



Coffs Harbour Dredging 2026 - 2036

Review of Environmental Factors

Transport for NSW

September 2025

Coffs Harbour Dredging

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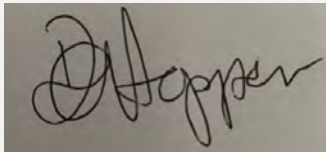


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Approval and authorisation

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Accepted on behalf of Transport for NSW by:	Dave Hopper Principal Manager Dredging Maritime Infrastructure Delivery Office Transport for NSW
Signed:	
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Executive summary

The proposal

Transport for NSW Maritime (Transport) proposes to routinely dredge the existing basin levels of Coffs Harbour, primarily around the marina entrance and boat ramp as well as their immediate eastern and western approaches over a ten-year period. It is possible that other areas in the harbour will be identified for dredging throughout the project period as regular surveying identifies areas of infilling and sand build-up. The purpose of the dredging is to restore and maintain navigable depths within the harbour.

The proposal is a continuation of historical activities that have been undertaken intermittently to maintain navigable depths within the harbour over the last 25 years. Transport proposes to ensure that a ten-year dredging program is in place to regularly manage the sand build-up within the harbour and to use the dredged sand for nearshore placement at Park Beach to enable the dredged material to re-enter the natural northward drift of sediment and provide the opportunity to nourish eroding beaches north of the harbour. This aligns with the aims, objectives and actions of the Coffs Harbour Coastal Zone Management Plan (CZMP).

Key features of the proposal include:

- Maintenance dredging being required every one to three years (depending on infill rates) over a 10-year period. Average sediment volumes of approximately 96,000 m³ are expected in most campaigns, to be determined by regular surveys. The initial campaign is expected to be approximately twice that volume.
- Maintenance dredging of the marina navigation channel and boat ramp navigation channel to a depth of a minimum of -4.5m LAT (Lowest Astronomical Tide) at the marina navigation channel and -2.5m LAT at the boat ramp navigation channel.
- Sediment sampling of dredged material prior to the commencement of each campaign to inform suitable placement locations.
- Placement of sand in the nearshore area at Park Beach (if it is identified as suitable) to be consistent with the intent of Coffs Harbour City Council's *Coastal Zone Management Plan (CZMP) 2019*.
- Bed levelling of the basin floor after dredging and periodically levelling high spots resulting from natural shoaling and accretion.
- The creation of sediment sinks at key locations to reduce the frequency of dredging along the entrance channels.

Dredging is expected to commence in early 2026 outside of peak holiday and popular boating activity periods, and outside of Shearwater migration periods where possible. The proposed dredging would continue intermittently over a ten-year timeframe as required. After ten years the program would be reviewed and revised if required.

Need for the proposal

The proposed dredging activities are required to meet the NSW Government's objectives of providing continuous, safe, navigable waterways along the NSW coastline. This particular project has been identified within the *NSW Coastal Dredging Strategy 2019 – 2024* as a "Key Investment Location".

As identified within the Final Report of the CZMP, the construction of the harbour has virtually intercepted all of the north-bound sand that moves from the south by longshore sediment transport (some 75,000m³/yr). This in turn, results in substantial accretion at the northern end of Boambee Beach, substantial recession of Park Beach, and its adjacent beaches, and significant trapping of sand within the harbour. Dredging and sand replenishment (beach nourishment) has been identified as a means of maintaining the harbour as a working and recreational waterway and of enhancing sand reserves at Park Beach and potentially on beaches further north as sand moves northwards via littoral drift.

Proposal objectives

The objectives of the proposal are:

- To maintain sufficient navigable depths of a minimum of -2.5m (boat ramp approach) and -4.5m (marina) Lowest Astronomical Tide (LAT) level within the harbour over a ten-year period, particularly at the entrances to both the marina and boat ramp.
- To beneficially re-use dredged material (where suitable) to replenish depleting sand reserves north of the harbour for purposes such as beach nourishment and improved surf amenity.
- Undertake suitable monitoring programs to determine the actual environmental impacts of the works and to refine the methodology where required, to inform future campaigns and adapt safeguards and mitigation measures to reduce environmental impacts.
- Minimise impacts on harbour users and the environment.

The works outlined are proposed to be undertaken repeatedly between 2026 and 2036 to ensure on-going navigation channel access.

The proposal objectives fulfil the strategic planning for the area by providing an evidence-based approach to maintaining maritime infrastructure and prioritising safe access to waterways.

Options considered

The proposal has considered four options, three of which incorporate the re-use of the dredged sand. The options are:

Option 1: Dredging of the harbour and placement of the dredged sand at the northern end of Jetty Beach.

This option was considered for its potential to quickly remove sand build up in the marina or boat ramp entrance over a short timeframe when adverse weather events occur suddenly. Dredging for this option would be undertaken using a smaller model of dredge (most likely a cutter suction dredge) and a pipeline to place the material directly on to the northern end of Jetty Beach from the dredge.

Further investigations undertaken as part of this review of environmental factors (REF) and modelling of sand movement in the harbour indicates that this is not a suitable option, and it is not intended to consider this option further as part of this REF.

Option 2: Dredging of the harbour and placement of the dredged sand on Park Beach via overland pipeline.

This option would involve dredging the harbour, most likely with a cutter suction dredge, and using a land-based pipeline to pump dredged sand from the northern end of Jetty Beach to the southern end of Park Beach. The sand would be deposited on-shore immediately north of the

Surf Club. This option has been identified as having potential benefits after adverse weather events when the Surf Club assets are at risk due to sand recession. The use of an overland pipeline would also allow sand to be transferred to Park Beach when sea conditions are not suitable for ocean transport of dredged material. This option has been identified as having potential environmental and cultural heritage impacts.

This option is not the preferred option and would only proceed after further investigation and subject to additional environmental assessment, if environmental impacts are deemed to be acceptable. It is not intended to pursue this option further as part of this REF.

Option 3 (preferred option): Dredging of the harbour and placement of sand in a nearshore location off Park Beach via ocean transport.

This option would involve dredging within the harbour, mostly like with a hopper dredge, and transporting it via barge past Mutton Bird Island to a nearshore area north of Little Mutton Bird Island. The sand would be deposited approximately 100m offshore clear of any reefs or identified key habitat areas. This option ensures that all dredged material remains within the nearshore sediment budget. The combination of wave action and tidal currents would potentially bring sand onshore towards Park Beach, and contribute to the northward littoral drift of sand, thereby contributing to nourishing the beach in this location. Sand would be placed at least 200m north of the Surf Club to minimise the potential for large volumes of sand to drift into Coffs Creek.

Option 4: Do nothing.

To do nothing would not achieve the proposal objectives to maintain suitable navigable depths within the harbour in order to provide safe passage for vessels.

This option would also mean that no dredged sand would be available for beach nourishment, and beaches north of the harbour would continue to suffer severe coastal recession.

This is not the preferred option and has not been considered further as part of this REF.

Statutory and planning framework

Section 2.80 (2) of *State Environmental Planning Policy (SEPP Transport and Infrastructure) 2021* permits development to be carried out by or on behalf of a public authority without consent on any land for the purposes of navigation facilities and environmental management works associated with a port facility or a wharf or boating facility. In this section, a reference to “development for the purpose of navigation facilities, wharf or boating facilities also includes a reference to dredging, or bed profile levelling, of existing navigation channels, if that dredging or levelling is carried out for safety reasons”.

Section 2.164 of the SEPP permits development for the purpose of waterway or foreshore management activities to be carried out on any land by or on behalf of a public authority without consent. Waterway or foreshore management activities are defined in the SEPP to include “coastal management and beach nourishment, including erosion control, dune or foreshore stabilisation works”. As the proposal is for the purpose of coastal management and includes beach nourishment to address the impacts of coastal erosion and is to be carried out by or on behalf of Transport, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* and development consent is not required.

This REF has identified that the proposal would be unlikely to cause a significant impact on the environment. The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

Under the *Crown Lands Management Act 2016*, Transport would be required to obtain a licence prior to the commencement of the proposed works on Crown land where no licence is currently in place. Transport has a current Crown licence over the harbour area.

The proposal is an aquatic activity as it would be undertaken on navigable waters and would temporarily restrict the availability of those waters for normal use by the public. As such, the proposal requires Transport (Maritime) approval under the *Marine Safety Act 1998*.

The *Protection of the Environment Operations Act 1997* is the key environmental protection and pollution statute. The EPA administers this Act and establishes a licensing regime for waste, air and water pollution, and scheduled activities. The proposal is unlikely to cause pollution and is not a scheduled activity, therefore it does not require an Environment Protection Licence (EPL).

All near shore beach nourishment activities would occur within the Solitary Islands Marine Park, declared in accordance with Part 5, Division 1, section 23 of the *Marine Estate Management Act 2014*. A Marine Park Permit would be required for any part of the proposed activity located in the Habitat Zone and Special Purpose Zone of the Marine Park.

Part 7 of the FM Act outlines legislative provisions to protect fish habitat and Part 7A outlines provisions to conserve threatened species of fish and marine vegetation and their habitat. The proposal is unlikely to have a significant impact on any threatened species, marine vegetation, or habitat provided that the recommended safeguards and management measures are implemented during the proposed works.

Under Section 205 of the FM Act, a permit is required to harm (cut, remove, damage, destroy, shade, etc.) marine vegetation including saltmarshes, mangroves, seagrass, and seaweeds. The proposal is unlikely to involve any harm to marine vegetation and a Section 205 permit would not be needed for the initial dredging campaign. The requirement for future permits will be assessed as part of the Marine Habitat Survey undertaken prior to each dredging campaign.

Under Section 199 of the FM Act, written notification to the Minister is required before any dredging work is carried out. Any response from the Minister within 21 days must be taken into consideration. DPIRD Fisheries were consulted as part of the preparation of this REF, and their comments have been considered in this REF. DPIRD Fisheries would be notified again after the REF is determined and prior to commencement of works.

The proposal would impact upon an area subject to an undetermined Aboriginal Land Claim within the harbour. The Coffs Harbour and District Local Aboriginal Land Council were consulted during the preparation of this REF and have not raised any objections to the proposed dredging.

Community and stakeholder consultation

Key agency stakeholders were consulted for the preparation of this REF. Responses were received from:

- NSW DCCEEW Biodiversity Conservation Services
- Coffs Harbour City Council
- NSW DPIRD Fisheries and Marine Parks
- Crown Lands Regional Services
- Coffs Harbour and District Local Aboriginal Land Council

Issues raised by stakeholders related primarily to environmental and community impacts. Those issues have been summarised in this REF and responses provided by Transport. All issues raised by stakeholders have been addressed in this REF and have been considered in determining the preferred option and required mitigation and management measures.

This REF will be publicly displayed for community comment. All comments received from the community during the display period would be considered in a submissions report.

Environmental impacts

The main environmental impacts of the proposal are likely to relate to biodiversity and water quality. There are also more minor impacts associated with socio-economics, maritime transport and parking and cultural heritage.

Biodiversity

Searches of threatened and migratory species databases identified 59 marine birds, 11 marine mammals, 5 marine reptiles, 9 sharks and rays, 3 fish, 1 macroalga and 1 Threatened Ecological Community which may potentially occur in the vicinity of the proposal.

A review of existing mapping and previous studies identified that estuarine macrophytes (mangroves, saltmarsh and seagrasses) have not been previously recorded to occur within the footprint of the works, however, do occur in the wider vicinity within Coffs Creek. Some of the works, specifically those involving the proposed sand placement, would occur within the Habitat Protection Zone of the Solitary Islands Marine Park.

Direct impacts from the Proposal would include the removal of approximately 96,000m³ of seabed material on average for most campaigns and the placement of this sediment to subtidal areas nearshore to Park Beach. The initial dredging campaign is expected to remove approximately twice that amount. Direct ecological impacts from the proposed dredging are expected to be the removal of and/or physical disturbance to invertebrate infauna and/or slower moving sessile epibenthic invertebrates, which would either be removed as a result of dredging or buried as a result of sand placement. These losses are not considered to be ecologically detrimental to the wider invertebrate community or ecological function within the harbour or the adjacent shoreline habitats, including the Marine Park. The affected infauna communities within both the dredging areas and placement area are expected to recover within several months. The works would result in the direct modification of Type 3 key fish habitat (KFH) during dredging, whilst placement nearshore at Park Beach would involve direct modification of Type 1 KFH, as this location is within the Marine Park.

The project at times may result in some indirect impacts to adjacent habitats as a result of reduced water quality and increased sedimentation. Habitats with sensitive receptors such as reef assemblages are most vulnerable to such disturbances. Although these impacts are expected to be minimal given the coarse nature of the dredged material being expected to settle quickly, the naturally high sediment loads along the Coffs Coast and the exposure of the project to coastal currents, adequate buffers to sensitive receptors and areas of elevated biological or ecological value would need to be adopted to mitigate these risks. This includes suitable buffers to the reef on the northern side of the Coffs Harbour northern breakwater and Little Muttonbird Island, where the Critically Endangered Marine Brown Alga (*Nereia lophocladia*) has previously been known to occur. All adjacent habitats on the northern side of the northern breakwater are also considered highly sensitive KFH as they are within the Marine Park.

Based on the current and previously known distribution of *N. lophocladia*, the proposed works are not expected to impact on the species to any ecological significance. Known distribution is outside of the dredge and placement areas. Where necessary works must occur within close proximity to suitable natural habitat for the species, targeted surveys would be conducted prior to works to mitigate potential impacts where changes in distribution may occur.

Various threatened and migratory marine species may occur in the area at times, however, most are likely to be transient visitors or only enter the area in search or pursuit of prey items, which they forage across very large expanses of the coastal environment for. Thus, the habitat

within the study area has minimal ecological significance for the majority of these species. Exceptions include migratory marine birds, shorebirds and marine turtles which at times utilise habitat within Coffs Harbour and the Solitary Islands Marine Park. These species may experience impacts to nesting, foraging, refuge or roosting habitat due to dredging or sand placement works in subtidal areas. Further assessment has identified that the proposed works are unlikely to have a significant impact on the species or local populations. However, careful management and consideration of the timing of works over the 10-year period would be required to mitigate potential impacts on these species.

Sediments, Contamination and Water Quality

Marine sands dominate sediments within the harbour. Given the high accretion rate of marine sands into the harbour, clean marine sediments are likely to dominate the proposed dredge areas. Previous analysis of sediment properties indicates that the materials to be dredged are likely to have similar physical properties to those at the proposed placement area offshore of Park Beach.

Given the predominance of clean marine sediment throughout the harbour and sediment flow paths, it is considered that there is a low potential for contaminated sediment within the proposed dredge areas, however given the limited nature of previous studies, contamination at either dredge area cannot be ruled out. Further sampling investigations are required to assess contamination within the proposed dredge areas prior to each dredging campaign.

Previous investigations indicate predominance of medium-grained marine sediments within the harbour therefore both sites are unlikely to contain a significant proportion of fines. It is therefore expected that water quality impacts associated with turbidity would be manageable but should be monitored during works.

