Producer Habitats, mangroves and infauna (See Marine Ecosystems). Thirdly, to model the longshore sediment transport along the western coastline of Cox Peninsula the SER applied a Q-alpha curve for single beach profile taken at Mandorah. The SER has identified that the modelling is not optimal in terms of predicting longshore sediment transport. The net longshore sediment transport estimates vary greatly. It is noted that it could not undertake modelling 400 m south of Mandorah where a prominent shoreline feature (groyne) and change in shoreline orientation compartmentalises littoral drift to the north because the use of the Mandorah derived Q-alpha curve is inappropriate. Yet the same Q-alpha curve is used to resolve sediment transport in front of a creek entrance between Mandorah and Wagait Beach which is almost 90 degrees to the Mandorah beachline. These results have not been reported. Understanding the fate of longshore transported sediments is important for assessing the implications of changes in sediment transport to sensitive receptors. The modelling would have benefitted from using multiple Q-alpha curves to determine seasonal and annual longshore sediment transport characteristics. Finally, the longshore drift modelling used a single wave climate: the dominant northerly wet season winds. As such, it has not modelled dry season conditions where the wind direction can come from southwest. Based on the information provided, the modelling only accounts for wet season conditions. *Sediment Transport Modelling Results.* Modelling results have been presented for a number of individual sediment transport pathways; before, after and residual change spatial maps, and changes in coastlines. The Flora and Fauna Division makes the following observations associated with modelling results and conclusion/statements: • The presented maps do not provide results for the full ZOI and therefore it is difficult to place into context; • None of the predicted outputs have been combined into a single layer, and thus there is no oversight of what the total amount of sediment transport is within the modelled components; • The SER (Section 8.1.3 Figure 8-12) shows *no* net change of sediment deposition south of Mandorah. It is unclear if this implies that there is no difference between before and after the creation of Mandorah harbour in sediment transport values. This needs to be clarified as the longshore sediment transport seems to indicate that shore line

		will be lost and therefore one must conclude that shallow intertidal areas in front of the beach must also have changes to its sediment budget. It would be expected that this is reflected on Figure 8-12; • The sediment transport for intertidal areas was not mapped, as the model only included nearshore environments. The SER defined these as subtidal waters; • Maps do not show bed load sediment transport, because this was not modelled; • Longshore sediment transport for large sand particles were only modelled; • The fate of sediments in southern part of the ZOI remains unknown, despite this being required to be provided in the SER. • Appendix L of the SER (Section 7.3.3) mentions that *Longshore Transport rates may be lower than expected because there appears a lot of shallow rock in the area, which would reduce the amount of sediment available for transport*. No evidence has been provided for the spatial distribution of hard substrate and its proportion to available sediment environments. This comment appears to be an assumption that remains to be validated; and • Appendix L of the SER (Section 9.2) discusses the issue of sediment siltation of the newly created Mandorah harbour in context of dredge maintenance. It mentions that "*The passage into and out of the harbour by the ferry, and to a lesser extent, recreational vessels, will stir up freshly deposited sediment, thereby reducing the amount of sediment retained in the harbour*". If the proponent believes this is a significant parameter in determining dredge maintenance schedule, it is recommended that this is modelled as part of the TSS options to demonstrate how the elevated TSS within the water column will affect Benthic Primary Producer Habitats (see Marine Ecosystems). The Flora and Fauna Division considers the sediment transport information provided in the SER and Appendices L and K are focused on the engineering design of the structure and are inadequate to assess the risk to marine flora and fauna. In summary the Flora and Fauna Division recommends that • The hydrodynamic, wave, and sediment-transport model are undertaken by the proponent using Delft3D's 3D capability and that the performance of all models is qualitatively and quantitatively validated; • The Hydrodynamic model is validated with extensive field measurements, including ADCP transects for plume ZOI during neap and spring tidal cycles, ACDP transects in intertidal and subtidal waters fronting the northern beach and reef section with aim to refine hydrodynamic characteristics within this area; • The CPMMP include: o targeted, long-term validation datasets (e.g., repeated intra-annual and inter-annual surveying, broad scale characterisation of available sediment volumes and characteristics); o collecting data to derive parameters for hydrodynamic and sediment transport models based on local conditions (e.g., critical bed shear stresses, settling velocities, sediment densities, sediment and TSS characteristics); and

