

Technical Memorandum

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Subject	Eramurra Salt – Marine fauna advice in response to EPA comments		

1. Purpose

This memorandum contains marine fauna advice in response to EPA comments received May 2024. Information contained herein is outside the scope of the Conservation Significant Marine Fauna Desktop which has been updated where appropriate. Specifically, this document outlines potential remaining knowledge gaps, indirect impacts and mitigation options. This memorandum does not provide advice on survey design, which O2 Marine can provide upon request but will need to be covered under a new agreed scope.

2. Overview

The EPA comments that are addressed within this memorandum (and which section) are presented in

Table 1. Text in italics represents specific requests made by Preston Consulting.

Table 1 EPA comments addressed in this memorandum

Comment Number	ESD Item	EPA Service Unit Advice	Memo Section
40	62 and 71	<p>Comment</p> <p>The draft ERD does not contain sufficient information to inform the size and importance of the conservation significant marine fauna populations at a local and regional scale (ESD item 71). In the absence of this information, the impacts of the proposal on conservation significant marine fauna species cannot be assessed. If conservation significant marine fauna species are likely to occur in the area, and relevant existing data is not available, marine field surveys are required to be undertaken (ESD item 62).</p> <p>Actions</p> <p>Please update the ERD to address the following:</p> <ul style="list-style-type: none"> • Provide further information and targeted surveys on the population size of conservation significant marine fauna species, including the importance of the populations in a local and regional context. • The area's value for threatened marine turtles outside of nesting is currently unknown. No in-water surveys for marine turtles have been undertaken. Opportunistic observations during a sawfish survey (Appendix 4.8) identified in excess of 80 juvenile green turtle, (listed vulnerable) within a 13-minute window in mangrove habitat proximal to the proposed seawater intake location, suggesting the area may be an important foraging ground for the species. • The broadscale aerial surveys to inform Australian humpback dolphin (listed migratory and Priority 4) abundance were undertaken between 2015 and 2017. It is considered that more contemporary information is required to assess the abundance. It is noted that the boat-based surveys for dolphins undertaken in 2019 were not undertaken in the vicinity of the development envelope. • Opportunistic sightings during broadscale aerial surveys for dolphins were used to inform the presence of dugong (listed migratory) in the project area. Surveys for dugong have specific considerations, which may not have been considered or applied; as outlined in the Commonwealth Guidelines (DCCEEW, 2024). 	Error! Reference source not found.
43	68	<p>Comment</p>	Error! Reference

Comment Number	ESD Item	EPA Service Unit Advice	Memo Section
		<p>The potential impacts of dredging on marine fauna have not been appropriately considered. For example, further consideration of indirect impacts of habitat loss, as well as the potential for turbidity to impede on migration have not been appropriately considered.</p> <p>Actions</p> <p>Please update the draft ERD to provide a robust evaluation of the potential for dredging to impact on marine fauna and any required mitigation and management.</p> <p><i>Indirect impacts of turbidity on migration and other potential impacts.</i></p>	source not found.
45	72	<p>Comment</p> <p>The proposal has the potential to significantly impact on a number of key marine fauna species however some impacts and risks, including seawater intake have not been appropriately evaluated. The intake area at the mouth of the McKay Creek is an important habitat for marine fauna.</p> <p>Further, for other pressures, appropriate details on the proposed management measures and how these measures will achieve appropriate environmental outcomes has not been provided.</p> <p>Actions</p> <p>Please update the ERD to address the following:</p> <ul style="list-style-type: none"> ● Provide additional information on proposed intake regime (volumes, variability etc) and the potential impacts on marine fauna including: the duration and frequency of seawater intake, changes to tidal depth and inflows to the creek, entrainment of marine fauna and the generation of underwater noise. The potential for locating the intake pipe in alternative location should be considered. ● Address concerns around the potential for the bitterns discharge to act as a barrier to marine fauna. ● Provide an evaluation of bitterns toxicity to marine fauna species. ● Provide additional information and discussion of key potential impacts on key species from salt farm development and associated coastal modification in the region. 	5

Comment Number	ESD Item	EPA Service Unit Advice	Memo Section
		<ul style="list-style-type: none"> Provide details of the proposed artificial light management and ongoing monitoring regime to ensure significant impacts to nesting and hatching turtles, particularly hawksbills nesting in close proximity to export infrastructure, do not eventuate. <p><i>Include any advice on how bitterns could act as a barrier.</i></p>	

3. Marine fauna knowledge gaps

3.1. Overview

The EPA have provided specific comments regarding further studies for turtles, humpback dolphins and dugongs.