It is considered that implementation of the mitigation measures identified in Appendix D and this REF would be sufficient to manage issues related to sediment and water quality for the proposed works.

Socio-economic and transport

The proposal is anticipated to have positive socio-economic outcomes. Apart from improved safety for recreational and commercial boaters and their passengers using the Harbour, the placement of dredged sand material off Park Beach is expected to improve the condition of Park Beach which has been subject to erosion.

The dredge, while in operation and moored between dredging and pipelines, would result in localised restrictions on vessel traffic. However, impacts will be minor and localised and passage will remain available at all times. Safeguards will be implemented to minimise impacts on vessel traffic during dredging.

Cultural heritage and archaeology

There are a large number of Aboriginal sites known to occur in the vicinity of the works, and the harbour area is subject to an undetermined Aboriginal Land Claim, suggesting that the area is of importance to the local Aboriginal community.

The Coffs Harbour and District Local Aboriginal Land Council were consulted during the preparation of this REF and have raised no objections to the proposed works. Provided that the recommended mitigation measures are implemented, it is not expected that the proposal would have a significant impact on cultural heritage or archaeology.

Justification and conclusion

Predictable navigation channels meeting minimum depth and width criteria are required to facilitate safe passage for recreational and commercial vessels accessing Coffs Harbour.

The works are required as areas of the navigation channels into the Coffs marina and boat ramp regularly develop shoals which affect the safe navigation of vessels. These shoals require maintenance dredging to remove sand and maintain safe navigable passage. The use of this sand for beach nourishment would act to ensure the highest and best use of this material to mitigate the effects of coastal erosion. Where sand is not suitable for beach nourishment, it would be classified as waste and re-used or disposed of accordingly.

The State Government's *Coastal Dredging Strategy 2019 – 2024* recognises Coffs Harbour as a key investment location to improve navigation and accessibility for commercial, recreational and tourist enterprises, which have flow-on benefits for local economies. In addition, the use of dredged sand for beach nourishment would be likely to increase the resilience of Park Beach which is recognised as a priority area for beach nourishment.

The NSW *Maritime Infrastructure Plan 2019 – 2024* (MIP) has identified Coffs Harbour as a popular recreational boating destination that supports significant tourism activity and provides access to the Solitary Islands Marine Park. The Plan also notes that the area hosts several major boating events, which require consistent and safe navigation access into the boat ramp and marina.

The placement of dredged sand in the near shore environment off Park Beach is expected to have positive benefits for sand supplies to Park Beach and potentially for beaches further to the north. Beaches north of the harbour have a history of beach erosion and placement of sand off Park Beach is identified as a desired outcome of any dredging undertaken within the harbour in the *Coffs Harbour Coastal Zone Management Plan*. Park Beach has historically experienced severe erosion, posing safety risks to beachgoers and threats to shoreline infrastructure.

The continuation of maintenance dredging in the harbour and associated beach nourishment is proposed for the next ten years to ensure continued safe navigation for vessels, continued use of dredged material to mitigate coastal erosion and improve surf amenity, and would assist in achieving the objectives of the relevant strategic plans.

Display of the review of environmental factors (REF)

This REF is on display for comment between 13 October to 3 November 2025. You can access the documents in the following ways:

Internet

The documents are available as pdf files on the Transport for NSW website at:

www.transport.nsw.gov.au/coffsdredging

www.haveyoursay.nsw.gov.au/coffs-harbour-dredging

Printed copies

The documents can be viewed at the following locations:

Coffs Harbour Library, 27 Gordon Street, Coffs Harbour NSW 2450

Printed and electronic copies are available by contacting 1800 271 100, noting that there may be a charge for hard copies, CD or USB.

Staffed displays

These will be held at the Coffs Harbour Yacht Club, Ground Floor Meeting Room, 30 Marina Drive Coffs Harbour NSW 2450 at the following dates and times:

Monday 20 October, 3 pm to 6 pm

Tuesday October, 11 pm to 2 pm.

How can I make a submission

To make a submission about this proposal, please send your written comments to:

Email: dredging@transport.nsw.gov.au

Mail: MIDO Dredging Project

Locked Bag 5100

Rozelle NSW 1450

Phone (for enquiries): 1800 271 100

Submissions must be received by **3 November 2025**. Submissions will be managed in accordance with the Transport for NSW Privacy Statement which can be found www.transport.nsw.gov.au/privacy-statement#Your_Privacy

What happens next

Transport will collate and consider the submissions received during public display of the REF. After this consideration, Transport will determine whether or not the proposal should proceed as proposed and will inform the community and stakeholders of this decision.

If the proposal is approved to proceed, Transport will continue to consult with the community and stakeholders prior to and during works.

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Appendix B: Statutory Consultation Checklists

Appendix C: Aquatic Ecology Assessment

Appendix D: Sediment and Water Quality Characteristics Assessment

Appendix E: Agency Consultation

Appendix F: PACHCI Assessment

Appendix G: Sand Management Strategy

1 Introduction

1.1 Proposal identification

The proposal is located within the Coffs Harbour City Council Local Government Area. Transport for NSW (Transport) proposes to intermittently dredge the harbour over a ten-year period. The dredge study area is shown in Figure 1 below. It is intended that all dredging would be undertaken within the area nominated as “approved dredge boundary”.

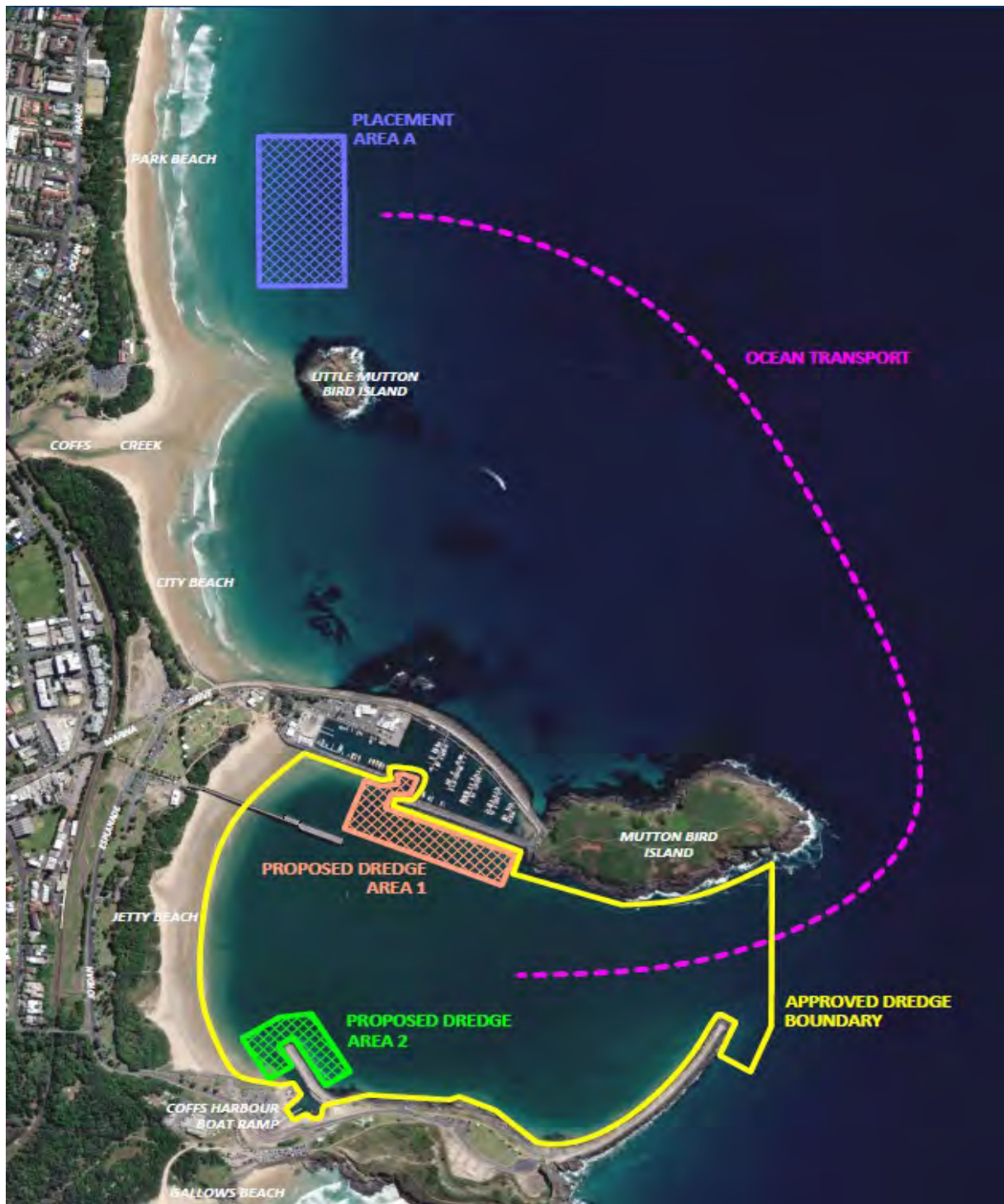


Figure 1: Location of proposed works. Source: North Coast Surveys 2024.

A ten-year dredging program is being proposed to provide a consistent and efficient means of restoring and maintaining navigable depths within the harbour and particularly at the entrances to two key pieces of public maritime infrastructure, the Coffs Harbour marina and Coffs Harbour regional boat ramp. At the end of the ten-year program, Transport would review the dredging and beach nourishment outcomes to determine whether dredging should continue into the future after this time, and if so, to refine the program to make continuous improvements to its methodology.

Options considered for re-use of the dredged sand included deposition of small amounts of sand in the northern corner of Jetty Beach after adverse weather events, in the southern corner of Park Beach after adverse weather events, and nearshore (underwater) placement of dredged sand at the southern end of Park Beach, approximately 150m north of Little Mutton Bird Island and 100m offshore. It is intended that nearshore placement off Park Beach would be undertaken as the preferred option throughout the ten-year life of the project, therefore no other options will be considered further for assessment as part of this REF.

Key features of the proposal include:

- An initial dredging campaign in early 2026 to remove up to 200,000m³ of sand from the harbour.
- Maintenance dredging every one to three years (depending on infill rates) over a 10-year period with average volumes of approximately 96,000 m³ for each of those campaigns. Dredging volumes would be subject to ocean conditions and survey results.
- Maintenance dredging of the marina navigation channel and boat ramp navigation channel to a depth of approximately -4.5m LAT (Lowest Astronomical Tide) at the marina navigation channel and -2.5m LAT at the boat ramp navigation channel.
- Sediment sampling of dredged material prior to the commencement of each campaign to determine whether sand is suitable for beach nourishment.
- Habitat surveys prior to each campaign to identify potential impacts on threatened species and to update the distribution of ecologically significant habitats.
- Placement of sand in the nearshore area at Park Beach in accordance with Council's *Coastal Zone Management Plan (CZMP) 2019*.
- Bed levelling of the basin floor after dredging and periodically levelling high spots resulting from natural shoaling and accretion, as well as the creation of sediment sinks in key locations to reduce the frequency of dredging.

Dredging and beach nourishment is expected to commence in early 2026 outside of peak holiday and popular boating activity periods and would continue intermittently over a ten-year timeframe as required.

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by Blue Sky Planning and Environment Pty Ltd on behalf of Transport for NSW Maritime Infrastructure Delivery Office. For the purposes of these works, Transport for NSW (Transport) is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of this REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail mitigation and management measures to be implemented.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of section 171 of the *Environmental Planning and Assessment Regulation 2021*, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (DUAP, 1995/1996), and the *Marinas and Related Facilities EIS Guideline* (DUAP, 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of Section 5.5 of the EP&A Act requiring that Transport examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the requirement for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report.
- The potential for the proposal to significantly impact any matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of Climate Change, Energy, the Environment and Water for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 Need and options considered

2.1 Strategic need for the proposal

The Coffs Harbour jetty precinct is considered to be a main hub for both recreational and professional water-based pursuits and provides a base point for activities such as fishing, scuba diving, jet skiing, whale and dolphin watching, amongst other activities.

The harbour area adjacent the jetty foreshore precinct is considered to be one of Coffs Harbours' most significant economic stimuli, providing a playground for visitors to the area as well as contributing to financially supporting small businesses.

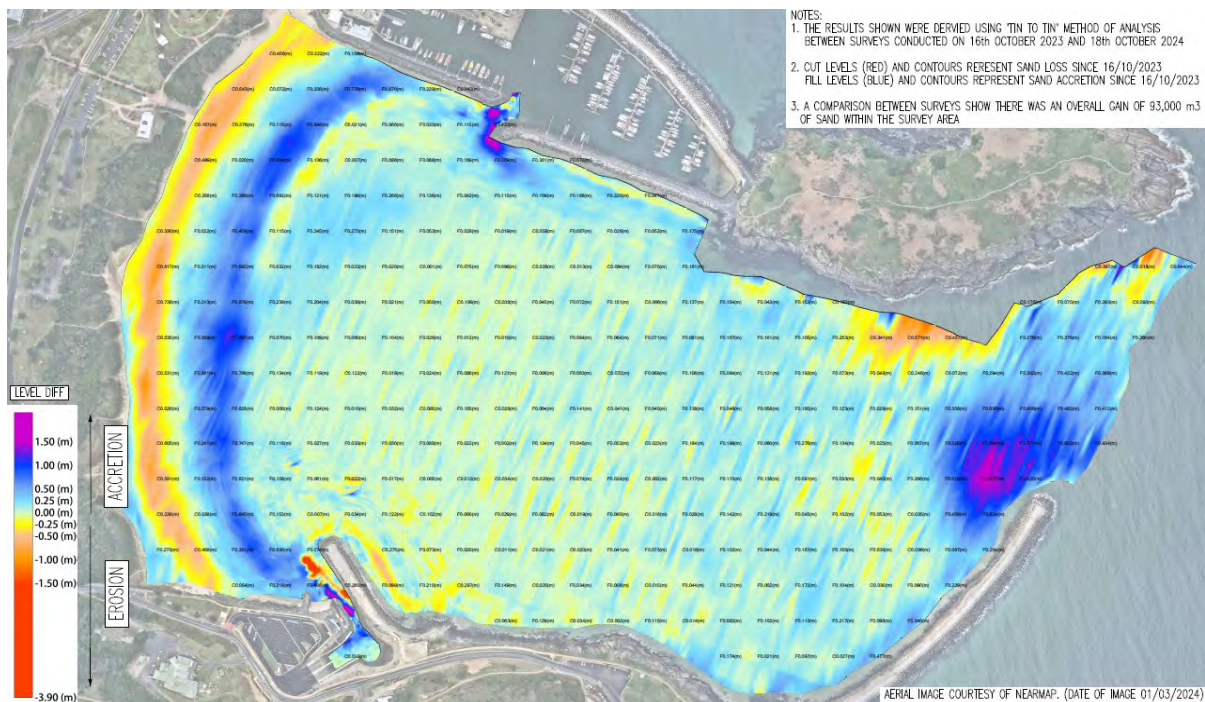
The *NSW Coastal Dredging Strategy 2019-2024* recognises the Coffs Harbour entrance channel to the boat ramp as a key investment location to improve navigation and accessibility for commercial, recreational and tourist vessels, which has flow-on benefits for the local economy. The use of dredged sand from the harbour, for beach nourishment and erosion control, would increase the resilience of Park Beach which is significantly impacted by increased progradation and coastal erosion events.