		○ modelling of all sediment transport pathways (e.g., TSS, bed load, resuspension and sedimentation of TTS, longshore sediment transport) for representative sediment grainsize classes (e.g., muds, fine, medium and coarse sand) and coagulation of TSS and sedimentation rates.
Sea	**Theme or issue**	**DEPWS response**
	Marine Environmental Quality	
SER Sections 8.1.2; 8.2, 8.2.2, SER Appendix B - DDSDMP Appendix C - CEMP Appendix L Metocean	NT EPA: • Revise the site conceptual model to include all potential contamination sources (e.g., from transport, handling and stockpiling of dredged rock, and construction of breakwaters and pile-driving). • Improve the accuracy of the estimates of the amount of sediment deposition that will be derived from dredging induced turbidity (from operating the cutter suction dredge and the backhoe dredge), and ensure this is included in the modelling. • Review and revise the models to improve confidence in the evaluation of the proposal's cumulative impacts to marine environmental quality, including ensuring the sediment transport and	Proponent addressed Marine Environmental Quality comments in Sections 8.1.2; 8.2, 8.2.2, Appendices B-DDSDMP, C - CEMP, K - Metocean Report and L - Sediment Transport Report. SER Section 8.2 provides an overview of additional information and investigations undertaken after the Referral was submitted. The Appendices B, K, L provide details supporting Section 8.2 of the SER. The SER included an assessment of the risk to the marine water quality. The SER concludes that: *Based on the results of the highly conservative modelling process, the Proposal is not expected to compromise the EPA's objective for marine environmental quality, with any effects considered short term and fully reversible.* While the risks to water quality are considered low, the Flora and Fauna Division provides the following comments on the analysis undertaken by the proponent: **Dredge and Disposal Plume Dispersion** *Dredge Spoil Disposal location* Although there is no figure that overlays benthic habitat data with dredge spoil site selection options, comparing SER Appendix I map of benthic sampling sites with SER Section 8.3.1 seems to indicate that Disposal site 1 was not surveyed. Therefore, reasoning that site 3 was preferable because it has less benthos coverage does not hold. The SER would have benefited from being more transparent in how it decided on preferred disposal site. Further, the selected disposal site is placed on the high side of a dune system valley. It may be more appropriate to move the site slightly west so that the sand fraction of the dredge spoil will predominantly deposit in the deepest part of the dune valley. A similar approach was taken for the Conoco Phillips dredge spoil disposal site and bathymetric surveys have shown that the deposited sediments have remained more or less stable, even after 23 years. It is unlikely that the plume characteristics will change much, due to the current characteristics that are predominantly forced to follow this large sand dune to the west of the dredge spoil disposal site. *Model inputs and Assumptions*. Modelling approach: As per hydrodynamic modelling response, 3D approach was required for plume modelling and sedimentation estimates. If the development proposal is approved, then conditions for the approval should include that the CPMMP employs a 3D modelling approach.

<table>
<tr>
<td></td>
<td>
plume models include source terms for all potential sources of contamination.

Provide additional information on triggers to supplement the information provided Section 7.3 Dredge Plume Dispersion
Establish the turbidity/TSS and light intensity relationship, and apply this to develop the appropriate triggers for mitigation and management actions.

Review and update the DSDMP, and the CEMP for the Proposal.
Review and update the CEMP for the Proposal.

Apply the NT EPA’s hierarchies for environmental protection and management (Part 2 of the Environment Protection Act 2019).

DEPWS above, plus

The accuracy of the estimates of the predicted amount of sediment deposition derived from dredging

</td>
<td>
Modelling has not taken into account resuspension of deposited TSS from dredging and dredge spoil disposal.
<u>Timeframes</u>: Appendix L of the SER (Section 2, Tables 8-1 and 8-2) seems to have a discrepancy between working hours and modelling run times. In particular:

SER Section 10, concludes that the project program is anticipated to require 14-30 days to complete. This seems to contradict calculated timing required for backhoe operations which requires to excavate 70,000m3 at 121.5 m3/hour (SER Table 2-1 and Appendix L Tables 8.1 & 8.2) which equates to 72 days.
There is a difference in work hours for cutter suction activities between neap and spring scenarios, 22 and 19 hours respectively.
Backhoe activities require 72 days for completion (see above), however, the model has been run for only 18 or 28 day simulation.

This raises questions whether the modelling results represent the full period of the on ground activities for TSS concentration (Appendix L, Figures 8.2 – 8.5) and deposited sediment thicknesses (Appendix L Figures 8-6 to 8.9). Further clarification should be sought.
Further, Appendix B of the SER (Section 3.7) has identified that there is an area that may contain high strength rock within the dredging footprint. Mitigation options or alternative dredging methods to remove the hard rock have not been identified in the SER nor the DDSDMP. Further information is required in terms of (a) dredging method (e.g., blasting, backhoe) (b) estimates of how long will it may take to remove the hard rock substrate and (c) TSS and plume characteristics from this activity.
<u>Model parameters</u>. Appendix L of the SER (Section 8.2.1.4) highlights a number of parameters used for modelling dredge spoil sediment dispersion. Many of these are default parameters and potentially are not representative for Darwin Harbour marine environments. It is recommended that these parameters are collected as part of the CPMMP.
Further, the SER used the mean sediment grain size (D50) of 0.02 mm to model plume dispersal at the dredge spoil disposal site. This represents only the fine sediments, i.e., muds. To understand plume behaviour and sedimentation rates there is need to model several grainsize classes that represent the sediments being dredged, because of their different sedimentation characteristics. It is unclear from the SER or Appendices what the actual grainsize characteristics are for the dredge material. Appendix B of the SER (Section 3.4) notes that 19 sediment cores were taken, but no specifics for grainsize is provided; Appendix L Section 5.3 mentions that the sediments consist of fines and sands and that D50 is about 0.180 mm (fine sand). No ranges are provided.
The Flora and Fauna Division believes without additional information about the grainsize characteristics for dredge material, that at least the D50 of 0.180 mm should have been also modelled. Not modelling the sand fraction may also explain why there is no sedimentation at the dredge spoil disposal site (see below Modelling Results), which is quite surprising (Appendix L Figures 8-6 – 8-9).
<u>Water Quality data</u>. The SER and Appendix L rely heavily on INPEX 2011 data to characterise water quality parameters. Although there has been little development along the eastern coastal area of Cox Peninsula, natural
</td>
</tr>
</table>