Table 2 summarises the existing uncertainties, and the assumptions that can be made in the ERD to address such uncertainties. For completeness and consistency, O2 Marine are extending this advice to other key species identified in the Conservation Significant Marine Fauna Desktop (CSMFD; O2 Marine 2025a)(Appendix A).

Knowledge gaps were identified following completion of the revised CSMFD, which presents available information on the population, distribution, habitat, life history and existing threats and pressures for relevant marine fauna. These parameters are required to conduct an EIA on conservation significant species, according to the *EPBC Act significant impact guidelines* (DEWHA 2013) (Table 3), Environmental Factor Guideline – Marine Fauna (EPA 2016), and the Statement of environment principles, factors, objectives and aims of EIA (EPA 2023). In the absence of sufficient baseline data, a precautionary approach may need to be applied during environmental assessments (DCCEEW 2024). The resultant knowledge gaps were identified paying attention to the requirements outlines in the newly published National Guidelines for the Survey of Cetaceans, Marine Turtles and the Dugong (DCCEEW 2024).

O2 acknowledges the change in regulatory expectations at the Commonwealth level since baseline studies for the Proposal began, being the publication of the National Guidelines for the Survey of Cetaceans, Marine Turtles and the Dugong (DCCEEW 2024). However, it may be argued that the Pilbara region (and the northwest coast of WA) is generally lacking in robust data on large marine vertebrate fauna and that larger scale surveys are required for species management and conservation. The EPA’s Marine Fauna Factor Guideline specifies that region-wide studies are beyond the capacity of any individual proponent (EPA 2016). To ensure the criteria for the EPBC Act Significant impact guidelines (DEWHA 2013) and the EP principal guidelines (EPA 2018), then, it is recommended that EIA is undertaken with careful and transparent outline of uncertainties and assumptions for species with knowledge gaps. Assumptions are to be conservative in nature, such that the Precautionary Principle (i.e. S4 A EP Act 1986) be upheld. The management measures for the protection of these species must also be clear and committed to as these will form an important rationale behind the assessment of potential risks.

Table 2 presents responses to the EPA comments in relation to further studies for turtles, humpback dolphins and dugongs, and how the EIA may be conducted based on assumptions. Should it be deemed that the assumptions are not enough, additional study options can be discussed with relevant regulators as necessary. Further elaboration is outside of this memorandum’s scope. If requested, O2 are able to discuss further with the client directly, participate in regulatory meetings and detailed information could be provided through the development of an offset strategy.

Table 2 Response to EPA comments regarding the need for further turtle humpback dolphin and dugong studies. This tables lists the studies that informed the CSMFD, and outlines the uncertainties and assumptions to be used when writing the approvals documentation. Assumptions in EIA should uphold the precautionary principle and include best practice management measures.

Species group	Studies cited in CSMFD	Uncertainties	Assumptions
Turtles	<ul style="list-style-type: none"> • O2 Marine (2025b) • Peel et al. (2024) • Wilson et al. (2023) • HBI (2025, 2023) • Pendoley Environmental (2023, 2024) • O2 Marine (2022) • Fossette et al. (2021a) • Fossette et al. (2021b) • Ferreira et al. (2021) • Pendoley (2016) • Whittock et al. (2016) • Imbricata Environmental (2013). 	<p>From EPA comments</p> <ul style="list-style-type: none"> • Population size • Importance of the populations in a local and regional context. • Identification of important juvenile foraging habitat areas. <p>Advice arising from CSMFD</p> <ul style="list-style-type: none"> • It is likely that the Proposal Intake Creek and surrounding environment provides important foraging habitat for juvenile green turtles. 	<p>Precautionary principle</p> <ul style="list-style-type: none"> • Creek mouths and internal systems within the Proposal area are all important juvenile foraging habitat areas for turtles – especially greens. • Three (green, flatback, hawksbill) turtle sp. could be present year-round, during all life stages and in all Proposal elements. <p>Further rationale (as summarised from the CSMFD)</p> <p>Green turtles have previously been recorded in the Proposal and have a high likelihood of occurring within all aspects of the Proposal, including the intake creek, during all life-history phases (i.e. mating, nesting, inter-nesting, foraging, hatchlings, juveniles and adults) with a likely year-round presence. Likely to be present foraging where suitable seagrass habitat is present. Low nesting has been recorded on the islands adjacent to the Proposal and does not represent important nesting locations. It is likely given the high number of juveniles sighted around the intake creek that this area, and the surrounding environment provides important juvenile foraging habitat.</p> <p>Flatback turtles are known to occur in the water around the Proposal and have a high likelihood of occurrence within all aspects of the Proposal, during all life-history phases (i.e. mating, nesting, inter-nesting, foraging, hatchlings, juveniles and adults) with a likely year-round presence. Nesting on islands around the beaches around the Proposal is low and the area does not represent important nesting habitat and is not considered to be regionally important habitat. The area is likely to be occupied by a component of the overarching population (Pilbara stock). Flatback turtles are known to be highly mobile (Peel et al. 2024) and are not restricted to the Proposal area.</p> <p>Hawksbill turtles are known to occur in the water around the Proposal and have a high likelihood of occurrence within all aspects of the Proposal, during all life-</p>