The *NSW Maritime Infrastructure Plan 2019-2024* has identified Coffs Harbour as a significant growth area and popular recreational boating destination that supports significant tourism activity and provides access to the Solitary Islands Marine Park. The Plan also notes that the area hosts several major boating events, which have significant economic benefit for the local area and require safe and consistent navigation channels. The Plan also notes that the Coffs Harbour boat ramp is the only major ramp between Wooli and Nambucca Heads, hence its function as a "regional" boat ramp.

The NSW Government and Coffs Harbour City Council are currently progressing strategic planning for the jetty foreshore to make better use of land surrounding the marina and adjacent the boat ramp, improving connections to the Coffs Harbour central business district (CBD). A whole of government approach is being undertaken to activate the Coffs Harbour southern foreshore precinct, to provide the right mix of maritime infrastructure. Ensuring that vessel access is consistently available within the harbour will be crucial to ensuring the sustainability of the government's investment in the jetty foreshore.

In addition to maintaining navigable boating access, the *Coffs Harbour Coastal Zone Management Plan Final Report 2019* (CZMP) includes a management action to implement a dredging and sand placement program on Park Beach (reference BD.1).

The figure below is a bathymetric comparison plan which is a graphic representation of a comparison between bathymetric surveys conducted on 16 October 2023 and 18 October 2024. A comparison between surveys shows that there was an overall gain of around 93,000m³ of sand within the harbour over a twelve-month period, primarily around the boat ramp and associated breakwater, and close to the marina and associated breakwater.



2.2 Existing infrastructure

Major existing infrastructure within the immediate vicinity of the proposed works includes:

- The Coffs Harbour Jetty which is an iconic timber structure that is over 100 years old and is recognised as a state significant heritage item.
- The Coffs Harbour boat ramp which was recently upgraded by Transport and included an extension of the breakwater to address safety concerns related to seiche effects. The boat ramp provides access and egress for vessels utilising the harbour. Part of the boat ramp precinct also includes recreational fishing infrastructure and footpaths, and a large car parking area.
- The Coffs Harbour marina and breakwater which provides shelter for moored vessels and incorporates a walkway for visitors, as well as adjacent restaurants and cafes and other retail and commercial services.
- The Park Beach Surf Club which provides a restaurant and surf lifesaving facilities for the popular Park Beach.

The revitalisation planned for the Coffs Jetty Foreshore, by the NSW Government and Coffs Harbour City Council, will eventually provide significant local and regional attractions and public domain improvements.

2.3 Proposal objectives

The objectives of the proposal are to provide a strategic evidence-based approach to maximising the use and sustainability of maritime infrastructure in Coffs Harbour and prioritising safe access to its waterways over the next ten years. The proposal seeks to:

- Maintain sufficient navigable depths of between -2.5m and -4.5m Lowest Astronomical Tide (LAT) within the harbour over a ten-year period, particularly at the entrances to both the marina and boat ramp.

- To beneficially re-use dredged material (where suitable) to replenish depleting sand reserves north of the harbour and improve surf amenity.
- Undertake suitable monitoring programs to determine the actual environmental impacts of the works and to refine the methodology where required, to inform future campaigns and adapt safeguards and mitigation measures to reduce environmental impacts.
- Minimise impacts on harbour users and the environment.

These objectives fulfil the strategic planning for the area by providing an evidence-based approach to maintaining maritime infrastructure and prioritising safe access to waterways.

2.4 Alternatives and options considered

2.4.1 Identified options

Four options have been considered to deliver the project objectives. To determine the most appropriate option for the 10-year dredging proposal, consultation with government agencies and stakeholders and a review of the documents listed below was undertaken.

- BMT, WBM Pty Ltd (2010). Coffs Coast Coastal Processes and Hazards Definition Study Volume 1: Final Report.
- BMT (2019). Coffs Harbour Coastal Zone Management Plan. Final Report.
- Carley, J.T., Wyllie, S.J., Lord, D.B. and R.J. Cox, (2006). Coastal Processes in the Coffs Harbour Region, Proceedings of the 15th NSW Coastal Conference.
- GHD, 2019. Coffs Harbour Boat Ramp Sediment Assessment, report for Coffs Harbour City Council.
- Royal Haskoning DHV (2025). Coffs Harbour Sand Management Strategy.
- TNSW (2023). Gallows Beach Sand Transfer System. Review of Environmental Factors.

The options that have been considered are:

Option 1: Dredging of the harbour and placement of the dredged sand at the northern end of Jetty Beach.

This option was considered for its potential to quickly remove sand build up in the marina or boat ramp entrance over a short timeframe due to sudden adverse weather events. Dredging for this option would be undertaken using a smaller model of dredge and a pipeline to place the material directly on to the northern end of Jetty Beach from the dredge.

Further investigations undertaken as part of this REF and modelling of sand movement in the harbour indicates that this is not a suitable option. Additionally, this option was not supported by responding Agencies. This option is not considered further in this REF.

Option 2: Dredging of the harbour and placement of the dredged sand on Park Beach via overland pipeline.

This option would involve dredging the harbour and using a land-based pipeline to pump dredged sand from the northern end of Jetty Beach to the southern end of Park Beach. The sand would be deposited on-shore immediately north of the Surf Club. This option has been identified as having potential benefits after adverse weather events when the Surf Club assets are at risk due to sand recession. The use of an overland pipeline would also allow sand to be transferred to Park Beach when sea conditions are not suitable for ocean transport of dredged material.

This option would require de-watering of dredged material prior to placement on Park Beach, which creates significant amenity and disposal issues associated with fines collected in the de-watering process.

This option has been identified as having potential environmental and cultural heritage impacts. This option is not the preferred option and would only proceed subject to additional environmental assessment.

Although this option may be considered in the future it is not currently the preferred option and would not be progressed until further environmental investigations are complete and separate approvals are sought if potential environmental impacts are deemed to be acceptable. Additionally, this option was not supported by responding Agencies. This option is not considered further in this REF.

Option 3 (preferred option): Dredging of the harbour and placement of sand in a nearshore location off Park Beach.

This option would involve dredging the harbour and transporting it via barge past Mutton Bird Island to a nearshore area north of Little Mutton Bird Island. The sand would be deposited approximately 100m offshore clear of any reefs or identified key habitat areas. This option ensures that all dredged material remains within the nearshore sediment budget. The combination of wave action and tidal currents would potentially bring sand onshore towards Park Beach, thereby contributing to nourishing the beach in this location, as well as moving sand further north to contribute to natural northward littoral drift.

Sand would be placed at least 200m north of the Surf Club to minimise the potential for large volumes of sand to drift into Coffs Creek. This option restores the natural supply of sand to the Park Beach nearshore area and on balance has the least environmental and social impacts. No de-watering is required for this option, making it favourable over option 2.

Additionally, this option was the option that was preferred by most responding Agencies.

Option 4: Do nothing.

To do nothing would not achieve the proposal objectives to maintain suitable navigable depths within the harbour in order to provide marine vessels safe passage around the entry to the marina and boat ramp.

This option would also mean that dredged sand from the harbour would not be available to address coastal recession on beaches north of the harbour.

This option was not supported by responding Agencies. This option is not the preferred option and is not considered further in this REF.



Figure 3: Options considered. Source: North Coast Surveys 2024.

2.4.2 Analysis of options

Following a process of engagement with relevant government and community stakeholders, it has been determined that on balance, option 3 is the preferred option. This option has the least environmental impacts and would allow pumping directly into the placement area, thereby removing the need for de-watering and minimising community disruption and loss of amenity.

The following table demonstrates how Transport analysed the options and chose the preferred option.

Table 2.1: Analysis of options

	Acceptable Environmental and Cultural Heritage Impacts	Minimal Community Disruption and Loss of Amenity	Agency and Community Support	Cost and Efficiency	Achieves Objectives
Option 1	✓	✓	✗	✓	✗
Option 2	✗	✗	✗	✓	✓
Option 3	✓	✓	✓	✓	✓
Option 4	✓	✓	✗	✓	✗

2.5 Preferred option

Option 3 is the preferred option. This option would involve mass deposition nearshore to Park Beach (subject to sediment sampling) by removing sand from the harbour navigation channels of approximately 96,000m³ on average each year with on-going top-ups as sand is intermittently removed from the harbour. The initial dredging volume in early 2026 is expected to be approximately twice that volume. The exact dredging footprints would evolve as sand movement differs with ongoing accretion events (informed by regular bathymetric survey), however all dredging will be undertaken within the dredge study area shown within Figure 3.

This option would involve bottom dumping of nourishment material, which is suitable in the outer surf zone and nearshore area depending on the vessel draft. After the dredge (or barge) has filled its hopper with dredged sand from the harbour, it would travel past Mutton Bird Island and Little Mutton Bird Island to the sand placement area where it either opens hopper doors located at the bottom of the vessel or splits its hull. Split hopper is generally preferred as it allows for shallower placements. Nearshore placement aims to emulate a natural storm bar formation. If a storm arrives soon after beach nourishment, wave breaking may be triggered and thereby help protect the coast. If no storm arrives, the waves would redistribute the sand onshore to Park Beach. Where bottom dumping has been used in other NSW locations the beach response has been positive.

This preferred option is considered the best strategy to ensure safe navigation, protect sensitive habitats, and maintain the aesthetic and recreational value of local beaches. This option was chosen through comprehensive consideration of navigational requirements, stakeholder input and environmental constraints.

3 Description of the proposal

3.1 The proposal

The proposal involves the dredging of the harbour with a focus on the navigation channel and approaches of the Coffs Harbour regional boat ramp and the marina. These areas have been intermittently dredged over the last twenty-five years by various agencies.

This proposal aims to ensure that consistent and regular dredging is undertaken over the next ten years, to ensure safe passage for vessels in and out of the harbour. After the ten-year period, the project would be reviewed and refined, depending upon the results of the monitoring that would be undertaken during the project.

A major dredging campaign would be undertaken initially to remove approximately 200,000m³ of sand from the harbour (depending upon infilling rates and the available funds) and transport it, by barge or a similar form of transport, to the nearshore environment off Park Beach. After the initial major campaign, it is expected that volumes removed would be around 96,000m³ most years, with areas expected to be dredged every one to three years, depending upon the rate of infilling. Bathymetric surveys would be undertaken annually to determine the infilling rates to guide the dredging locations, volumes and schedule.

Sediment sampling of the dredging areas would be undertaken prior to each campaign to confirm that dredged material is suitable for beach nourishment. Where dredged material is not suitable for beach nourishment, it would be classified and re-used or disposed of in accordance with its waste classification.

3.2 Design

The design of the proposed works has been informed by the *Coffs Harbour Conceptual Sediment Transport Model for Sediment Management* at Appendix G and the *Coffs Harbour Coastal Zone Management Plan. Final Report* (BMT 2019).

The figure below (taken from Appendix G) provides a conceptual model of the sand movement at Coffs Harbour to inform the dredging footprint and depths that are required to achieve safe navigation into the boat ramp and marina.

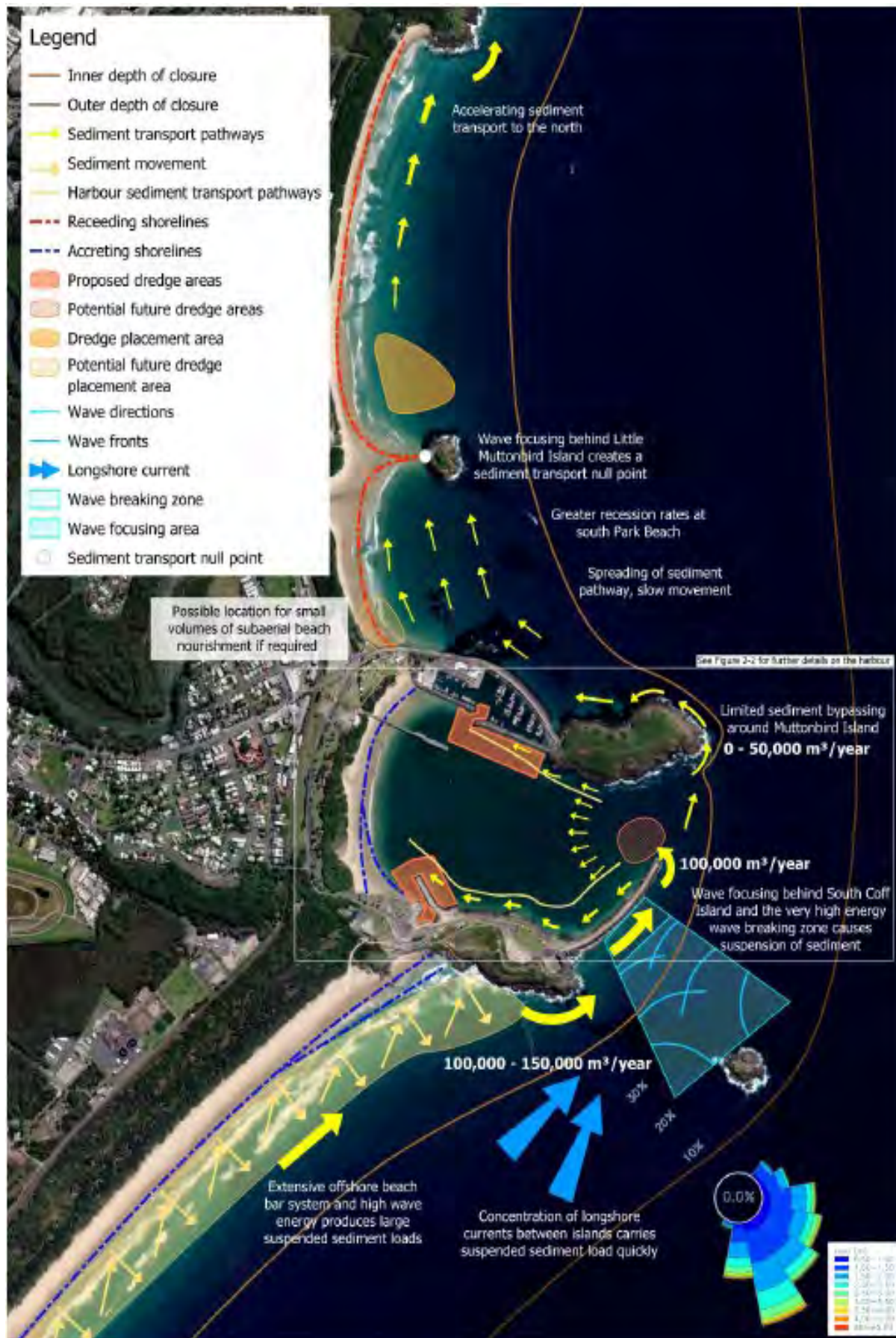


Figure 4: Conceptual Sand Movement Model. Source: RHDHV 2025

The dredge design would take into account likely sediment slumping at the edge of the dredge cut. A minimum batter slope of 1 in 4 would be applied for all dredge areas. Where the dredge area is constrained by rock walls and a shallow batter cannot be maintained, the stability of the structure would be considered and the impact of slumping of any loose sediment in these areas allowed for in the dredge design.