	induced turbidity is questioned, and requires clarification. • Clarification around discrepancy between dredge operation time lines and TTS model run time; cumulative impacts • Light available at the seafloor, TSS and NTU relationships, clarification of how triggers, ZOI zones of impacts have been developed.	environmental conditions may have changed. Therefore, validation of the long-term INPEX data set would provide confidence in that a 12 year data remains appropriate. The Flora and Fauna Division recommends that the relevant WQ data is collected and validation is undertaken or incorporated into the CPMMP. <u>Calibration and validation</u>. No calibration or validation has taken place. Validation should be incorporated into the CPMMP, which could also provide additional calibration time series data to refine the model. The plume dispersal characteristics could be validated through ADCP transects and TSS sampling during a full set of neap and spring tides. *Modelling Results.* <u>Local Area Relationships – TSS, NTU, PAR relationships</u>. The SER (Section 8.2.2 and Appendix J) described a method for developing an algorithm for converting local turbidity (NTU) values to TSS concentrations, and depth averaged TSS concentrations to PAR. The results are presented in SER Table 8-3 and details can be found in Appendix J. However, Appendix J is no more than a series of graphs with NTU – TSS and Depth Turbidity profiles for 30 odd sites, and a map with site locations. There are some concerning aspects to this section that require further clarification, especially because this section is important for deriving triggers for management actions for sensitive receivers. In particular, the following issues were noted: • There is a lack of understanding about how the equations were derived • The locality map has no labels, so graphs cannot be related to sites on the map which hampers the interpretation of the graphs as the location has bearing on the NTU, TSS and PAR data/results. • There is no explanation as to why TSS to NTU relationship (TSS = 1.8167 *NTU) is high compared to the literature (ranges from 0.8 – 1.4), and INPEX's used 1:1 relationship. It is unclear if there was any assessment undertaken to determine if the collected site data are representative of the area. For example, Appendix J, Figure A2 seems to show that two sites could be considered outliers that have undue influenced the TSS to NTU derived relationship and may explain why the 1.8167 is so high. • There is no explanation how the TSS to PAR relation was derived nor does it seem to have played a role in the development of management triggers, which were requested to be provided in the SER. • Besides presenting TSS to PAR relationships, PAR values also need to be expressed as a percentage of surface light intensity, as then to link minimum light requirements (MLR) for sensitive habitats to light conditions at the seafloor (see Marine Ecosystems). <u>Trigger development and Zone of Influence assessment.</u> Section 8.2.5 of the SER describes how trigger values were developed. It follows the WA EPA (2021) and ANZWQG (2018) guidelines, and a publication by Fisher et. al. (2019). Not taking into account that there is need to understand mortality rates (natural and dredge induced rates) of a sensitive receptor to determine zones of low, medium and high impact (See Marine Ecosystems), the assessment seems to have:

		• only taken one variable into account in deriving the triggers: TSS concentrations or a surrogate for it (i.e., NTU). There no mention of the frequency, time duration of elevated TSS, deposition rates and light availability at the seafloor. • not provided an explanation how the Zone of Influence TSS ranges (presented in the legend for example SER Appendix b DDSDMP Figure 4-3) were calculated. • used the 99% exceedance percentile as the *strict* impact threshold, i.e., zone of high impact, whereas Fisher et. al. (2019) uses the 95% percentile. Further, the section presents Table 8-4 as if it is based on Mandorah related data; however, the sites names listed in the table are not mentioned in SER or Appendices and therefore raises concerns where the data came from. It seems like that the table may have been lifted from Fisher et. al. (2019) and used without any clarification. Then the Section proposes water quality triggers in SER Table 8-5. No explanation was provided for how these were derived, except for a few graphs showing moving average of TSS across a 11-month period. Given that setting the triggers are such an important component of implementing management responses, this section is inadequate and requires a full write with analysis of data, transparent methodology for setting the triggers, and should including frequency, time duration, sediment deposition and light variables in its assessment. The development of triggers should take into account, besides corals, also at least assess triggers for mangroves, macroalgae, and seagrass, with a final assessment that determines which triggers are the most conservative and should be applied as triggers for management actions. <u>Predicted TSS concentrations and sediment deposition from Dredging and dredge spoil disposal activities</u>. Figures 8.17 to 8.18 of the SER provide the modelling results of TSS plume dispersal from various dredging activities. However, there is no map showing the combined effect of all activities, including sediment deposition from dredge spoil disposal, except for Appendix B- Figure 4-7 which shows cumulative sediment thicknesses grouped by Zones of H/M/L Influences. In other words there are no total amounts of deposition. This is important for assessing the risk of burial for benthos. In addition, there is no estimate of sediment deposition for 70% of the dredge spoil disposed sediments, because non-fines (sands and large grainsize sediments) were excluded from the modelling. *Monitoring sites* Section 8.2.6 of the SER mentions that monitoring sites were chosen based upon the predicted zones of impact as well as the results of the benthic mapping, specifically considering locations of seagrass, sponge and coral colonies. However, Appendix B of the DDSDMP (Figures 5-1 and 5-2) seem to indicate that all monitoring sites are placed on boundaries between zone of high, medium and low, and in non-impacted areas. No information was provided in relation whether these sites are located in sensitive receptor habitats. To allow for cause-effect analysis and assessing dredging impacts, monitoring sites require to be placed in sensitive habitats, and should be driven by boundaries of impact zones (see also Marine Ecosystems).