Species group	Studies cited in CSMFD	Uncertainties	Assumptions
			<p>history phases (i.e. mating, nesting, inter-nesting, foraging, hatchlings, juveniles and adults) with a likely year-round presence. Hawksbill turtles are known to nest on both mainland and island beaches around the Proposal, and were the most abundant species identified in Proposal specific surveys. , it is likely the area supports a component of the overarching population (Western Australian stock). Results from the benchmark turtle surveys determined that the beaches around the Proposal have low nesting abundance, and the cumulative contribution of nesting females to the genetic stock for each species is <1% and is not thought to represent an important nesting population (Pendoley Environmental 2024).</p> <p>There is sufficient information on turtles nesting, inter-nesting foraging, migration and breeding habitats to assume that the waters around the Proposal area could provide habitat for all life stages. In water surveys are not needed. Opportunistic sightings and captures in gill nets in the creeks surrounding the Proposal (HBI 2025) provide sufficient information to determine that juvenile marine turtles will be present within the intake creek and impacts from this need to be appropriately considered. Especially as the area appears to provide foraging habitat for juvenile green turtles.</p> <p>Management measures</p> <ul style="list-style-type: none"> • DSDMMP and management planning to implement MFOs during dredging and piling • Consideration of ecological windows, no dredging during nesting, inter-nesting and peak hatchling period (October-March) • Turtle exclusion device included if a cutter suction dredge is used • Construction and operational light spill and glow will be reduced through the implementation of best practice measures as outlined in the ALMP • Artificial light monitoring to be undertaken post construction to verify baseline modelling outputs • Ensure specified dredging area is not exceeded

Species group	Studies cited in CSMFD	Uncertainties	Assumptions
			<ul style="list-style-type: none"> • Report sick, injured and dead marine fauna within dredge area and nearshore work area • Vessel speed restrictions and trained MFOs • Intake velocity should be consistent with recommendation (>0.15 m/s) to reduced entrainment and entrapment • Appropriate mesh size and screen design on sea water intake • Regular inspections during construction and operations • Pest control measures • Avoid any sources of noise not necessary to construction or operations. • Appropriate construction management plan, including dedicated MFOs, soft-start, pre-start, shut-down, low-vis and daylight hours only for piling.
Humpback dolphins	<ul style="list-style-type: none"> • O2 Marine (2025b) • Raudino et al. (2023) • Hanf et al. (2022) • Allen (2021) • Parra et al. (2018) • DBCA (2021a, b) 	From EPA comments <ul style="list-style-type: none"> • Population size • Importance of the populations in a local and regional context. • Range wide surveys on species occurrence and abundance in the Pilbara, excluding Exmouth Gulf, are >5 years old which is older than the suggested timeframe for contemporary data in the National Guidelines for the Survey of Cetaceans, 	Precautionary principle <ul style="list-style-type: none"> • The species is highly mobile and abundance has been shown to varying, assume species could be present at any time of the year, using the area for foraging where suitable reef habitat is present, socialising, travelling, and breeding. • Assume that subpopulations of Australian humpback dolphins could be present (average subpopulation size of ~130 individuals DCCEEW 2025). <p><i>Further rationale (as summarised from the CSMFD)</i></p> <p>The CSMF desktop provides a review of the current knowledge of Australian humpback dolphins species within and in close proximity to the Proposal area, providing both regional and local advice on the species. The data available in WA for Australian humpback dolphins suggests the species occurs as localised populations in low numbers within a range of inshore habitats, including both clear and turbid coastal waters, with the species having an affinity for coral reefs (Hanf et al. 2022). Habitat critical to the survival for the Australian humpback dolphin refers to areas that are necessary (DCCEEW 2025):</p>