Particle size distribution compatibility would be assessed between the dredge cut location and the intended deposition area prior to each dredging campaign.

The figure below shows the approximate dredging footprint proposed, and the approximate volumes that would need to be removed to achieve the targeted depths.

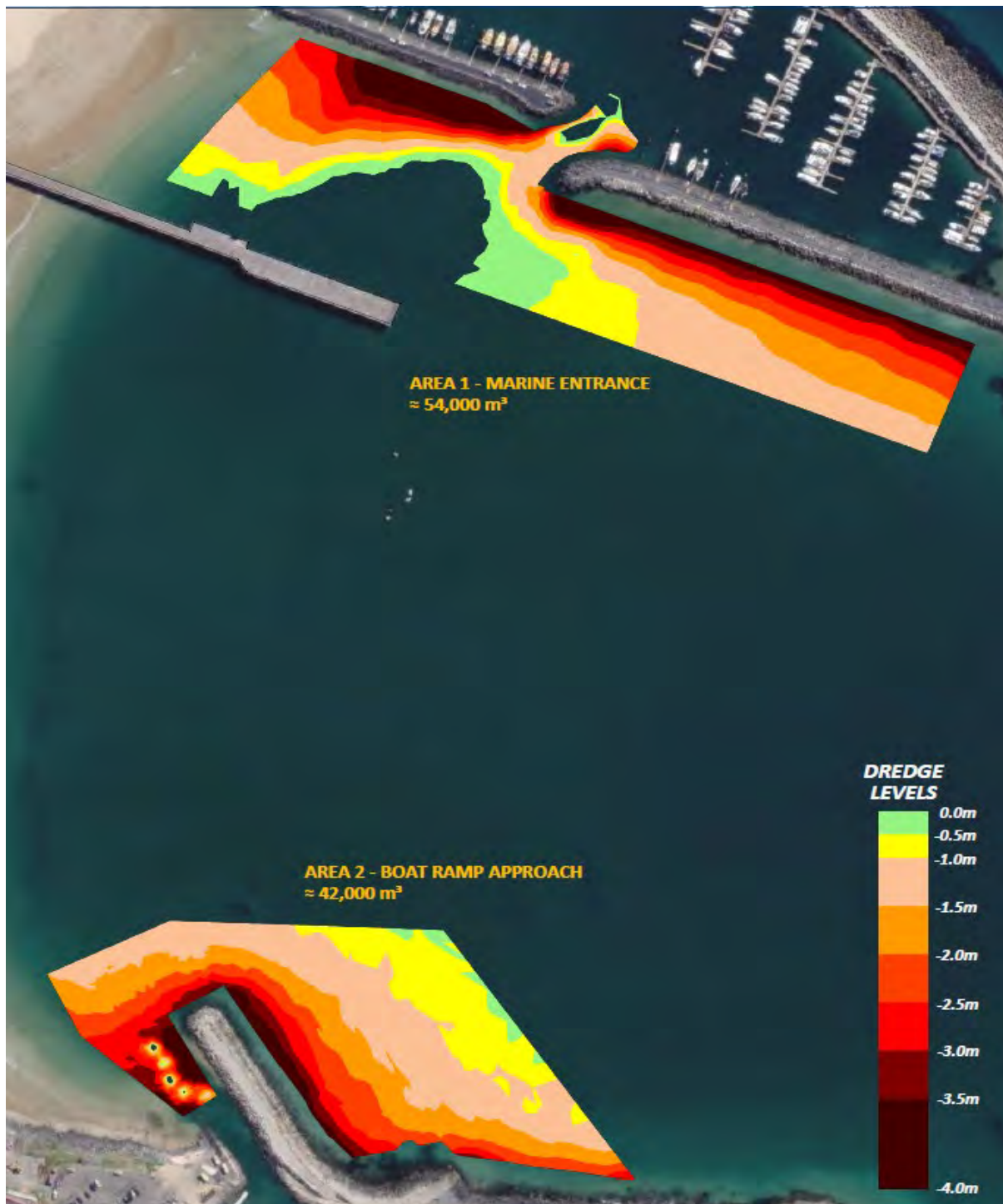


Figure 5: Dredging footprint. Source: North Coast Surveys August 2024.

Dredged materials (subject to sediment sampling results) would be placed approximately 100m offshore, north of Park Beach as per Figure 3. The nominated sand placement area (Area A of Figure 3) is indicative only, with final volumes, locations and elevations subject to the results of pre-placement hydrographic surveys. Maximum placement elevations would not exceed surrounding geomorphic features and all placement areas would maintain required buffers to sensitive habitat features identified in the Aquatic Ecology Assessment at Appendix C.

It is likely that on occasion, a cutter suction dredge would be used to shift sand from the marina entrance to a position further east within the nominated dredging footprint. This would only be undertaken when sand accretion requires the marina entrance to be cleared as a matter of priority (due to adverse weather events etc), and when the depth and width of the channel is not suitable for a larger dredge. Primarily sand would be removed from the marina entrance by a larger trailer suction hopper dredge during each programmed campaign. It may also be necessary to remove sand from the boat ramp navigation channel using a cutter suction dredge connected to the existing Gallows Beach pipeline.

The creation of sediment sinks along sediment transport pathways is proposed to reduce the rate of infilling in navigation channels. Each of the dredging activities considered in this REF would generally need to be repeated in perpetuity to provide long-term sand management. Levels proposed for sediment sinks are suggested to fit in-line with the surrounding bathymetry, and to provide a reasonable dredging volume within the annual harbour limits for each stage.

All sand placement activities would be guided by a Sand Placement Management Plan which would be informed through an annual review of the sediment transport model at Appendix G to map sediment erosion and accretion around Coffs Harbour, as well as post-placement surveys and annual hydrographic surveys.

3.3 Works activities

3.3.1 Work methodology and plant and equipment

The proposal is anticipated to involve the following work methodology and plant and equipment, subject to the contractor's proposal:

Preparation:

- The most recent conceptual sediment transport model prepared for Coffs Harbour would be reviewed to inform the most suitable approach for any dredging and beach nourishment campaign.
- A hydrographic survey of both the dredging and placement areas would be undertaken prior to the commencement of works to confirm dredging and placement areas and volumes, and the Sand Placement Management Plan would be prepared.
- A pre-works aquatic ecology survey and inspection for threatened species would occur, with any baseline data captured for monitoring purposes.
- Sediment sampling of the dredging area would be undertaken to confirm the suitability of the dredged material for beach nourishment or waste classification.
- Notifications will be provided to relevant prior to the commencement of the work.
- Update of relevant management plans including the CEMP.
- The site laydown area would be established and the positioning of the dredge vessel support platform or docking barge would occur.

- Appropriate navigational markers and aids would be installed at the dredge areas.

Dredging and Beach Nourishment:

Depending on target areas, contractor selection and plant availability, dredging is likely to utilise an ocean-going trailing suction hopper dredge as this would be the most efficient way of achieving the project objectives. A cutter suction dredge may also be required for areas with restricted access and ongoing maintenance requirements. The work method is outlined below:

Ocean-going trailing suction hopper dredge (TSHD): A TSHD is a vessel that operates under its own propulsion and works by lowering a suction head to the desired working depth. Sand is fluidised at the dredge head by a combination of water jets and suction. Sand is entrained in water drawn in at the suction head up a pipe and into an onboard hopper (a container designed to hold loose bulk material and discharge its contents from the bottom). Excess water from the dredging process spills out of the hopper and is discharged during dredging at the dredge site and during transit to the placement site. The skipper visually monitors the water quality within and around the hopper on a continual basis. Once the hopper is filled, the TSHD manoeuvres to the placement area.

Typically, the sand load is released directly underneath the dredge as the hull is split or hopper doors are opened. When releasing sand directly from the hopper, the water depth must be sufficient to allow access for the fully laden dredge and to allow sand to exit the hopper. Pumping can be used for shallower areas however this method is more expensive due to the need for additional equipment and will be avoided if possible.

The TSHD would be mobilised by sea. As the vessel can operate relatively independently, there is no particular requirement for a works compound or laydown area. However, if required, a site for this purpose would be allocated within the existing Transport Crown Licence area shown in Figure 5.

A TSHD would require a mooring location near the dredge areas. A mooring location would be established in an appropriate location in the harbour depending upon the weather. Mooring Areas would be nominated in a Navigation Plan that would be prepared by the contractor and approved by Transport in consultation with the relevant maritime stakeholders. The mooring would include a barge approximately 20m x 9m. The barge would be secured to the seabed by spuds, which are large steel poles used to stabilise the vessel during operations. The dredge would moor to the barge in between dredging periods. The barge would be removed from the harbour after dredging works.

Dredging would be undertaken until the target bed level and profile is reached. This would involve multiple passes over an area to progressively deepen and widen the dredge cut to design. Dredging is interrupted by the need to periodically unload the hopper, thus moving between the dredging and placement area.

The times of dredging are likely to be restricted. Specifically, restrictions would be eased during periods of high tide to allow the vessel to access shallower parts of the dredge area, and/or the dredge hopper may only be partially loaded to reduce laden vessel draft during cycles. This may reduce dredging production rates and increase the number of transit cycles required to transport sand to the placement area. The frequency and time taken for transits would depend on the TSHD employed for the work, as well as ocean and weather conditions.

For the preferred option, sand is to be progressively placed approximately parallel to existing sand shoal contours to the north of Park Beach Surf Club, approximately 100m offshore and 150m north of Little Mutton Bird Island. Sand would be placed to mimic the natural bed form and improve surf amenity. During placement, the full load of the dredge hopper is typically released within a matter of minutes. Then, it is spread by dispersion of the sand as it falls through the water column and by vessel movement during the placement process.

Both dredging and placement activities are typically controlled by Global Positioning System guidance. The guidance is informed by hydrographic survey and design information.

The main dredge vessel would be serviced by outboard-powered work boats. They may undertake functions such as crew transfer, hydrographic surveys or environmental monitoring.

The TSHD would also be utilised to create sediment sinks within the vicinity of the boat ramp entrance and the harbour entrance when identified as necessary by ongoing surveys. This would improve the longevity and efficiency of each campaign.

Cutter Suction Dredge: A cutter suction dredge (CSD) uses a rotating cutting tool to dislodge the sand and draw it into a suction pipe. Whilst dredging CSDs remain stationary by means of a spud that is lowered onto the seabed. A CSD dredges by making a sideways swinging motion using anchors and winches to achieve accurate dredging results. CSDs are not designed to operate in oceanic swell and would only be employed occasionally where sand removal is required from the marina entrance and boat ramp entrance, which would be too narrow and shallow for a TSHD when rapid sand accretion has occurred.

Where this method is required at the marina entrance sand would be side cast to the east of the marina entrance so that it can be picked up by the trailer suction hopper dredge during each programmed campaign. At the boat ramp, the CSD would be connected to the existing pipe that already transfers sand to Gallows Beach.

Disestablishment and rehabilitation:

Post-dredging and placement, hydrographic surveys would be undertaken to confirm compliance with the design, to verify volumes of sand moved and confirm completion of the contracted works.

At the conclusion of each dredging campaign, all vessels and other equipment would be removed from the harbour and any laydown area would be returned to original condition.

Environmental monitoring requirements would be undertaken in accordance with the relevant environmental management plans.

3.3.2 Works hours and duration

Dredging and nourishment activities would occur in discrete campaigns with a typical duration of approximately 8 weeks per campaign. Standard hours of operation would be:

- Monday to Friday: 7am – 6pm
- Saturday: 8am – 1pm
- Sundays and public holidays: No work.

The size of the dredging vessel, tides and weather conditions may influence times when dredging can take place. Therefore, extended construction hours of Monday to Sunday 5am to 10pm would apply when required, subject to a plan being prepared by the contractor and approved by Transport for works outside of standard working hours.

Subject to infill rates, it is anticipated that dredging would be required every three years, however annual hydrographic surveys would confirm the frequency of dredging required and it may be necessary to dredge more frequently.

3.3.3 Plant and equipment

Depending on the source material depth and location, the following types of dredge vessel and land-based plant may be used for the proposal:

Trailer Suction Hopper Dredge (TSHD):

- Suitable for dredging and transporting material (within hopper).
- Suitable for placement via pipeline or bottom dumping.

- Requires water depth greater than 4m for operation but is suitable for ocean conditions.
- Can operate in conjunction with other vessel traffic without significantly affecting navigation.

Cutter Suction Dredge

- Requires relatively sheltered location for operation
- Requires the installation of a pipeline to transport and place material at destination (potentially across navigation channel)
- is a stationary dredger and can cause delays to for vessel traffic when dredging in a shipping channel

Other equipment:

- Barges to transport sand or temporary equipment.
- Temporary sheds, signage, and barriers, etc. These would most likely be located near the car parking area at the boat ramp.
- Workboats.
- Safety fencing around the laydown area.
- Pipes and pipe racks.
- Storage containers.
- Navigation aids.
- Small handheld equipment (as required).

3.3.4 Traffic management and access

Sand placement would be achieved via marine plant only. Marine traffic would be managed via implementation of a Traffic Management and Navigation Plan to be prepared by the contractor and approved by Transport Maritime Operations prior to commencement of works.

3.4 Ancillary facilities

It is proposed that any ancillary facilities such as compound sites and laydown areas would be established within Transport's existing Crown License Area (RN618891) as shown in the figure below. It is likely that an area close to the boat ramp would be selected (if required). The area would be used for storage of machinery and equipment, site offices and amenities and vehicle parking for workers. It is likely that dredges would be moored within the marina area, subject to an approved Traffic Management and Navigation Plan.

The allocated compound sites and laydown areas would remain open to the public when not in use but would be closed off for short periods when they are required for the proposed works. This would be intermittent and infrequent. Pedestrian and traffic controls would be in place during the use of the proposed compound sites, and the community would be notified in advance of the sites being used. If a trailer suction hopper dredge is used, it is unlikely that any compound site would be required.



Figure 6: Transport's existing Maritime Infrastructure Crown Licence Area at Coffs Harbour

4 Statutory planning framework

This Part provides the statutory and planning framework for the proposal and considers the provisions of relevant state environmental planning policies, the local environmental plan and other relevant legislation.