Sea	Theme or issue		DEPWS response
	Marine Ecosystems		
SER Sections 8.1.2, 8.2; 8.3, SER Appendix B - DDSDMP Appendix C – CEMP Appendix I - Benthic Ground Truth Data	Issue	Benthic primary producer habitats and filter feeder habitats can be impacted by suspended sediment through three primary cause effect pathways: light reduction, increased suspended sediment concentrations, and sediment deposition (smothering). Benthic communities mapped Appropriate triggers are developed to minimise risk to benthic communities	Proponent responded to the Marine Ecosystems comments in Sections 8.1.2, 8.2; 8.3 and Appendices B (DDSDMP) and C - DDSDMP, *Baseline Habitat information* <u>Spatial distribution</u>. Section 8.3.2 (Figure 8-23) and Appendix B - Section 3.8 (Figure 3-9) provide the final habitat map for part of the zone of influence, with Appendix I showing a map with benthic ground truth sites and a series of images of the seafloor for each of the sites. The map is based on the most recent predictive habitat map (Streten et. al. 2021) and newly collected data for the dredge spoil disposal area (SER Appendix I). The section does not provide detail on • how the habitat map was derived • which data sets it used to create the habitat map, clearly state what is predicted data and what is known data • how well the ground truth sites matched the modelled habitat map and whether further predictive habitat modelling is required because of the potential discrepancy between modelled data and ground truth data • why the Referral habitat maps and the SER habitat map differ from each other • whether Section 8.3.2 (Figure 8-24) represents percentage cover or the probability of coral occurring. The data presented in Streten et. al. (2019) are probability maps, not percentage cover maps and therefore if Figure 8-24 represents estimated percentage cover, then the SER should provide methods how this was derived. In addition to that, the map in Appendix I has no site labels and therefore one cannot link seafloor images with location data. This would have allowed one to eyeball whether ground truth data matches predicted habitat data. <u>Revised triggers</u>. Section 8.3.3 proposes revised impact thresholds for the proposal area in Tables 8-7 to 8-9. Table 8-7 and 8-8 provide thresholds for TSS and SD (sediment deposition). This section could benefit from further clarification for: • how time duration and frequency of disturbance have been incorporated into deriving the thresholds and triggers; • the thresholds and triggers are for each individual benthic primary producer habitat, as setting these are species specific. Followed by a discussion around what the most appropriate thresholds and triggers are for assessing potential project impacts. At the moment is it is unclear whether the thresholds are specifically for corals or for all benthic primary producer habitats;
	Request for further information		
	NT EPA	• Review and revise the modelling of the zones of impact, and the risk assessment for dredge spoil disposal and site selection. • Demonstrate that the site selection process is robust, and the potential impacts to marine ecosystems from the disposal of dredge material are acceptable.	