Species group	Studies cited in CSMFD	Uncertainties	Assumptions
		<p>Marine Turtles and the Dugongs (DCCEEW 2024) for baseline data in the background information.</p> <p>Advice arising from CSMFD</p> <ul style="list-style-type: none"> Population estimates across the Pilbara region, including the Proposal area are unknown Number of subpopulations across the Pilbara, and northern WA are unknown In WA population trend data is not available, however likely that the population is decreasing in the Pilbara. Abundance of Australian humpback dolphins in the Pilbara (Exmouth to Dampier) has been shown to vary across years 	<ul style="list-style-type: none"> For activities such as foraging, reproduction and seeking shelter from predators such as <i>Galeocerdo cuvier</i> (tiger sharks) and <i>Carcharhinus leucas</i> (bull sharks), <i>Carchardon carcharius</i> (great white sharks) and <i>Crocodylus porosus</i> (saltwater crocodiles) (Smith et al. 2018; Nicholls et al. 2023) For the long-term maintenance of the species (including the maintenance of prey species) To maintain genetic diversity and long-term evolutionary development For recovery of the species <p>Therefore habitat critical to the survival is shallow (≤ 15 m depth) inshore coastal waters and estuarine habitats within sub-tropical and tropical zones of Australia up to 20 km from a coastline or land body, such as an island group, with sand banks, mud flats, seagrass, rock and/or reef substrate. Within this ranges, site with a high density of teleost fish, cephalopods and bivalves are considered potential important foraging habitat (DCCEEW 2025).</p> <p>Coral habitat is well represented in the region, with minimal habitat in the Proposal footprint. In the Pilbara, Australian humpback dolphins have been observed foraging in rivers, which could be an indication that rivers are an important habitat at a local scale and possibly used intermittently.</p> <p>Humpback dolphins are known to have a large geographical range and occur in low densities makes the species population estimates difficult (Parra and Cagnazzi 2016; Raudino et al. 2023). The population trend of the Australian humpback dolphin in the Pilbara is currently unknown but is thought to be declining (Raudino et al. 2023). The estimated size of subpopulations for the Australian humpback dolphin is ~136 individuals (DCCEEW 2025). Important populations in WA, as identified within the species Conservation Advice (DCCEEW 2025) include but are not limited to those inhabiting coastal waters of North West Cape and Cygnet Bay. There is evidence of low connectivity and movement between Dampier Archipelago and Exmouth and that across WA the species occurs in localised populations (Brown et al. 2014; Raudino et al. 2018). Australian humpback dolphin</p>

Species group	Studies cited in CSMFD	Uncertainties	Assumptions
			<p>abundance was estimated in Raudino et al. (2023) for the Pilbara region using surveys from 2016 and 2017, including the waters of and adjacent to the Proposal (abundance was 1,546 (95% CI = 942–2,537; 0.097 ± 0.03 individuals per km²) and 2,690 (95% CI = 1,792–4,038; 0.169 ± 0.064 individuals per km²) in 2016 and 2017). There is sufficient information to assess impacts to the Australian humpback.</p> <p>Management measures</p> <ul style="list-style-type: none"> • DSDMMP and management planning to implement MFOs during dredging and piling • Ensure specified dredging area is not exceeded • Report sick, injured and dead marine fauna within dredge area and nearshore work area • Vessel speed restrictions and trained MFOs • Avoid any sources of noise not necessary to construction or operations. • Regular inspections during construction and operations • Appropriate construction management plan, including dedicated MFOs, soft-start, pre-start, shut-down, low-vis and daylight hours only for piling. • IMP control and monitoring during construction and operations • Standard hydrocarbon and waste management measures.
Dugongs	<ul style="list-style-type: none"> • O2 Marine (2025b) • Said et al. (2025) • Hodgson et al. (2024) • IMMA (2022) • Bayliss and Hutton (2017) • DBCA (2021a, b) 	<p>From EPA comments</p> <ul style="list-style-type: none"> • Population size • Importance of the populations in a local and regional context. • Surveys on species occurrence and 	<p>Precautionary principle</p> <ul style="list-style-type: none"> • Assume dugongs could be present and forage where seagrass habitat is present and could be present throughout the year. • Loss or impact to seagrass should take into account by low cover (2-10%) of colonising seagrass (<i>H. ovalis</i> and <i>H. uninervis</i>) as this habitat has been found to influence dugong abundance and is important foraging habitat. <p><i>Further rationale (as summarised from the CSMFD)</i></p>