4.1 Environmental Planning and Assessment (EP&A) Act 1979

The objects of the EP&A Act are:

- a. to promote the social and economic welfare of the community and a better environment by the proper management, development, and conservation of the State's natural and other resources,*
- b. to facilitate ecologically sustainable development by integrating relevant economic, environmental, and social considerations in decision-making about environmental planning and assessment,*
- c. to promote the orderly and economic use and development of land,*
- d. to promote the delivery and maintenance of affordable housing,*
- e. to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities, and their habitats,*
- f. to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),*
- g. to promote good design and amenity of the built environment,*
- h. to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,*
- i. to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,*
- j. to provide increased opportunity for community participation in environmental planning and assessment.*

The proposal is consistent with the objectives of the Act as it promotes the social and economic welfare of the community by ensuring that maritime navigation channels in Coffs Harbour can be accessed safely by the community. It promotes a better environment through the proper management of a natural resource and protects the natural environment through the implementation of safeguards.

As Transport is the proponent, the proposal has been assessed under Part 5 of the EP&A Act. Accordingly, Transport must satisfy Section 5.5 of the Act by examining and fully considering all matters which are likely to affect the environment by reason of the proposed activity. This REF and its supporting studies fulfill that requirement.

As the proposal is for the purpose of navigation and emergency response facilities and environmental management works (refer to the sections below) and is to be carried out on behalf of Transport, it can be assessed under Division 5.1 of the EP&A Act. Development consent from council is not required.

4.2 Environmental Planning and Assessment (EP&A) Regulation 2021

Clause 171 of the Regulation requires the determining authority to consider several environmental factors when considering the likely impacts of an activity on the environment.

This REF considers those factors in detail and Appendix A provides a summary of how the proposal complies with Clause 171 of the Regulations.

4.3 State Environmental Planning Policy (Transport and Infrastructure) 2021

SEPP (Transport and Infrastructure) 2021 aims to facilitate the effective delivery of infrastructure across the State.

Chapter 2 – Infrastructure

Division 13 Port, wharf or boating facilities

Section 2.80(2) of the SEPP permits development to be carried out by or on behalf of a public authority without consent on any land for the purposes of navigation facilities and environmental management works associated with a port facility or a wharf or boating facility. In this section, a reference to *“development for the purpose of navigation facilities, wharf or boating facilities also includes a reference to dredging, or bed profile levelling, of existing navigation channels, if that dredging or levelling is carried out for safety reasons”*.

Division 25 Waterway or foreshore management activities

Section 2.164 of the SEPP permits development for the purpose of waterway or foreshore management activities to be carried out on any land by or on behalf of a public authority without consent.

Waterway or foreshore management activities are defined in the SEPP to include *“coastal management and beach nourishment, including erosion control, dune or foreshore stabilisation works”*.

As the proposal is for the purpose of coastal management and includes beach nourishment to address the impacts of coastal erosion and is to be carried out by or on behalf of Transport, it can be assessed under Division 5.1 of the EP&A Act and development consent is not required.

Division 1 Consultation

Under section 2.10 of the SEPP Transport is required to undertake consultation with Council where proposed activities may impact on public places under the ownership of Council, have an impact on pedestrian/vehicle movements or have an impact on stormwater management services. The proposal may involve works that would impact upon public recreation areas that are under the care, management or control of Council, being foreshore areas between Coffs Harbour regional boat ramp and Park Beach. During works, the proposal may have minor short-term impacts on pedestrian movements in these open spaces.

Under section 2.11 of the SEPP Transport is required to undertake consultation with Council where proposed activities may have an impact on listed heritage items. The dredging footprint is in proximity to the State heritage listed Coffs Harbour Jetty.

Coffs Harbour City Council were consulted during the preparation of this REF. A written response was received and is summarised in Part 5 of this REF.

The proposal is being undertaken in proximity to a nature reserve (Muttonbird Island) therefore the DCCEEW Biodiversity and Conservation Service were consulted in accordance with section 2.15 of the SEPP. A written response was received and is summarised in Part 5 of this REF.

As the sand placement is being undertaken within the Solitary Islands Marine Park declared under the Marine Estate Management Act 2014, consultation with NSW DPIRD Marine Parks was undertaken in accordance with section 2.73 of the SEPP. A written response was received and is summarised in Part 5 of this REF.

The selected locations and placement methodology of the dredged material would minimise the environmental effects of dredging (the development) by avoiding areas of sensitive marine vegetation, large tidal currents, and areas of high vessel traffic. Further, the placement of the material in the preferred location would be likely to contribute to the onshore sand supply of beaches north of the harbour, providing additional sand for areas of known coastal recession. As such, the placement of the dredged material is also “environmental management works” as described in this SEPP.

The proposal is not located on land reserved under the National Parks and Wildlife Act 1974 and does not require development consent or approval under:

- State Environmental Planning Policy (Precincts – Eastern Harbour City) 2021,
- State Environmental Planning Policy (Precincts – Central River City) 2021,
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021,
- State Environmental Planning Policy (Precincts – Regional) 2021, or
- State Environmental Planning Policy (Planning Systems) 2021.

4.4 Other relevant NSW legislation

4.4.1 Coastal Management (CM) Act 2016

The objects of the CM Act are to manage the coastal environment of New South Wales in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the people of the State, and in particular:

a. to protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience, and

b. to support the social and cultural values of the coastal zone and maintain public access, amenity, use and safety, and

c. to acknowledge Aboriginal peoples' spiritual, social, customary, and economic use of the coastal zone, and

d. to recognise the coastal zone as a vital economic zone and to support sustainable coastal economies, and

e. to facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making, and

f. to mitigate current and future risks from coastal hazards, taking into account the effects of climate change, and

g. to recognise that the local and regional scale effects of coastal processes, and the inherently ambulatory and dynamic nature of the shoreline, may result in the loss of coastal land to the sea (including estuaries and other arms of the sea), and to manage coastal use and development accordingly, and

h. to promote integrated and coordinated coastal planning, management, and reporting, and

i. to encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events, and

j. to ensure co-ordination of the policies and activities of government and public authorities relating to the coastal zone and to facilitate the proper integration of their management activities, and

k. to support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions, and

l. to facilitate the identification of land in the coastal zone for acquisition by public or local authorities to promote the protection, enhancement, maintenance, and restoration of the environment of the coastal zone, and

m. to support the objects of the Marine Estate Management Act 2014.'

Part 3 of the CM Act applies to any public authority that exercises functions in connection with the coastal zone. Division 4 Clause 23 states:

(2) Public authorities (other than local councils) are to have regard to coastal management programs to the extent that those programs are relevant to the exercise of their functions.

The proposal is located in the coastal zone, as defined by the CM Act. The proposal is consistent with the objectives of the CM Act as it contributes to maintaining the coastal zone as a vital economic zone and to supporting a sustainable coastal economy by mitigating the impacts and risks of coastal hazards.

A Coastal Zone Management Plan (CZMP) (WBM, 2019) has been prepared for Coffs Harbour. The proposal is consistent with that Plan which includes an action to implement a dredging and sand placement program to improve sand reserves north of the harbour.

4.4.2 Fisheries Management (FM) Act 1994

The objects of the FM Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. To meet the objectives of the Act, Part 7 of the FM Act outlines legislative provisions to protect fish habitat and Part 7A outlines provisions to conserve threatened species of fish and marine vegetation and their habitat.

An assessment of the potential impacts of the proposal on marine biodiversity is included at Appendix C. The assessment concludes that the proposal is unlikely to have a significant impact on any threatened species, marine vegetation, or habitat provided that the recommended safeguards and management measures are implemented during the proposed works.

Under Section 205 of the FM Act, a permit is required to harm (cut, remove, damage, destroy, shade, etc.) marine vegetation including saltmarshes, mangroves, seagrass, and seaweeds. The proposal is unlikely to involve any harm to marine vegetation and a Section 205 permit would not be needed for the initial dredging campaign. The requirement for future permits will be assessed as part of the Marine Habitat Survey undertaken prior to each dredging campaign.

Under Section 199 of the FM Act, written notification to the Minister is required before any dredging work is carried out. Any response from the Minister within 21 days must be taken into consideration. DPIRD Fisheries were consulted as part of the preparation of this REF, and their comments have been considered in Part 5 of this REF. DPIRD Fisheries would be notified again after the REF is determined and prior to commencement of works.

4.4.3 Biodiversity Conservation (BC) Act 2016

The Biodiversity Conservation Act 2016 (BC Act) provides for legal protection of biodiversity and threatened species in NSW. Specifically, it provides for the following:

- A process for declaring and protecting areas of outstanding biodiversity value.
- The listing of threatened species, populations and ecological communities, with critically endangered, endangered and vulnerable species under Schedule 1.
- The listing of critically endangered, endangered and vulnerable ecological communities under Schedule 2.

- The listing of extinct species, species extinct in the wild and collapsed ecological communities of animals and plants under Schedule 3.
- Requirements for the preparation of a species impact statement (SIS).
- Determining where the Biodiversity Offset Scheme (BOS) applies to proposals.

The BC Act sets the criteria for determining whether a proposal is likely to have a significant impact on threatened biodiversity listed under the BC Act. If significant impacts are identified, the preparation of a SIS or Biodiversity Development Assessment Report (BDAR) would be required.

The BC Act identifies areas with outstanding biodiversity value. The Biodiversity Values (BV) Map has been prepared under Part 7 of the BC Act to protect land sensitive to impacts from development and clearing. Listed items of threatened biodiversity under the BC Act with the potential to be impacted by this proposal would require further consideration. For Division 5.1 projects, a significant impact may trigger the requirement for determination under the BOS.

Listed items of threatened biodiversity under the BC Act with the potential to be impacted by the proposal have been considered in detail in the *Assessments of Significance* in Appendix C. For Division 5.1 projects, a significant impact may trigger the requirement for determination under the BOS. The Assessments of Significance conclude that there is unlikely to be a significant impact on any threatened biodiversity provided that the safeguards in this report are implemented during the works. Ongoing surveys and assessment of biodiversity would be undertaken over the ten-year period to ensure that predicted impacts remain valid.

4.4.4 Aboriginal Land Rights (ALR) Act 1983

The purpose of the ALR Act is to provide land rights for Aboriginal persons in NSW, including the provision of representative Aboriginal Land Councils, and to provide for the acquisition of land and other assets by or for those Councils. Division 2 section 36 of the ALR Act includes provisions for claimable Crown lands.

On 2 August 2024, the Crown Lands division of the Department of Planning, Housing and Infrastructure notified Transport that an Aboriginal Land Claim (ALC) had been lodged by the NSW Aboriginal Land Council on 17 July 2024. The ALC covers the whole of the harbour, including the waters within and the surrounding public lands including Gallows Beach and breakwalls (not including Muttonbird Island).

The ALC is currently undetermined, however if the ALC is granted, the area will be transferred to the Local Aboriginal Land Council and Transport will not be able to proceed with the proposal within the granted area without the agreement of the Local Aboriginal Land Council.

Although the ALC is undetermined, Transport have begun informal consultation with the Coffs Harbour and District Local Aboriginal Land Council, and the Land Council have stated that they approve of dredging of the inner harbour within the ALC area. It is intended that consultation with the Land Council will continue if the proposal is approved.

4.4.5 Marine Estate Management (MEM) Act 2014

The MEM Act provides for strategic and integrated management of the whole marine estate, including marine waters, coasts and estuaries. The MEM Act does this by providing for management of the marine estate consistent with principles of ecologically sustainable development, the establishment of two advisory committees, development of the *Marine Estate Management Strategy* and providing a comprehensive system of marine parks and aquatic reserves.

The Solitary Islands Marine Park is located to the north of the harbour, including the nearshore area of Park Beach, and Coffs Creek, as shown in the figure below.

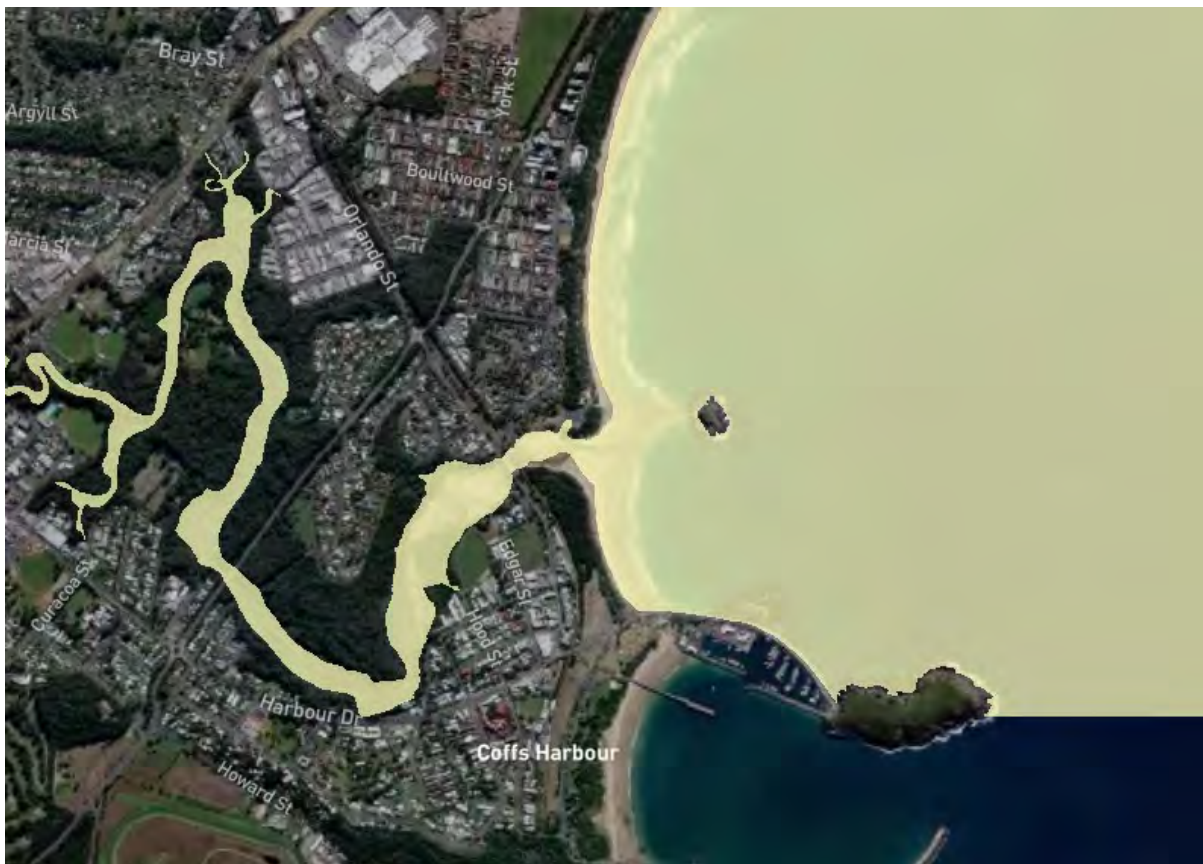


Figure 7: Southern extent of Solitary Islands Marine Park. Source:
<https://www.dpi.nsw.gov.au/fishing/marine-protected-areas/marine-parks/solitary-islands-marine-park>

The Act is supported by regulations that detail management rules for the marine estate, marine parks and aquatic reserves.