	• Provide a seagrass health monitoring program which includes assessing environmental conditions such as light availability at the seafloor, sedimentation rates, wave and current energy. • Provide a plan for monitoring dugong movement patterns along the western side of Darwin Harbour. • Review and revise the DSDMP and include provisions for management, monitoring, and reporting of seagrass and dugong. • Provide an assessment of the potential direct, indirect and cumulative (successive, incremental, and combined) impacts from the existing, ongoing and proposed dredging and dredge disposal activity. • Apply the NT EPA's hierarchies for environmental protection and management (Part 2 of the Environment Protection Act 2019).	• The SER provides information about TSS, NTU and PAR relationships. However, the PAR is not used as a trigger, nor has the PAR been used to inform what the TSS / NTU triggers could be and relied on WA EPA values. There is no discussion why the WA EPA values are more appropriate than deriving local triggers; • why the sediment deposition (SD) thresholds do not change for Wet and Dry whilst TSS values do. One would expect that sediment deposition increases with increased TSS; • why burial thresholds for ZoMI and ZoHI are set at <40 mm and >40mm, respectively (Table 8-9), whilst the SD is set at >5.6 mm/ 14 days and >10.5 mm / 14 days (Tables 8-7 & 8-8). How was the 40 mm value derived? • why *area loss* is considered an appropriate threshold? This is dependent on the existing extent of for example coral, seagrass, macroalgae communities. Losing 1 ha of 1 ha existing habitat vs 1ha of 20 ha will have a completely different assessment outcome. As high, medium and low impact zones of influence are defined by mortality of sensitive receptors (WA EPA guidelines), it would make far more sense to include species mortality as the metric for establishing threshold triggers; and • how light thresholds were developed and what do they represent? For example, do they represent sea surface or sea floor light intensities? Or are they percentage of sea surface light intensities or are they minimum light requirements? <u>Risk Assessment</u>. The Proponent has undertaken a risk assessment of the project activities, which is summarised in Appendix B of the SER. There are a number of questions around assessment of some activities and their residual risk. They are mainly caused by (1) the uncertainty due to sediment transport model approaches, parameters used and predicted outcomes (2) unknown condition and tolerances of benthic primary producer habitats (BPPH) and (3) uncertainty around outcomes from mitigations actions. Further, this is confounded by placing the likelihood of risk at an inappropriate level to start with. For example: • elevated TSS concentrations & sedimentation have an initial risk rating of high and residual rating of low. However, for both there are data gaps or uncertainties around the amount of sediment deposition, tolerances of BPPH to elevated sedimentation, and lack of baseline data against impacts can be measured against. This should at least place the residual risk into the medium category; and • Direct removal of benthic community and habitat is assessed as very high risk with the residual risk being high. There are no mitigation actions to reduce the direct impact. So therefore, how can the risk assessment change this, it should remain very high. Further, there are some risk pathways that are not considered. For example, sediment bedload transport, sand deposition from dredge material disposed at the dredge spoil site and wave induced sediment transport in shallow waters (see Coastal Processes and Marine Environmental Quality comments around data gaps and modelling deficiencies). As such the risk assessment remains questionable and requires review.

		<u>Habitat Loss assessment</u>. Habitat loss is assessed solely on the cumulative impact of cutter suction and dredging activities at the project site. It does not does not take into account longshore sediment transport, dredge spoil disposal impacts (fines and sand fractions) and bed load sediment transport. As consequence the calculated percentage loss of benthic community habitat areas are likely to be underestimated (Section 8.3.3 - Tables 8-10 to 8-12). The tables themselves raise a few questions as it is difficult to understand how the values were derived. • Table 8-10 seems to have error for values for *% of habitat class* column, which adds up to 1, and therefore maybe represent a proportion of the total of benthic community habitat area, rather than a percentage. • The losses are based on the 'Proposal Area', however, what is meant by 'proposal area' and how it was defined is unclear. SER seems to be defined as the project footprint, which equates to 3.7 Ha (SER Section 2 Table 2-1). However the benthic community habitat alone is 177 Ha, so therefore the project area for this section must be have different definition. This should be clarified and presented on a map together with the final benthic community habitat extents. • There is also no map with existing benthic habitats together zones of impact (High, Medium or Low) that allows some kind of informal assessment to verify Tables 8-10 and 8-11. Nevertheless, it is clear from the information presented that: • Seagrass habitat will be lost within the direct footprint of the new facility and thus cannot be mitigated. A consideration of offsets should be considered. • Nearby seagrass meadow in the immediate vicinity of the new facility *will* be affected by elevated TSS, sediment deposition, longshore sediment drift and declining benthic PAR conditions. They also may be affected by unknown changes in sediment bedload transport conditions and sediment transported through wave action in shallow waters. • In the wider area - waters between Woods Inlet and Charles Point - seagrass, coral and macroalgae habitats *may* be under pressure due elevated TSS, sediment deposition, declining benthic PAR. They also may be affected by unknown changes in sediment bedload transport conditions and sediment transported through wave action in shallow waters. No monitoring plans have been provided for seagrass, macroalgae and/or coral monitoring other than what is described briefly in the DDSDMP. It is recommended that monitoring programs are established that aims to assess the health, resilience and resistance of seagrass and coral communities with the waters between Woods inlet (inclusive) and Charles Point (see comments below). The time frame for these monitoring programs should cover the period until sediment transport reaches its original state, i.e., when there is normal sediment movement past the Mandorah harbour.