Species group	Studies cited in CSMFD	Uncertainties	Assumptions
		<p>abundance in the Pilbara, excluding Exmouth Gulf, are >5 years old which is older than the suggested timeframe for contemporary data in the National Guidelines for the Survey of Cetaceans, Marine Turtles and the Dugongs (DCCEEW 2024) for baseline data in the background information.</p> <p>Advice arising from CSMFD</p> <ul style="list-style-type: none"> Population and abundance estimates have not been completed for the Pilbara, except for the Onslow region. Dugong abundance is driven by suitable seagrass habitat. Suitable habitat exists in the region with surveys at Regnard Island confirming dugongs and seagrass The area is likely to support dugongs 	<p>Dugongs have previously been recorded in the Proposal and have a high likelihood of occurring within all aspects of the Proposal, especially where seagrass habitat is present. Dugongs typically inhabit seagrass meadows, with specific areas known to support dugongs in WA including Shark Bay, Ningaloo Reef, Exmouth Gulf and the Pilbara coast. The largest Dugong population in WA is in Shark Bay, followed by Exmouth Gulf. Although, there is no recent estimates are available for in the Pilbara. Recent study on seagrass foraging preference, across the Pilbara and including Regnard Island (survey completed in 2018; Said et al. 2025), supports that dugongs are present and suitable foraging seagrass habitat is present. The Dampier Archipelago is recognised as an Important Marine Mammal Area (IMMA) with dugongs being the qualifying species, with the species known to occur in the shallow, warm waters in bays and between islands, including at East Lewis Island, Cape Preston, Regnard Bay, Nickol Bay and west of Keast Island (IMMA 2022). Although dugongs have been recorded in the area, they are known to occur across the region, and the species BIA does not overlap the Proposal area. Dugong calves have been sighted either side of the Proposal (Bayliss and Hutton 2017), with no ecological windows for the species having been identified calves could be present. Dugongs and their habitat are not restricted to the Proposal area. Dugongs are known to frequent the region and surrounds throughout the year.</p> <p>Dugongs generally have small core foraging habitat areas. Core foraging area and habitat utilisation is dependent on the quality and abundance of seagrass habitat, which often has patchy distribution and can vary seasonally (Holley 2006; Sheppard et al. 2019). Minimal seagrass habitat is within the Proposal footprint and is well represented within the nearshore LAUs.</p> <p>There is sufficient information to assess impacts to the dugong.</p> <p>Management measures</p> <ul style="list-style-type: none"> DSDMMP and management planning to implement dedicated MFOs during dredging and piling

Species group	Studies cited in CSMFD	Uncertainties	Assumptions
			<ul style="list-style-type: none"> • Appropriate construction management plan, including dedicated MFOs, soft-start, pre-start, shut-down, low-vis and daylight hours only for piling. • Ensure specified dredging area is not exceeded • Report sick, injured and dead marine fauna within dredge area and nearshore work area • Vessel speed restrictions and trained MFOs on all Proposal vessels • Seagrass monitoring • Avoid any sources of noise not necessary to construction or operations. • Regular inspections during construction and operations • IMP control and monitoring during construction and operations • Standard hydrocarbon and waste management measures.

4. Dredging impacts and mitigation

Preston Consulting have requested information on potential impacts of dredging on migratory species. This advice focusses on that topic and changes to the current Dredge Spoil and Disposal Monitoring and Management Plan (DSDMMP) (O2 Marine 2025c).

Dredging has the potential to impact upon marine fauna (migratory and non) through multiple pathways, these include:

- Continuous noise while dredging
- Reduction of light levels (i.e. loss of BCH and reduce foraging capacity)
- Clogging of fauna feeding and respiratory structures by sediments
- Displacement and/or relocation of animals elsewhere to seek alternative food source
- Avoidance of an area (from either noise, turbidity and/or loss of habitat)
- Injury or death from entrainment from cutter suction dredge
- Direct and indirect loss of important habitats (e.g. foraging or breeding grounds) or prey displacement
- Mobilisation of nutrients and/or contaminants in dredged sediments.

The key concerns for migratory species are barriers to movement and reduced ability to access quality habitat and resources for important activities and life phases (e.g. movement, foraging, resting, pupping).

Key Migratory species (CSMFD v. 6, O2 Marine 2025a) to be considered in the ERD are:

Humpback whales– are likely to use the waters adjacent to the Proposal for their migration along the WA coastline. The whale’s southern migration is when whales are generally closer to the shore and mother-calf pairs are present. Mother-calf pairs are cohort, and could be present resting, milling and lactating in the shallow waters near the Proposal. Lactating female humpback whales save their energy by devoting a significant amount of time to rest, and during this time they mainly rest while stationary at shallow depths (Bejder et al. 2019). During this period anthropogenic noise can affect vocal communication between mother and calf pairs, constant communication between mother and calf is crucial for the survival.

Dugongs – are likely to be using the area for foraging where seagrass habitat is present. Could be impacted via loss of foraging habitat and avoidance of area from disturbance e.g. persistent interruptions from vessel movements and noise can result in disruptions to important behaviours (e.g. feeding, mating, courtship) which can in turn potentially impact the reproductive success and ultimately affect population levels (Hodgson and Marsh 2007).