No dredging would be undertaken within the boundaries of the Solitary Islands Marine Park. The component of the works within the Marine Park would include sand placement in the nearshore area off Park Beach. The Act Division 6 section 55(3) states:

A determining authority (not being a Minister) must not carry out, or grant approval to carry out, an activity unless the determining authority has—

(a) taken into consideration—

(i) if there are management rules for the marine park or aquatic reserve, the purposes of the zone within which the area concerned is situated as specified in those management rules, and

(ii) the permissible uses of the area concerned under the regulations or the management rules, and

(iii) if a management plan for the marine park or aquatic reserve has been made, the objectives of the marine park or aquatic reserve, and

(iv) any relevant marine park or aquatic reserve notifications.

Clause 9 of the MEM Regulation Sets out the following assessment criteria for deciding whether or not to give consent to the carrying out of any activity in a marine park or an aquatic reserve:

Table 4.1: MEM Regulation assessment criteria

Criteria	Compliance
(a) the objects of the Act (as specified in section 3 of the Act)	The proposal complies with the objects of the MEM Act as it: • facilitates economic opportunities for the people of New South Wales, including opportunities for regional communities, and • the cultural, social and recreational use of the marine estate, and • the maintenance of ecosystem integrity through contributing to the natural northward littoral drift of sediment to contribute to beach nourishment.
(b) the purposes of marine parks and aquatic reserves (as specified in sections 22 and 33 of the Act respectively)	The proposal is consistent with the purpose of the marine park as it would contribute to the natural longshore sediment transport system, thereby contributing to reducing beach erosion and long-term recession north of the harbour.
(c) the objects of the zone in which the activity is proposed to be carried out,	The sand would be placed within the marine park habitat protection zone (HPZ). The proposed works would require a permit under clause 1.16 of the <i>Marine Estate Management (Management Rules) Regulation 1999</i> to harm, damage or interfere with habitat (including soil, sand, shells or other material occurring naturally within the zone). Clause 1.8 of the Regulation establishes the objectives of HPZ as “to provide a high level of protection for biological diversity, habitat and ecosystems”. Consent for activities within HPZ can only be granted where consistent with the objects, to provide opportunities for recreational and commercial activities (including fishing), scientific research, educational activities and other activities, so long as they are ecologically sustainable and do not have a significant impact on any fish populations or on any other animals, plants or habitats. The sand would be placed in the nearshore area to join the natural longshore sediment transport processes of the coastline in this location, thereby contributing to natural sand accretion on beaches north of the harbour. This is an ecologically sustainable approach to address the artificial structures such as breakwaters, seawalls and groynes that have been introduced into the natural system and caused significant perturbations of the beach processes. Most notably the breakwaters in the harbour which act as shore-normal barriers to the longshore transport of sand, trapping sand and building out the beach/dune on the updrift

Criteria	Compliance
	(southern) side and eroding an equivalent quantity of sand from the downdrift (northern) side.
(d) the activities that are permissible in the zone in which the activity is proposed to be carried out (as specified in the relevant management rules),	The proposal does not include an activity that is prohibited in the zone.
(e) any operational plan for the marine park adopted by the Marine Parks Authority pursuant to section 25 (4) of the Marine Parks Act 1997 (before its repeal) that continues to have effect because of clause 5 of Schedule 2 to the Marine Estate Management Act 2014,	The Operational Plan for the Park (October 2003) outlines the scheme of operations that Marine Parks intends to undertake or permit in providing for conservation and sustainable use of Solitary Islands Marine Park to attain the objects of the Act. Management Action 3.5.2 states that Marine Parks will <i>"Assist in ensuring that adequate beach launching, boat ramp and other vessel access points are maintained in conjunction with the Coffs Harbour City Council, Pristine Waters Council and the Waterways Authority"</i> The proposal is consistent with the operational plan.
(f) any management plan for the marine park or aquatic reserve,	A network management plan for the five mainland marine parks (including Solitary Islands) is currently under preparation.
(g) any threatened species or other protected flora or fauna under the Fisheries Management Act 1994, the National Parks and Wildlife Act 1974 or the Threatened Species Conservation Act 1995 that may be affected by the proposed activity,	The Aquatic Ecology Assessment at Appendix C of this REF examines in detail the likelihood of threatened species or other protected flora or fauna under the Fisheries Management Act 1994, the National Parks and Wildlife Act 1974 or the Biodiversity Conservation Act 2016 that may be affected by the proposed activity. That assessment concludes that no significant impact is likely as a result of the proposed activity.
(h) the form of transport to be used to gain access to the zone in, on or from which the activity is proposed to be carried out, having regard to the adequacy of facilities for parking, mooring and landing vehicles, vessels and aircraft, and for loading and unloading them,	A dredge and barge are the likely forms of transport used to gain access to the Park. The vessel used would not be required to land or moor within the marine park and would only enter intermittently to unload clean marine sand in the nearshore area.
(i) the type of equipment to be used in connection with the proposed activity,	Part 3 of this REF describes the type of equipment likely to be used in connection with the proposed activity.
(j) the arrangements that have been made for the prevention, mitigation and making good of any damage to the marine park	The Aquatic Ecology Assessment at Appendix C and the Sediment and Water Quality Assessment at Appendix D detail the safeguards that would be in place to ensure that any damage to the marine park arising as a result of the proposal are minimised and

Criteria	Compliance
or aquatic reserve arising from the proposed activity,	mitigated. These have been included in the REF in Parts 5 and 6.
(k) such other requirements as the relevant Ministers consider appropriate to the proposed activity.	The NSW DPIRD were consulted as part of the preparation of this REF. Their requirements and concerns have been addressed throughout the REF.

4.4.6 Crown Land Management (CLM) Act 2016

The CLM Act provides for the ownership, use and management of Crown land of NSW. Under Section 2.18 and Division 5.6 of the CLM Act the Minister may grant a licence authorising the use or occupation of Crown land for any facility or infrastructure or any other purpose that the Minister thinks fit.

Transport would apply for a long-term licence over the Crown land at Park Beach, to allow the proposal to proceed. This would be the area of the proposed works below the mean high-water mark and would cover the sand placement area.

Section 1.3 outlines the objects of the CLM Act:

(a) to provide for the ownership, use and management of the Crown land of New South Wales, and

(b) to provide clarity concerning the law applicable to Crown land, and

(c) to require environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown land, and

(d) to provide for the consistent, efficient, fair and transparent management of Crown land for the benefit of the people of New South Wales, and

(e) to facilitate the use of Crown land by the Aboriginal people of New South Wales because of the spiritual, social, cultural and economic importance of land to Aboriginal people and, where appropriate, to enable the co-management of dedicated or reserved Crown land, and

(f) to provide for the management of Crown land having regard to the principles of Crown land management.

The proposal is consistent with the objects of the CLM Act as this REF has taken into consideration the environmental, social, cultural heritage and economic considerations of the use of Crown land. It also provides for the management of Crown land in accordance with section 1.4 of the CLM Act which sets out the principles of Crown land management as addressed below:

(a) that environmental protection principles be observed in relation to the management and administration of Crown land, and

(b) that the natural resources of Crown land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible, and

(c) that public use and enjoyment of appropriate Crown land be encouraged, and

(d) that, where appropriate, multiple use of Crown land be encouraged, and

(e) that, where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity, and

(f) that Crown land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interests of the State consistent with the above principles.

The proposal seeks to re-instate areas of important public space (this includes the navigation channels and beaches north of the harbour) in such a way that both the land and its resources are sustained in perpetuity.

4.4.7 Protection of the Environment Operations (POEO) Act 1997

The POEO Act focuses on environmental protection and provisions for the reduction of water, noise and air pollution and the storage, treatment, and disposal of waste.

The POEO Act introduces licensing provisions for scheduled activities that are of a nature and scale that have the potential to cause environmental pollution. It also includes measures to limit pollution and manage waste. This Act is administered by the NSW Environment Protection Authority (EPA) who were consulted as part of this REF.

Schedule 1 Clause 39 of the POEO Act lists waste disposal (application to land) as a scheduled activity.

Subclause (2)(e) states that this Clause does not apply to sites where only virgin excavated natural material (VENM) is received from off site and applied to land.

The POEO Act defines virgin excavated natural material (VENM) as ‘natural material (such as clay, gravel, sand, soil or rock fines):

n. that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities, and

o. that does not contain any sulfidic ores or soils or any other waste, and

p. includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved for the time being pursuant to an EPA Gazettal notice.’

Only VENM would be placed at the placement site. Dredged sand would be tested prior to placement in accordance with Appendix D, to ensure that it meets the criteria for classification as VENM.

A dredging and beach nourishment project does not require an Environment Protection Licence (EPL) under the POEO Act because it is not a scheduled activity under the Act. However, Transport may voluntarily apply for an EPL as a non-scheduled activity to regulate water pollution and to provide a defence against accidental pollution of waters as a precaution. The EPA may not issue an EPL if they believe there is a low risk of pollution. In the case of the proposal, monitoring, controls and thresholds would be in place to ensure that there would be only a low likelihood of water pollution occurring.

If the controls set out in the relevant guidelines and quality assurance specifications, and additional controls detailed in Part 6 are implemented, and monitored, there is unlikely to be any significant water, noise, or air pollution impact.

Schedule 1 of the Act lists premises-based activities that require an Environment Protection Licence (EPL). Part 1, Clause 19 of Schedule 1 includes extractive activities, including the maintenance dredging of a navigation channel for vessels, carried out by or on behalf of a public authority. It states that an activity is not premises-based if it is carried out by means of mobile plant. Further, Part 2 of Schedule 1 does not prescribe any non-premises-based activities for extractives activities (including maintenance dredging for navigation channels).

The definition of “mobile plant” is described in Schedule 1, Part 3 Division 2 of the Act to be:

...any equipment or machinery that—

(a) is capable of carrying on any one or more of the activities referred to in Part 1 of this Schedule, and

- (b) is capable of moving under its own motive power or being transported, and*
(c) is operated at a particular site on a temporary basis only (that is, for a total period of not more than 6 months in any 12-month period),

but does not include railway vehicles used or intended to be used to transport passengers or freight for reward or to maintain railway track and equipment.

As the proposed dredging is not premises-based, and is being undertaken by mobile plant, an EPL is not required for the dredging activities.

4.4.8 Heritage Act 1977

The *Heritage Act of 1977* protects the conservation of buildings, works, maritime heritage (wrecks), archaeological relics and places of heritage value through their listing on various State and local registers. It makes it an offence to harm any non-Aboriginal heritage values without approval.

The Coffs Harbour Jetty is listed on the State Heritage Register. It includes the jetty structure and the land and water within 5m of the structure. The Jetty is located in proximity to dredge area 1, but outside the dredging footprint and area of potential impact.

No dredging or sand placement activities would be undertaken in the vicinity of state-listed heritage items, thus approval of the proposed works is not required under Part 4 of the Heritage Act.

4.4.9 Marine Safety Act 1998 and Marine Safety Regulation 2016

The objects of the Marine Safety Act 1998 are:

- (a) to ensure the safe operation of vessels in ports and other waterways,*
(b) to promote the responsible operation of vessels in those waters so as to protect the safety and amenity of other users of those waters and the amenity of occupiers of adjoining land,
(b1) to provide an effective framework for the enforcement of marine legislation,
(c) to provide for the investigation of marine accidents and for appropriate action following any such investigation,
(d) to consolidate marine safety legislation.

The proposal meets the objectives of the Marine Safety Act 1998. Under Section 18 of the Marine Safety Act 1998, the proposal is an aquatic activity as it would be undertaken on navigable waters and would temporarily restrict the availability of those waters for normal use by the public.

As such, Section 97(1) of the Marine Safety Regulation 2016 would require the work to be subject to an approval issued by Transport Operations (Maritime).

4.4.10 State Environmental Planning Policy (Resilience and Hazards) 2021

Although the proposal does not require consent under the provisions of SEPP (Resilience and Hazards) 2021, the provisions of the SEPP are considered below as the development is within the coastal zone.

Chapter 2 of the SEPP (Resilience and Hazards) aims to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the

objects of the *Coastal Management (CM) Act 2016*, including the management objectives for each coastal management area.

The CM Act defines the coastal zone into four coastal management areas:

- i. Coastal wetlands and littoral rainforest area
- ii. Coastal environment area
- iii. Coastal use area
- iv. Coastal vulnerability area

Under the SEPP, works in an area identified as coastal wetlands or littoral rainforests require development consent. The proposal is not located on land classified as coastal wetland or littoral rainforest. Further, no works are proposed within any proximity areas.

The proposal is located on land mapped as a coastal vulnerability area, coastal environment area and coastal use area. The considerations in the table below are relevant.

Table 4.2: SEPP (Resilience and Hazards) 2021 considerations

Consideration	Comment
Clause 2.9 – Coastal Vulnerability Area	
(a) if the proposed development comprises the erection of a building or works—the building or works are engineered to withstand current and projected coastal hazards for the design life of the building or works	The proposed works would not compromise any building or other works.
(b) the proposed development— (i) is not likely to alter coastal processes to the detriment of the natural environment or other land, and (ii) is not likely to reduce the public amenity, access to and use of any beach, foreshore, rock platform or headland adjacent to the proposed development, and (iii) incorporates appropriate measures to manage risk to life and public safety from coastal hazards	The legacy construction of Coffs Harbour has resulted in sand accretion at the northern end of Boambee Beach, infilling of the harbour and subsequent recession of Park Beach. In more recent years the extension of the boat ramp breakwater has caused further infilling of the boat ramp area. A conceptual model of the local sand movement has been prepared for this REF (Appendix G) and has informed the design of the proposal, ensuring optimal sand placement for long-term stability and for meeting the needs of the area. All works would be short-term, minor and are necessary to manage coastal hazards. Measures would be in place to manage risks and public safety during works.
(c) measures are in place to ensure that there are appropriate responses to, and management of, anticipated coastal processes and current and future coastal hazards.	The works are being undertaken to address current and future coastal hazards.
Clause 2.10 – Coastal Environment Area	
(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment	The proposal would have some minor temporary impacts on water quality. The proposal would not cause an adverse effect on the integrity and resilience of the biophysical,

Consideration	Comment
	hydrological (surface and groundwater) and ecological environment.
(b) coastal environmental values and natural coastal processes	The works are not expected to negatively impact coastal processes. A conceptual model of the local sand movement has been prepared for this REF (Appendix G) and has informed the design of the proposal, ensuring optimal sand placement for long-term stability and for meeting the needs of the area. The strategic placement of the material is expected to minimise any potential impacts. The proposal is not expected to cause an adverse impact on coastal environmental values and natural coastal processes.
(c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1	The proposal would have some minor, temporary impacts on water quality however, it is not expected to have a long-term adverse effect on water quality. The proposal would not impact sensitive coastal lakes as none are located near the proposal.
(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms	The proposal would avoid impacting native vegetation, undeveloped headlands and rock platforms. The proposal avoids areas of known marine vegetation where practicable, with only minimal indirect disturbances expected. The proposal may cause minor temporary disturbance to marine fauna; however, it is unlikely to significantly impact fauna.
(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability	Laydown sites (if required) would maintain public access to and along adjacent foreshore areas. No adverse impacts on existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability, are expected.
(f) Aboriginal cultural heritage, practices and places	There are several listed Aboriginal sites in close proximity to the works footprint, though none are located within the works area. Although the inner harbour is subject to an undetermined Aboriginal Land Claim, the Local Aboriginal Land Council have approved of the proposed dredging. Provided that ongoing consultation with the Land Council is undertaken, it is unlikely that the works would affect any Aboriginal cultural heritage, practice or place.