		Marine Fauna. The SER has not provided additional data above what was already presented in the Referral, a desk top analysis of which marine fauna are likely to occur in the project area. Risk assessment considered that risk from vessel strike to marine fauna was medium and residual risk as low (SER Section 5.4). It is unclear how the proponent came to this risk rating because assessment requires prior knowledge on how the area is used by threatened and migratory species. No baseline information is provided to support the rating of medium. Given that there is seagrass habitat present in the footprint and nearby the project area, and dugong are consistently reported from Woods Inlet, one could infer that dugong feed on these seagrass meadows also. Therefore, the risk rating from vessel strike could be high. It is recommended that at very least dugong surveys are undertaken for the eastern side of the Cox Peninsula prior and during the construction phase of the project. The assessment does not consider loss of Dugong feeding habitat as a risk. It is recommended that the meadow extents are mapped prior to the start of project activities and seasonal variably of extent, cover and health is assessed.
	Monitoring: DDSDMP, CEMP, and CPMMP	*DDSDMP – specific comments* Proposed Water quality triggers. The critical aspect of assessing whether a trigger is reached is the selection of the reference sites. Has the proponent undertaken an assessment of WQ data for the selected reference sites and ensured that the reference sites reflect natural conditions at Mandorah? Further, the DDSDMP provides no rules around if only one of the reference sites trigger a management response, but other two do not. Appendix -B (Section 5.2.4) has a monitoring response for down-time of dredging activities that relies on the length of time for slack water. However, the DDSDMP does not define what slack water means. This needs clarification. Water Quality Monitoring sites. Appendix B (Section 5.2.3) identifies a number of WQ monitoring sites. It seems that the monitoring sites target zone of influence boundaries, which is fine for assessing whether TSS modelling and zone of influence zones are appropriate. However, to understand whether dredging activities impact on benthic community habitats, there is also a need to include monitoring sites in these habitats. If this is integrated with BPPH condition, resilience and resistance monitoring then cause and effect relationships can be established and the impact of project activities on benthic communities can be assessed. Benthic Community Monitoring. Section 8.3.4 states: • benthic community *monitoring will include the provision of assessing the health of important BCH habitats, including seagrass, corals and sponges. The BCH monitoring program will be implemented to assess environmental conditions specific to BCH and seagrass, including: •Light availability at the seafloor; •Sedimentation rates; and •Wave and current energy.*

		If there was an understanding of how physical environmental parameters influence benthic community health then these parameters may be appropriate. However, this link remains elusive for all benthic habitats in Darwin Harbour and therefore the benthic habitat monitoring program needs to include metrics for seagrass, coral and macroalgae health (condition, resilience and resistance) together with WQ and other physical environmental parameters. Further, the DDSDMP lacks detail about the methodology for benthic community monitoring. For example, where will the monitoring take place, what is the survey intensity, what metrics will be monitored, etc. The Flora and Fauna Division recommends that the overall monitoring program for the project should take a holistic approach and is established as a single integrated program, rather than three minor monitoring programs. The monitoring programs should also well-defined aims. • Management responses require an understanding of baseline conditions. Otherwise, how will it assess the impact once a trigger is exceeded? The DDSDMP proposes a month of monitoring before work commences. Given the large seasonality variability in extent and cover of seagrass (and macroalgae) it is recommended that monitoring of (1) seagrass (extent, cover and health indices), (2) coral health and cover and (3) macroalgae cover and health indices commences as soon as logistically possible once approval is given, no matter when the intention is to start work. This would ensure that the baseline information is as robust as possible. It should at least include the periods in which these habitats are in peak condition. • Section 8.2.3 states that *the impacts from proposed activities are not of the magnitude or duration that will directly impact the filter feeding mechanisms of benthic invertebrates, or exceed the loadings detrimental to vertebrate fauna.* There is no information provided that supports this statement and thus is an assumption. The SER / DDSDMP should address this risk with evidence. <u>Marine Fauna Monitoring</u>. Appendix -B (Section 5.4.2) provides methodologies for monitoring marine fauna. Further comment on the monitoring measures are provided below: • The required observation distance of 500 m for a single observer seems large to reliably establish if marine fauna is present. The INPEX Dolphin monitoring program used four observers per transect, for example. Possibly, the proponent could consider that once the initial morning assessment has been undertaken that land based visual observers are placed to the south and north of Mandorah and can function as early warnings for the dredge-based observer; • Species included for visual monitoring include sharks and sawfishes. Further clarification should be sought on how this would be implemented; • The Flora and Fauna Division recommends that marine fauna sightings are also reported daily on the Marine Wild Watch site with photos of the marine fauna present; and

		Given the large number of uncertainties around sediment transport, water quality parameters, baseline information, the Flora and Fauna Division recommends that once the above uncertainties are addressed then Management Plans should be revised and resubmitted for assessment/approval.

Attachment 2 - Submission on the supplementary environmental report (SER)

Department of Infrastructure, Planning and Logistics – Mandorah Marine Facilities

This submission is made under regulation 123 of the Environment Protection Regulations 2020

Government authority: Environmental Operations Branch to be incorporated into the submission from Department of Environment, Parks and Water Security – Environment Division

Summary:

The action may require approvals and licences under other NT legislation administered by the Environment Division such as the *Water Act 1992* and the *Waste Management and Pollution and Control Act 1998*. All persons are required to comply at all times with the General Environmental Duty under section 12 of the *Waste Management and Pollution Control Act 1998*. Generic advice is provided in the comments below. This advice does not include all applicable requirements. It is the proponent's responsibility to ensure their activities comply with NT laws.