Turtles – are likely to be present in the waters foraging, nesting, inter-nesting and migrating. Impacts from dredging include loss or restricted access to foraging habitat, direct take through dredge entrainment, underwater noise and avoidance of the area. Increased turbidity has been identified as an existing threat of Potential Concern for the green turtle, and of Less Concern for the flatback and hawksbill turtle (DSEWPaC 2012).

Reef manta ray – are likely to be present in the waters around the Proposal area, likely foraging where suitable habitat is present. Manta rays are filter feeders (Couturier et al. 2012) and therefore are potentially be impacted by dredging if water quality is not adequately managed and therefore potentially impacting the food web which supports them.

Sawfish – are likely to be present foraging in creek systems, pupping has not been recorded in the Proposal area but is thought to occur within the Fortescue River. The area is likely an occasional foraging habitat along the migratory corridor for juvenile and sub-adult green sawfish.

Of these, those of key concern for the impact assessment are humpback whales, turtles and sawfish.

Dolphins are likely to be present within the Proposal area are highly mobile, and given the localised Research on the Indo-pacific bottlenose dolphins found that long term dredging programs did not affect the species use of the area (Bossley et al. 2022). Similarly, the Australian humpback dolphin occurrence has been found to remain stable during coastal construction which included dredging (Parra et al. 2024).

Note: birds are out of scope.

Humpback whales (Migratory) – Behavioural and masking response from underwater noise from dredging is the greatest potential impact to whales, especially during resting and calving period of their annual migration. Masking is problematic when communication between animals (for example, between mother-calf pairs to maintain contact) or the ability to sense predators is disrupted. Neonate humpback whale calves communicated at a low source level and continuous noise could mask this vocalisation. Behavioural responses to sound exposure vary and can include changes in swimming (speed and/or direction), diving (frequency and duration), breathing rates, vocalisation, foraging, mating, resting, socialising, defensive behaviours and/or moving towards or away from the source (Salgado Kent et al. 2016). Short-term behavioural responses including startle and avoidance of the noise can be advantageous in keeping individuals at a safe distance, which would occur with predator avoidance. However, this is not always the case; in some instance behavioural response could result in secondary organ or tissue damage (e.g. rapid rise from a dive) or response by moving directly in line of other threats (Salgado Kent et al. 2016).

Turtles (Migratory)- Dredging can increase sedimentation, reduce water quality and smother benthic habitats. The reduction in suitable benthic habitats can negatively impact marine turtles if the dredged area or sediment spoil ground is located in an area provides important foraging habitat. A study on turtles' response to dredging operations found that flatback turtles increased their use of dredging areas while active dredging operations were occurring, the cause of this is unknown. The increased use of the dredge area during dredging did not result in concurrent injury or mortality of flatback turtles (Whittock et al. 2017). Further there is the risk of injury or mortality to marine turtles during dredging from entrainment, vessel strike or the effects of noise and vibration.

Green sawfish (Migratory) -Suspended sediment plumes may reduce biological functioning by clogging feeding mechanisms or by smothering foraging habitats. Plumes of suspended sediments can impact marine fauna by reducing light penetration through the water column impairing visibility during foraging and potentially leading to reduced growth or to death of light-dependent benthic habitats on which they feed on. Elasmobranchs rely on several senses while foraging, and it is possible that increased turbidity could displace sawfish from foraging areas. Research on green sawfish

movements at Ashburton River and Hooley Creek found green sawfish acoustic detection when the creeks were highly turbid (flooding periods). This is thought the rivers were avoided due to reduced feeding efficiency and increased predation risk (Morgan et al. 2017). However, the species is also known to inhabit clear to relatively turbid waters, therefore green sawfish are likely able to inhabit and successfully forage along the turbidity spectrum.

It is likely that the off-loading facility at Cape Preston has already impeded the sawfish movements between Fortescue River mouth and the Proposal area, with evidence that only larger individuals are likely to migrate between the area (>2.5 m in length) (HBI 2025). Green sawfish migration movements are likely already impacted from the off-loading facility and pupping does not appear to occur within the creeks around the Proposal. It is likely that larger juveniles foraging within nearby creeks, the plume is not expected to enter the creeks or important pupping or foraging habitat.

Existing controls outlined in the DSDMMP (O2 Marine 2025c).

Additional mitigation:

- Dedicated Marine Fauna Observers (MFOs) rather than trained MFOs during dredging to ensure marine fauna are monitored while dredging
- Turtle exclusion device to be included if a cutter suction dredge is used.