Consideration	Comment
(g) the use of the surf zone	The placement of the dredged material may impact the quality of the surf break. However, applying the identified placement specifications and measures would minimise any impact, with no significant adverse long-term effects expected.
Clause 2.11 Coastal Use Area	
whether the proposed development is likely to cause an adverse impact on the following— (i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability, (ii) overshadowing, wind funnelling and the loss of views from public places to foreshores, (iii) the visual amenity and scenic qualities of the coast, including coastal headlands, (iv) Aboriginal cultural heritage, practices and places, (v) cultural and built environment heritage	The preferred option would be unlikely to result in any disruption to access to public spaces. Works would be undertaken away from popular beach areas and outside of peak holiday times, to minimise disruption. There would be no overshadowing, wind funnelling or loss of views. Whilst there would be a minor loss of visual amenity during works, this would be short-term only. No Aboriginal cultural heritage, practices or places, or cultural or built environment heritage are likely to be impacted by the works.
(i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or (ii) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or (iii) if that impact cannot be minimised—the development will be managed to mitigate that impact	The works would be designed, sited and managed to avoid adverse impacts to the greatest extent possible, without compromising the efficiency of the project. Safeguards are proposed in this REF to avoid, manage and mitigate potential impacts.
(c) the surrounding coastal and built environment, and the bulk, scale and size of the proposed development	The works are intermittent and temporary. Impacts on the coastal environment are expected to be minimal.

Clause 2.16 of the SEPP addresses coastal protection works. Section 4(1) of the Coastal Management Act 2016 defines coastal protection works to mean:

(a) beach nourishment activities or works, and

(b) activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters, including (but not limited to) seawalls, revetments and groynes.

Clause 2.16(2) states that:

Development for the purpose of coastal protection works may be carried out on land to which this Chapter applies by or on behalf of a public authority—

(a) without development consent—if the coastal protection works are—

(i) identified in the relevant certified coastal management program, or

(ii) beach nourishment

As the sand placement activities are consistent with the Coffs Harbour Coastal Zone Management Plan (CZMP) 2019, are for the “purposes” of beach nourishment, and are to be undertaken by Transport for NSW, which is a public authority, the works can be undertaken without development consent.

4.4.11 Local Environmental Plan

Coffs Harbour Local Environmental Plan 2013

The proposed works would be undertaken in, or in proximity to, the following land use zones:

- W3 Working Waterways
- W4 Working Waterfront
- SP2 Infrastructure
- RE1 Public Recreation
- RE2 Private Recreation

The objectives of the W3 Working Waterways zone are:

- To enable the efficient movement and operation of commercial shipping, water-based transport and maritime industries.
- To promote the equitable use of waterways, including appropriate recreational uses.
- To minimise impacts on ecological values arising from the active use of waterways.
- To provide for sustainable fishing industries.

The objectives of the W4 Working Waterfront zone are:

- To retain and encourage industrial and maritime activities on foreshores.
- To identify sites for maritime purposes and for activities requiring direct foreshore access.
- To ensure that development does not have an adverse impact on the environment and visual qualities of the foreshore.
- To encourage employment opportunities.
- To minimise any adverse effect of development on land uses in other zones.
- To encourage active living through the provision of healthy, walkable, green and safe built environments and streets, greener connections and walking and cycling infrastructure.
- To ensure development reflects design excellence and a high visual standard within the public domain.

The proposal is consistent with the objectives of the W3 and W4 zones as it would provide safe and efficient navigation channels to allow maritime activities to continue in the harbour.

The objectives of the SP2 Infrastructure zone are:

- To provide for infrastructure and related uses.
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.
- To encourage active living through the provision of healthy, walkable, green and safe built environments and streets, greener connections and walking and cycling infrastructure.

The proposal is consistent with the objectives of the SP2 zone as it proposes ongoing maintenance works to ensure that public infrastructure (the marina and boat ramp) remains accessible.

The objectives of the RE1 Public Recreation zone are:

- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.
- To encourage active living through the provision of healthy, walkable, green and safe built environments and streets, greener connections and walking and cycling infrastructure.
- To ensure that development reflects design excellence and is of a high visual quality in its presentation to the public realm.
- To provide places that are safe and welcoming, that meet the needs of a diverse population and facilitate equitable access.
- To encourage places that reflect local character and identity and allow for cultural expression.

The objectives of the RE2 Private Recreation zone are:

- To enable land to be used for private open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.
- To encourage active living through the provision of healthy, walkable, green and safe built environments and streets, greener connections and walking and cycling infrastructure.
- To ensure that development reflects design excellence and is of a high visual quality in its presentation to the public realm.

The proposal is consistent with the objectives of the RE1 and RE2 zones as it would allow areas of both public and private open space to be continued to be used for recreational purposes.

As the proposal can be assessed under Part 5 of the EP&A Act 1979 and is permitted without consent under SEPP (Transport and Infrastructure) 2021, consent from Council is not required.

4.5 Commonwealth legislation

4.5.1 Environment Protection and Biodiversity Conservation (EPBC) Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land'. These are considered in Appendix A, Appendix C and Part 6 of this REF.

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water under the EPBC Act.

4.5.2 Other relevant Commonwealth legislation

Native Title (NT) Act 1994

The main objects of the NT Act are:

- (a) *to provide for the recognition and protection of native title; and*
- (b) *to establish ways in which future dealings affecting native title may proceed and to set standards for those dealings; and*
- (c) *to establish a mechanism for determining claims to native title; and*
- (d) *to provide for, or permit, the validation of past acts, and intermediate period acts, invalidated because of the existence of native title.*

There were no Native Title claims registered over the study area with the National Native Title Tribunal at the time of writing this REF. NTS Corp were consulted during the preparation of this REF. No response has been received from NTS Corp. Prior to each dredging campaign, a Native Title search on the works area would be undertaken to check whether any claim has been lodged, and NTS Corp would be consulted.

4.6 Confirmation of statutory position

The proposal can be assessed under Division 5.1 of the EP&A Act.

Section 2.80(2) of the SEPP (Transport and Infrastructure) 2021 permits development to be carried out by or on behalf of a public authority without consent on any land for the purposes of navigation facilities and environmental management works associated with a port facility or a wharf or boating facility. In this section, a reference to “*development for the purpose of navigation facilities, wharf or boating facilities also includes a reference to dredging, or bed profile levelling, of existing navigation channels, if that dredging or levelling is carried out for safety reasons*”.

Section 2.164 of the SEPP permits development for the purpose of waterway or foreshore management activities to be carried out on any land by or on behalf of a public authority without consent.

Waterway or foreshore management activities are defined in the SEPP to include “*coastal management and beach nourishment, including erosion control, dune or foreshore stabilisation works*”.

The proposal to dredge navigational areas within Coffs harbour is “*development for the purpose of wharf or boating facilities*” and is being carried out by or on behalf of a public authority (being Transport) and is permissible without consent.

The proposal is not State significant infrastructure or State significant development. The placement of dredged sand by a public authority for the purposes of beach nourishment is permissible without consent under Section 2.16(2)(a)(2) of SEPP (Resilience and Hazards) 2021.

Transport for NSW is the determining authority for the proposal. This REF fulfils Transport’s obligation under section 5.5 of the EP&A Act to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

5 Consultation

5.1 Consultation strategy

Consultation activities are programmed to align with key project milestones to keep the community updated and informed throughout the project.

A dedicated project web page has been developed to be a central location for all community information relating to the project. A project specific email inbox and free call number has been established for the project so that the community has the ability to contact the project team for complaints and enquiries at any stage during the project.

Transport's consultation strategy is to engage and involve the community in a "have your say" process during the REF display, for a period of not less than three weeks. This strategy allows the community to consider the potential impacts of the project and provides the opportunity for the community to provide informed feedback.

Once the "have your say" period is completed the project team would review all feedback received and provide a response as part of a Submissions Report which would be prepared after the consultation period has ended. Any changes as a result of the feedback would be made publicly available within the Submissions Report.

5.2 Values

Transport's corporate values underpin their decisions and behaviours when working with customers, colleagues, stakeholders and partners as follows:

Customer focus - *We place the customer at the centre of everything we do*

Collaboration - *We value each other and create better outcomes by working together*

Solutions - *We deliver sustainable and innovative solutions to NSW's transport needs*

Integrity - *We take responsibility and communicate openly*

5.3 Objectives

Transport would consult with the community and key stakeholders on the proposal to:

- Inform the community and stakeholders of the proposal.
- Seek feedback on the works and REF, thereby giving the community the opportunity to raise issues of concern for consideration in developing the project. The feedback would inform the final proposal and design of the project.
- To better understand community values and desired outcomes for Coffs Harbour.

5.4 Engagement tools and techniques

- Media releases for local media to push the "reach" of notifications beyond a local level.
- Project notifications and project updates for nearby residents, businesses and stakeholders.
- Information sessions and face-to-face or online meetings with key stakeholders to brief the community on progress and updates.
- Site inductions, training and toolbox sessions for workers involved in delivering the project.

- Letters, emails and targeted correspondence.
- Project updates on the TfNSW website.
- A project phone number 1800 973 343 for enquiries, information and complaints.
- Database to record stakeholders and contacts.
- Signage around work area, announcing any upcoming closures or the start of work. This signage would appear at least two weeks ahead of any planned works.

5.5 Community involvement

Transport is committed to establishing genuine relationships within the local community. This is underpinned by the belief that effective communication is a crucial element in the successful delivery of its projects.

Table 5.1: Consultation to date and planned

Activity to date	Date
Initial announcement of the project by local members	late 2025
Meetings with Council	Ongoing and regularly
Establish and regularly update project website	late 2025 and ongoing
Establish and monitor specific information line	late 2025 and ongoing
Media releases	late 2025 and ongoing
Planned activities	Date
Community update “have your say” and REF display	October 2025
Advertise and undertake a community information session	October 2025
Prepare and publish submissions report	March 2026
Community update on outcome of “have your say” process	March 2026
Community update prior to start of works	March 2026
Community updates to inform the community of any changes or unforeseen issues	Ongoing as needed

The following table identifies key stakeholders and the required level of communication:

Table 5.2: Consultation to date and planned (consultees)

Group	Stakeholder	Communication activities
Federal government	Member for Cowper	• Update
State government	Member for Coffs Harbour	• Update • Inform
Local government	Coffs Harbour City Council Mayor and General Manager	• Update • Inform

Group	Stakeholder	Communication activities
		Involve / collaborate
Emergency services	Police, Fire and Rescue, Ambulance, Marine Rescue	- Update - Inform
Local residents	Members of the Coffs Harbour community	- Update - Inform
Maritime stakeholder groups	Maritime Operations Park Beach Surf Life Saving Club	- Update - Inform - Involve / collaborate

5.6 Aboriginal community involvement

Table 5.3: Summary of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI)

Stage	Description
Stage 1	Initial Transport for NSW assessment
Stage 2	Site survey and further assessment
Stage 3	Formal consultation and preparation of a cultural heritage assessment report
Stage 4	Implement environmental impact assessment recommendations

A Stage 1 PACHCI assessment was undertaken for the proposal by Transport's Aboriginal Cultural Heritage Officer. That PACHCI assessment included consultation with the Coffs Harbour and District Local Aboriginal Land Council. The LALC confirmed that the inner harbour area was the subject of an undetermined Aboriginal land claim (ALC 56060) and that the LALC approved of works within the claim area. The LALC have requested that they be notified should any aspect of the planned works be changed or altered in any way.

5.7 TISEPP consultation

Coffs Harbour City Council and other Agencies have been consulted in accordance with the relevant TISEPP clauses and as part of Transport's standard stakeholder consultation process.

Issues raised by respondents are considered in detail in part 5.8 of this REF.

A full analysis of consultation requirements under the TISEPP is included in the table at Appendix B which includes the triggers for formal agency consultation.

5.8 Government agency and stakeholder involvement

Various government agencies and stakeholders have been consulted about the proposal, including:

- NSW Environment Protection Authority
- NSW Transport Maritime Operations
- NSW DCCEEW Biodiversity Conservation Services
- Coffs Harbour City Council

- NSW DPIRD Fisheries and Marine Parks
- Port Authority of NSW
- NTS Corp (Native Title)
- Crown Lands Regional Services

Issues that have been raised as a result of consultation with these agencies and stakeholders are outlined in the table below.