Section of SER	Theme or issue	Comment
Appendix C – Draft Construction Environmental Management Plan		If the NT EPA determines that the SER provides sufficient information for the NT EPA to recommend to the Minister that the proposed action can be approved, it is recommended that the draft conditions of environmental approval specify the minimum environmental performance standards that would also achieve the objects of the *Water Act 1992* and the *Waste Management and Pollution Control Act 1998* especially if no secondary approvals are required under these Acts. The proponent should update project design and the draft CEMP to include consideration to the following advice applicable to the *Water Act 1992* and *Waste Management and Pollution Control Act 1998*. 1. **Waste**. If the proponent would be collecting, transporting, storing, recycling or treating listed wastes on a commercial or fee for service basis as part of the development or operations of the action, then an Environment Protection Approval or Licence may be required to authorise the activity under the *Waste Management and Pollution Control Act 1998*. 2. **Dust**. The proposed activities have the potential to generate dust, particularly during the dry season. The proponent must ensure that nuisance dust and/or nuisance airborne particles are not discharged or emitted beyond the boundaries of the premises. 3. **Noise**. The proponent is to ensure that the noise levels from the proposed action comply with the latest version of the Northern Territory Environment Protection Authority Northern Territory Noise Management Framework Guideline available at https://ntepa.nt.gov.au/__data/assets/pdf_file/0004/566356/noise_management_framework_guideline.pdf 4. **Water**. If this action requires the **discharge of waste to water** or could cause water to be polluted then it is likely that a secondary authorisation is required, such as a waste discharge licence under the *Water Act* 1992. Without authorisation, the proponent must

Section of SER	Theme or issue	Comment
		ensure that there is no discharge of contaminated water from the premises into the groundwater or any surface **waters**. Guidance on waste discharge licences is available at Guidelines on waste discharge licencing under the Northern Territory Water Act 1992. 5. **Erosion and Sediment Control (ESC).** The proponent must ensure that pollution and/or environment harm do not result from soil erosion. ESC measures should be employed prior to and throughout the construction stage of the development. Larger projects should plan, install and maintain ESC measures in accordance with the current International Erosion and Sediment Control Association (IECA) Australia guidelines and specifications. Where sediment basins are required by the development, the NT EPA recommends the use of at least Type B basins, unless prevented by site specific topography or other physical constraints. Basic advice for small development projects is provided by the NT EPA document: Guidelines to Prevent Pollution from Building Sites and Keeping Our Stormwater Clean, available at https://ntepa.nt.gov.au/__data/assets/pdf_file/0010/284680/guideline_prevent_pollution_building_sites.pdf and https://ntepa.nt.gov.au/__data/assets/pdf_file/0006/284676/guideline_keeping_stormwater_clean_builders_guide.pdf 6. **Storage**. If an Environment Protection Approval or Environment Protection Licence is not required, the proponent should store liquids only in secure bunded areas in accordance with VIC EPA Publication 1698: Liquid storage and handling guidelines, June 2018, as amended. Where these guidelines are not relevant, the storage should be at least 110% of the total capacity of the largest vessel in the area. Where an Environment Protection Approval or Environment Protection Licence is required, the proponent must only accept, handle or store at the premises listed waste, including asbestos, as defined by the *Waste Management and Pollution Control Act 1998* in accordance with that authorisation. 7. **Site Contamination**. Historical activities (including impacts from Cyclone Tracy) may have resulted in contamination at the premises. An assessment in accordance with the National Environment Protection (Assessment for Site Contamination) Measure (ASC NEPM) is required to determine whether the land is suitable for the intended land use. The proponent is encouraged to refer to the information provided on the NT EPA website https://ntepa.nt.gov.au/your-environment/contaminated-land. 8. **Waste Management - Import and Export of Fill**: The proposed activities have the potential to generate fill and/or involve the importation of fill for use on-site. Untested fill material may already be present on the site. All untested fill and all fill imported or generated and exported as part of the development, must either be certified virgin excavated natural material (VENM) or be sampled and tested in line with the most relevant guideline listed below and be shown to meet at least one of the applicable standards below: NSW EPA Sampling design part 1 - application - Contaminated Land Guideline - https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/contaminated-land/22p3915-sampling-design-guidelines-part1.pdf?la=en&hash=C12162FBB9438F9BF59782EE4E4A953AE569913D