5. Bitterns as a potential barrier to marine fauna movement

Bitterns discharge may result in direct effect of osmotic stress to marine fauna and indirect impacts to subtidal BCH because of increased salinity, osmotic stress, impairment, and ion toxicity. Further, bitterns discharge can also create an obstruction of marine fauna movements. Bitterns discharge can lead to disruptions of habitat important for foraging and breeding, especially for migratory marine fauna. Reduced oxygen levels from increased salt and chemicals can result in reduced oxygen which could create a barrier of unsuitable habitat which species may avoid or could create a physical barrier which species are unable to travel through. All this potential impacts could cause avoidance, disorientation, altered migration movements or delays in migrations if the outfall is not appropriately managed.

The modelling of the bittern's outfall indicates that the impacts will be localised and concentrated to the nearshore environment. The Moderate Ecological Protection Area (MEPA) does extend to the shore out to ~3 km offshore. The Low Ecological Protection Area (LEPA) does not extend to the coastline and is ~1 km from the shore. However, the bittern's dispersion model (worst-case) indicates that both the 90% and 99% SPL do not extend to the shore (See O2 Marine Environment Quality Monitoring and Management Plan (O2 Marine 2025d)). It is possible that the identified zones representing the Low Ecological Protection Area (LEPA) and Moderate Ecological Protection Area (MEPA) from the bittern's discharge could result in a barrier of movement. However, mobile marine fauna such as marine mammals, turtles, and sawfish may move through the low, moderate or high LEP zone from time to time, however the risk is considered low given the species ability to leave the zone if conditions are unfavourable. Less mobile marine fauna species are more susceptible to osmotic stress, such as juvenile prawns.

Humpback whales are unlikely to be in the waters where the impacts of the outfall are present, therefore no expected to be an impact. There is minimal suitable foraging habitat within the outfall

LEPA and MEPA. Further migration and movements of marine fauna are not restricted to shallow nearshore waters (excluding green sawfish), and therefore unlikely to result in restricted movements for dolphins, dugongs, turtles, sea snakes, and manta rays.

Sawfish are known to use shallow nearshore waters for migrations between pupping creeks to secondary nursery habitats, which could include from Fortescue River northeast to creeks near the Proposal. Small sawfish (<2.5 m TL) and other elasmobranchs use shallow habitats close to the shore to move between creeks, likely to avoid predation (Morgan et al. 2017). Green sawfish are known to inhabit hypersaline environments. Neonates and older juvenile green sawfish are known to emigrate from the Ashburton River mouth during high periods of freshwater discharge, suggests that the low salinity waters do not provide favourable conditions (Morgan et al. 2016). Closer to the Proposal area green sawfish are known to occur within Fortescue River, which has a background salinity level that ranges 36.4 ppt and 52.1 ppt (RPS 2021). Juvenile sawfish have been identified in Urala Creek South which has a background salinity of ~43 PSU. Therefore, given the species ability to inhabit saline environments it is unlikely that bitterns discharge would act as a barrier to movement for green sawfish. Further, small green sawfish movements in the region appear to be already impacted by the off-loading facility.

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Appendix A. MNES significant impact criteria

Table 3: MNES significant impact criteria and species biological information requirements used to inform knowledge gap assessment

MNES Classification	Criteria	Information required
Migratory	<ul style="list-style-type: none"> Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species. 	<ul style="list-style-type: none"> Habitat suitability and preferences Population location and trends Life history traits and habitat requirements.
Vulnerable	<ul style="list-style-type: none"> Lead to a long-term decrease in the size of an important population of a species Reduce the area of occupancy of an important population Fragment an existing important population into two or more populations Adversely affect habitat critical to the survival of a species Disrupt the breeding cycle of an important population Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat Introduce disease that may cause the species to decline, or Interfere substantially with the recovery of the species. 	<ul style="list-style-type: none"> Key breeding or dispersal populations Key locations Range and distribution Habitat suitability and preferences (including critical habitat) Population location and trends Life history traits and habitat requirements.
Critically Endangered and Endangered	<ul style="list-style-type: none"> Lead to a long-term decrease in the size of a population Reduce the area of occupancy of the species Fragment an existing population into two or more populations 	<ul style="list-style-type: none"> Population location and trends Key breeding or dispersal populations Key locations

MNES Classification	Criteria	Information required
	<ul style="list-style-type: none"> Adversely affect habitat critical to the survival of a species Disrupt the breeding cycle of a population Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat Introduce disease that may cause the species to decline, or Interfere with the recovery of the species. 	<ul style="list-style-type: none"> Range and distribution Habitat suitability and preferences (including critical habitat) Life history traits and habitat requirements.