Section of SER	Theme or issue	Comment
		NSW EPA Sampling design part 2 - Interpretation - Contaminated Land Guideline - https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/contaminated-land/22p3916-sampling-design-guidelines-part2.pdf?la=en&hash=56F1C2DB8A6DAC3303C676F679719A661DAA97D2 New South Wales EPA *Excavated Natural Material (ENM) Order 2014* (the excavated natural material order 2014 (nsw.gov.au); *or* New South Wales EPA *Recovered Aggregate Order 2014 (The recovered aggregate order 2014 (nsw.gov.au)*; or The definition of **Waste fill** detailed in the South Australian EPA *Current criteria for the classification of waste—including Industrial and Commercial Waste (Listed) and Waste Soil*, 2009 (Solid waste disposal (epa.sa.gov.au)) All imported fill material must be accompanied by details of its nature, origin, volume, testing and transportation details. All records must be retained and made available to authorised officers, upon request. The proponent should also consider the following NT EPA fact sheets, available at: https://ntepa.nt.gov.au/publications-and-advice/environmental-management : (a) *How to avoid the dangers of accepting illegal fill onto your land*, and (b) *Illegal Dumping - What You Need To Know* 9. The proposed activities have the potential to generate fill (waste material) and/or involve the importation of fill for use on-site. Prior to the removal of fill (waste material) from the site, or the importation of fill onto the site, waste classification assessment is to be undertaken in accordance with NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste, 2014*, and associated waste classification guidelines, available at http://www.epa.nsw.gov.au/your-environment/waste/classifying-waste/waste-classification-guidelines. All imported material must be accompanied by details of its nature, origin, volume, and transportation details. All records must be retained and made available to authorised officers, upon request, to confirm compliance with the General Environmental Duty detailed in the Waste Management and Pollution Control Act 1998. The proponent should also consider the following NT EPA fact sheets, available at: https://ntepa.nt.gov.au/publications-and-advice/environmental-management: (a) *How to avoid the dangers of accepting illegal fill onto your land*, and (b) *Illegal Dumping – What You Need To Know*. The CEMP should be developed as a dynamic document to facilitate compliance with conditions of the environmental approval as well as NT laws, allowing for continuous improvement in environmental management and performance as well as capacity to effectively manage unforeseen events and aspects of the proposed action that could impact the environment. The CEMP must be reviewed and be endorsed by a suitably qualified third party within sufficient time prior to commencement of the action. The endorsed CEMP must be submitted to the Minister with the third party's written report. The timeframe for submission of the endorsed CEMP to the Minister should allow for any changes the Minister may request prior to commencement of the action. The conditions of the environmental approval should be sufficiently specific so that the Minister does not need to also approve a CEMP.
SER, Section 8.2.2 Appendix B Updated Draft		General comment. Application of dredging-related water quality thresholds derived for Western Australian conditions should not be applied in Darwin Harbour, however, the Western Australian Marine Science Institution – Dredging Node methods used for deriving that data are possibly applicable for deriving water quality thresholds in Darwin Harbour. It is not known what the species specific tolerance

Section of SER	Theme or issue	Comment
Dredging and Spoil Disposal Management Plan		thresholds would be for dredging-related stressors and pressures within the different biogeographical and hydrodynamic regions of Darwin Harbour, particularly within the zones of impact for this proposed action. General rule of thumb, when tolerance thresholds are unknown, is to manage the impacts to within the normal (naturally occurring) ranges of increased sedimentation and water column turbidity in terms of maximum peak concentrations, duration of increased concentrations and frequency (periodicity) that the increased concentrations would occur. Prior to commencing any tidal works, including dredging, the proponent should be required to submit to the regulator a dredging and spoil disposal management plan (DSDMP) that has been reviewed, updated by the proponent and endorsed by a suitably qualified marine scientist with demonstrated expertise in assessing the Darwin Harbour ecosystem, water quality and hydrodynamics, sediment transport modelling, including knowledge about existing seafloor sediment transport characteristics. This includes endorsing the (a) water quality triggers that will be used as operational controls during dredging and dredged spoil disposal (b) the trigger action response plans for preventing adverse impact to sensitive receptors that include rapid monitoring indicators as well as longer-term measures of ecological response to dredging-related stressors and pressures during and for at least one year after completion of the breakwaters and dredging and spoil disposal; (c) implementation of all reasonable and practicable measures to minimise dispersion of fine material in the water column outside the construction footprint and from the dredged spoil disposal site. The endorsed DSDMP and monitoring program should be based on validated: (a) sediment transport modelling using fine sediment source terms applicable to the equipment and methods that will be used for excavation, transport and disposal, including simultaneous operation of BHD and CSD, if applicable; (b) location of monitoring stations that will be able to verify the predicted sediment transport and dispersion patterns; (c) location of monitoring stations that will be able to demonstrate/verify the actual level of impact of dredging-related pressures that occurred to sensitive receptors.
Appendix B Updated Draft Dredging and Spoil Disposal Management Plan, section 3.4	Water quality	General comment: The Darwin Harbour report cards, referenced in this section relate to data collected and compared during Dry season neap tide conditions. Related to these data, see also during the Wet season there are periods of calm days when water clarity can also be very good. It is preferable that baseline data be collected in the location of interest.
Appendix B Updated Draft Dredging and Spoil Disposal Management Plan, section 3.5	Sediment quality	General comment: The National Assessment Guidelines for Dredging 2009 (NAGD) thresholds are considered appropriate for disposal at sea in Commonwealth waters, but might not result in sufficiently accurate data for inshore sediments to be disposed at sea in coastal waters.