Appendix B. Knowledge gaps identified

Table 4: Baseline data gap analysis outcomes in relation to information required for EIA

Species	Summary of review to support gap identification	Gaps in relation to MNES criteria	Study required to inform EIA	Assumptions for EIA
Indo-pacific bottlenose dolphin EPBC Act: Migratory	Range wide surveys on species occurrence and abundance in the Pilbara, excluding Exmouth Gulf, are >5 years old which is older than the suggested timeframe for contemporary data in the National Guidelines for the Survey of Cetaceans, Marine Turtles and the Dugongs (DCCEEW 2024) for baseline data in the background information.	<ul style="list-style-type: none"> Population estimates and trends Important habitats for breeding 	<ul style="list-style-type: none"> No Project specific studies required 	<ul style="list-style-type: none"> Recent abundance mapping (Raudino et al. 2023) provide baseline abundance in the Pilbara The species is highly mobile and abundance has been shown to varying, assume species could be present at any time of the year, using the area for foraging, socialising, travelling, and breeding.

Species	Summary of review to support gap identification	Gaps in relation to MNES criteria	Study required to inform EIA	Assumptions for EIA
Humpback whale EPBC Act: Vulnerable and Migratory	Migration timing and distance from shore at the Proposal location has not been completed, information at this location has been informed by statewide or studies completed nearby in Exmouth Gulf. The population has expanded since these surveys (Salgado Kent 2012) and evidence of expanding calving range may extend at least 1,000 km to NWC (Bejder et al. 2019).	<ul style="list-style-type: none"> • Calving region in WA • Timing of migration and habitat use during migration at the Proposal area 	<ul style="list-style-type: none"> • Not required. 	<ul style="list-style-type: none"> • Assume during migration that calving could also occur across the migration BIA • Precautionary time, use ecological windows from Exmouth Gulf for migration
Turtles EPBC Act: Vulnerable and Migratory	Status of the stocks in WA are relatively unknown e.g. flatback Pilbara stock status unknown, hawksbill turtle WA status unknown. Distribution and foraging grounds for post-hatchling and juveniles is relatively unknown.	<ul style="list-style-type: none"> • Distribution and core foraging areas for post-hatchlings and juveniles 	<ul style="list-style-type: none"> • Not required 	<ul style="list-style-type: none"> • Assume species is present throughout its life-cycle and suitable foraging habitat could be present for juveniles, especially within creeks.
Short-nosed sea snake and leaf scaled sea snake EPBC Act: Critically Endangered	Currently there is no recovery plan for the species due to the fact threats and ecological requirements for the species are known. Population size, distribution, critical habitats, and ecological requirements for the species are essential to manage this critically endangered species. Short-nosed sea snakes population health of the 'coastal' and 'offshore-reef' populations are likely to be impacted by different threatening processes that operate at different scales and require separate management strategies.	<ul style="list-style-type: none"> • Population estimates and location of isolated breeding populations • Critical habitat for breeding populations and breeding requirements 	<ul style="list-style-type: none"> • Not required 	<ul style="list-style-type: none"> • These are gaps present at every region in WA • Assumption that species could be present where suitable reef habitat is present • Assume key species and threats need to be considered appropriately

Species	Summary of review to support gap identification	Gaps in relation to MNES criteria	Study required to inform EIA	Assumptions for EIA
Green sawfish EPBC Act: Vulnerable	Likelihood of the area providing secondary nursery habitat for green sawfish, with HBI (2023) identifying a >2 m TL sawfish at the mouth of the intake creek. Advice within the species recovery plan is until information confirms otherwise areas that support aggregations of individuals have been recorded displaying biologically important behaviour such as breeding, foraging, resting or migrating, are considered critical to the survival (DoEE 2015a).	<ul style="list-style-type: none"> Habitat critical for the survival of the species (e.g. foraging and secondary nursery habitat) present within the Proposal area 	<ul style="list-style-type: none"> Continue green sawfish work in the area 	<ul style="list-style-type: none"> The creeks around the Proposal area provide nursery and foraging habitat for green sawfish Assess impacts in relation to barrier of movements, potential to modify, destroy, or isolate or decrease the availability or quality of habitat.
Reef manta ray EPBC Act: Migratory	Population status and trends in Australia is not available.	<ul style="list-style-type: none"> Population and connectivity across WA and Australia. Population size in Australia and WA not known. 	<ul style="list-style-type: none"> Not required 	<ul style="list-style-type: none"> The species may occasional transient and is not dependent upon the Proposed Action area for breeding, feeding, migration or resting behaviour, is not restricted to the area.