Table 5.5: Issues raised through stakeholder consultation

Agency	Issue raised	Response/where addressed in REF
NSW Environment Protection Authority (EPA)	No response received. The EPA would be further consulted when sediment sampling is undertaken, if there is a potential for water pollution.	n/a
NSW Transport Maritime Operations (TMO)	No response received. Prior to commencement of works TMO would be consulted in relation to an aquatic license and operational safety.	n/a
NSW DCCEEW Biodiversity Conservation Services	Impacts on the following matters are to be considered in the REF: migratory birds, threatened species and ecological communities known to occur in the locality and in areas indicated for beach nourishment and pipelines including but not limited to: • Silverbush (<i>Sophora tomentosa</i>) • Scented Acronychia (<i>Acronychia littoralis</i>) • Native Guava (<i>Rhodomyrtus psidioides</i>) • Wedge-tailed Shearwater (<i>Ardenna pacifica</i>) • Crested Tern (<i>Thalasseus bergii</i>) • Little Tern (<i>Sternula albifrons</i>) • Common Tern (<i>Sterna hirundo</i>) • Sooty Oystercatcher (<i>Haematopus fuliginosus</i>) • Pied Oystercatcher (<i>Haematopus longirostris</i>) • Littoral rainforest in the NSW North Coast, Sydney Basin and South East Corner bioregions – Endangered Ecological Community. TfNSW to consider the high priority action of placement of dredged sand from Coffs Harbour to Park Beach in preparing the REF and undertaking the associated dredging work, in line with the action listed in the Coastal Zone Management Plan (CZMP). When assessing Option 2, the REF should ensure:	The aquatic ecology assessment at Appendix C considers the potential impacts of the proposal on marine biodiversity. It is not proposed to pursue the overland pipeline route as part of this REF. The preferred option (ocean transport to Park Beach offshore placement area) is consistent with the CZMP. A sand placement management plan would be prepared prior to the

Agency	Issue raised	Response/where addressed in REF
	- The pipeline does not impact any native vegetation. - Public safety and access are maintained throughout the dredging activity. - A sand placement plan for Area B (including dune heights and revegetation) is prepared by a suitably qualified coastal specialist and a copy supplied to City of Coffs Harbour and BCS. - A 2-year monitoring and maintenance period is established. When assessing Option 3, the REF should ensure: - Dredge depositions consider surf amenity. - Bed morphology and subtidal ecosystems in placement area A are investigated. - Longshore transport mechanisms in relation to the placement area A are investigated to confirm sediment transport does not impact Coffs Creek entrance. - Bed morphology changes are monitored for 2 years to consider where sediment moves within the Park Beach compartment. BCS support the proposed placement of sand to the north of the Harbour, which would increase the sediment budget within the Park Beach compartment and facilitate the longshore sediment transport processes. BCS does not support beach nourishment in large volumes as proposed in Option 1 as this would redistribute the sediments back into the proposed dredge area 1 and is not in line with Council's CZMP.	commencement of works. A monitoring and maintenance period would be established for sand placement areas. A sand movement study has been prepared for the REF and is included at Appendix G. An aquatic ecology assessment has been prepared for the REF and is included at Appendix C. BCS support for sand placement north of the harbour is noted. The area noted as Option 1 for beach nourishment (northern end of Jetty Beach) will not be pursued as part of this REF.
Coffs Harbour City Council	Refer to previous correspondence sent on this matter which referred to Council Resolution 2022/124: "That Council writes to the NSW Premier, NSW Minister for Transport, and our State Government Member requesting prompt action to: 1. Remove sand from the Harbour in a similar manner to that employed 21 years ago with a	Council's support for northerly transport of sand from the harbour and placement offshore (option 3) is noted. Placement area A is Transport's

Agency	Issue raised	Response/where addressed in REF
	dredge and barge to deposit the sand in the ocean off Park Beach. 2. Design and construct a permanent system for sand bypass or sand removal from the Harbour." The City supports the proposal to transfer sand out of the Harbour and to the north. It is anticipated that the REF process will identify the option most beneficial to restoring natural coastal processes and northerly transport of sand trapped by the Harbour. The City's preferred option is the placement of dredged sand offshore as per Option 3 in the Invitation to Comment document, to see it reintroduced into the natural longshore drift north of the Harbour, for the following reasons: - This is in line with recommendations from the Coffs Harbour Coastal Zone Management Plan (2019), - This action will reintroduce sand trapped by the Harbour into the natural northerly littoral drift, - This will help to reduce sediment starvation of beaches to the north caused by interception of sand by the Harbour, and - This will help reduce the potential for erosion of beaches north of the Harbour. If sand is to be deposited on Park Beach (Option 2) it should be deposited further north well away from the surf club and the entrance to Coffs Creek, due to the following reasons: - Previous sand nourishment from dredging campaigns has seen sand placed in front of the Surf Club and this has resulted in an artificially elevated dune height as the sand was blown inland onto the dunes. This has obstructed sight lines from the surf club and has resulted in dune heights having to be lowered. - Additional sand placed in this location may also have the potential to blow south and reduce the capacity of the entrance channel to Coffs Creek. If this option is pursued, the proposal should: - include a detailed sand placement and management plan for beach nourishment,	preferred option for restoring natural coastal processes. This is supported by the sand movement study at Appendix G. The preference for onshore placement further north of the surf club is noted. No onshore sand placement will be pursued as part of this REF. A sand placement management plan would be prepared prior to any sand placement. The area noted as Option 1 for beach nourishment (northern end of Jetty Beach) will not be pursued as part of this REF. An aquatic ecology assessment has been prepared for this REF to consider the potential biodiversity impacts of both the dredging and sand placement. This is included at Appendix C.

Agency	Issue raised	Response/where addressed in REF
	- consider placing the sand below mean high water mark to increase its chances of returning to the coastal drift and continuing its journey north, - consider that sand placed above the mean high-water mark will be more likely to blow landward and accumulate on the adjacent dunes, and - explore and include a variety of placement options and techniques. The City is not in favour of the option of sand nourishment at the northern end of Jetty Beach (Option 1), for the following reasons: - This area is currently accreting and has been accumulating sand that has already been trapped by the Harbour interception. This option will not return sand to the coastal drift to continue its natural northerly movement, - Studies have also shown that sand is moving from the northern end of Jetty Beach, south to the southern end of Jetty Beach and accumulating at the boat ramp, and - Adding additional sand to the north of Jetty Beach will retain sand in the Harbour system and is likely to accelerate infilling of the boat ramp. The City's position on Option 1 is consistent with the approval to dredge sand from the Marina as part of development application 0129/22DA. This approval was conditioned that 'Prior to issue of a construction certificate, the applicant must submit to Council for approval, an assessment detailing the feasibility of options regarding the placement of the dredged sand. The applicant must take into account the 'Coffs Harbour Coastal Zone Management Plan'. Other matters for consideration in the REF should include: - Impact on aquatic ecosystems both in the dredging zone and in the spoil receiving zone. - Potential impact on sand bars and surfing amenity. - Consideration of potential contaminants in the sediment.	A sediment assessment has been prepared for this REF to consider the potential for contamination of dredged marine sediments. That assessment is included at Appendix D. Site specific sampling and classification would be undertaken at the dredge sites prior to each dredging campaign.
DPHI Crown Lands and Public Spaces	The Coastal Crown Land Guidelines were published in November 2023. The guidelines aim to align coastal Crown land management with the objects and principles of the <i>Coastal Management Act 2016</i>. The guidelines are to be applied to certain dealings and	The <i>Crown Land Management Act 2016</i> has been considered in

Agency	Issue raised	Response/where addressed in REF
	decision-making procedures and processes relevant to coastal Crown Land management. The Coastal Crown Land Guidelines Principle 5 provides that 'Non-Commercial dredging on coastal Crown Land should be in the broader public and/or environmental interest'. More specifically the guidelines propose that dredging works must have regard to and be consistent with any relevant CMP and highest priority placement of sand accorded to beach nourishment activities identified in a CMP. The Coffs Harbour Jetty and surrounding open coast does not form part of a certified CMP. However, dredging and nourishment in this area was previously considered as part of the certified Coffs Harbour Coastal Zone Management Plan 2017 (CZMP). As the most recently endorsed strategy for the open coast in Coffs Harbour, the CZMP provides a framework to guide proposed navigation dredging and sand placement. Much of the proposed dredging activity will occur on Crown land that is subject to an undetermined land claim lodged under the <i>Aboriginal Land Rights Act 1983 - ALC Number: 56060; Claim Lodged 17-Jul-2024; Land Council: New South Wales Aboriginal Land Council</i>. TfNSW is encouraged to seek the support of the claimant land council for the activities that are being proposed on the Crown land subject to this ALC. Any relevant factors or considerations from this consultation should be documented in the REF. Dredge Area 1 and 2: • Dredging activities undertaken within Coffs Harbour and the area covered by <i>Crown Land licence to Transport for NSW Licence 618991 for the purpose of Access, Port Facilities and Services</i>, will require no further authorisation under the CLM Act if they are considered consistent with the purpose of this licence. • Dredging activities undertaken within Crown Reserve 140101 (R 140101) managed by Transport for NSW for the purpose of: Port Facilities And Services; Other Purposes: Pontoon, Accommodation House, Berthing, will require no further authorisation under the	Part 4 of this REF. The proposal is consistent with the Coastal Crown Land Guidelines as it is in the broader public and environmental interest. The preferred option is consistent with the Coffs Harbour CZMP as it proposes to transport sand to Park Beach for beach nourishment purposes. Consultation with the LALC has been undertaken in relation to the land claim. No objections to the proposal were raised by the Land Council. The proposed dredging activities undertaken within the existing Transport licence areas are consistent with the purpose of the licence and do not require any additional authorisation under the licence.

Agency	Issue raised	Response/where addressed in REF
	CLM Act if they are considered consistent with the reserve purpose. Deposition Areas: Option 1 Beach Nourishment (Jetty Beach): - Limited details are provided with regard to the deposition of sand / beach nourishment on Jetty Beach. - Although there is no CMP in place for the location of the proposed activity, the REF should consider Principle 5 of the Coastal Crown Land Guidelines 2023 and the strategic intent of the CZMP in relation to dredging of Coffs Harbour and related sand deposition / beach nourishment activities. This should include appropriate explanation/ justification as to any inconsistencies with the CZMP. - The Department's preliminary view is that this option is inconsistent with the strategic intent of the CZMP, especially in consideration of the volumes of sand identified in the letter to maintain navigation through the harbour (i.e. maximum volume 96,000 m3 in any 1 year). - Opportunities to progress minor dredging and sand placement campaigns at Jetty Beach for safety reasons, may be appropriate where delivery of sand to areas on or offshore of Park Beach, cannot be achieved within practical and realistic timeframes. Placement area A - Offshore Park Beach: Transport of sand via Option 3 ocean going trailing suction hopper dredge to be placed offshore from Park Beach in placement area A is likely to require a Crown Lands licence as the location is Crown waterway, under the direct management of the Minister for Crown Lands. placement area A is located in the Solitary Islands Marine Park declared in accordance with <i>Part 5, Division 1, section 23 of the Marine Estate Management Act 2014</i> (MEMA). A Marine Park Permit will be required for any part of the proposed activity located in the Habitat Zone of Solitary Islands Marine Park.	The area noted as Option 1 for beach nourishment (northern end of Jetty Beach) will not be pursued as part of this REF. A Crown Land licence will be sought for any offshore sand placement in Crown waterways. It is not intended to pursue the option involving the traversal of Coffs Creek. A Marine Park Permit will be sought for any part of the proposed activity located in the Solitary Islands Marine Park. The Department's view on the consistency of placement areas A and B with the CZMP is noted. Due to complex issues associated with the overland pipeline option (Option 2), it is not proposed to pursue this option further as part of this REF.

Agency	Issue raised	Response/where addressed in REF
	Although there is no CMP in place for the location of the proposed activity, the REF should consider Principle 5 of the Coastal Crown Land Guidelines 2023 and the strategic intent of the CZMP in relation to dredging of Coffs Harbour and related sand deposition / beach nourishment activities. This should include appropriate explanation/ justification as to any inconsistencies with the CZMP. The Department's preliminary view is that nourishment in placement area A is generally consistent with Action BD.1 of the CZMP. placement area B - Onshore Park Beach: Delivery of dredging material to Park Beach (placement area B) via Option 2 Overland Pipeline will traverse: Part R140102 Managed by Coffs Harbour City Council (Purpose: Environmental Protection, Public Recreation; Other Purposes: Business Purposes, Vegetation Management). Aboriginal Land Claims 41188 and 41189 (NSW LALC) has been granted for part of R140102 (Lot 1 DP740302; Lot 7056 DP1114092) Crown Waterway (Coffs Creek). R63966 Managed by Coffs Harbour City Council (Purpose: Public Recreation, Resting Place; Other Purpose: Business Purposes, Vegetation Management). Transport for NSW will be required to seek a licence, support or other authorisation from relevant parties for all activities associated with construction and operation of the sand pipeline. This would include a Crown Lands licence if the pipeline is to traverse Coffs Creek which is a Crown waterway, under the direct management of the Minister for Crown Lands. The Department's preliminary view is that nourishment in placement area B is generally consistent with Action BD.1 of the CZMP. General considerations: - Activities proposed on Crown land managed by the Minister for Crown Lands or which are inconsistent with the reserve purpose will require a Crown Lands licence. Information regarding the licence process is available on the Department's website: https://www.crownland.nsw.gov.au/licences-leases-and-permits	It is noted that the proposed dredging campaigns would be subject to <i>Section 199 of the Fisheries Management Act 1994</i> and require a referral to NSW DPI Fisheries. An assessment of the proposal against the relevant coastal management provisions of the SEPP (Resilience and Hazards) 2021 has been undertaken in Part 4 of this REF. Transport has considered to the fullest extent possible the potential environmental impacts of the proposal. Safeguards and mitigation measures are included in Parts 6 and 7 of this REF.

Agency	Issue raised	Response/where addressed in REF
	- The proposed dredging campaigns will be subject to <i>Section 199 of the Fisheries Management Act 1994</i> and require a referral to NSW DPI Fisheries. In this regard it is recommended that Transport for NSW consult with NSW DPI Fisheries regarding the preparation of the REF. - The activities proposed are located on land mapped as a coastal vulnerability area under the <i>SEPP (Resilience and Hazards) 2021</i>. This REF should address any relevant provisions in the SEPP with regard to the mapped coastal vulnerability area. The activities proposed are located on land mapped as a proximity area to littoral rainforest. This REF should appropriately address any relevant provisions in the SEPP with regard to the mapped proximity area. - As required under Division 5.1 of the <i>Environmental Planning and Assessment Act 1979</i> the environmental impacts of the proposed activity should be given due consideration, including the provision of safeguards and mitigation measures to limit potential impacts.	
DPIRD Fisheries	The location of the proposed placement area for dredged materials, as well as the overland pipeline, are within the Solitary Islands Marine Park. Marine parks are areas set aside with special legislative protection to conserve marine biological diversity and ecosystems. The Department of Primary Industries and Regional Development (DPIRD) Fisheries must ensure that activities comply with the requirements of the <i>Marine Estate Management Act 2014</i> (MEM Act) and regulations. The options for the proposed dredge spoil placement areas and overland pipe across Coffs Creek lie within marine park habitat protection zone (HPZ). These proposed works will require a permit under clause 1.16 of the <i>Marine Estate Management (Management Rules) Regulation 1999</i> to harm, damage or interfere with habitat (including soil, sand, shells or other material occurring naturally within the zone). Clause 1.8 of the <i>Marine Estate Management (Management Rules) Regulation 1999</i> establishes the objectives of HPZ as to provide a high level of protection for biological diversity, habitat and ecosystems. Consent for activities within HPZs can only be granted for	A Marine Park Permit would be sought for any part of the proposed activity located in the Solitary Islands Marine Park. The option for an overland pipe across Coffs Creek will not be pursued further as part of this REF due to the complexity of the issues associated with this option. The aquatic ecology assessment at Appendix C addresses the assessment

Agency	Issue raised	Response/where addressed in REF
	research, environmental protection, public health, traditional use or public safety purposes, or for the purposes of an ecologically sustainable use that does not have a significant impact on fish populations within the zone or on any other animals, plants or habitats. The REF should address the assessment criteria for marine park permits specified in clause 9 of the <i>Marine Estate Management Regulation 2017</i>, including how the proposal satisfies the objects of the MEM Act, purposes of marine parks and objects of HPZ and the arrangements that have been made for the prevention, mitigation and making good of any damage to the marine park arising from the proposed activity. Consistent with the NSW Government Guidelines for Division 5.1 assessments (pages 20 and 21), the REF must describe any alternatives considered with sufficient detail to understand the differences between the proposal and the alternatives (including the 'do nothing' alternative). The REF must describe how alternatives were assessed to inform selection of the preferred option, including justification for disregarding each alternative (where relevant). The REF must describe how potential impacts can be eliminated or reduced through mitigation measures and list these measures against each potential impact. This includes residual impacts and proposed mitigation measures. To adequately assess the potential impacts, the following factors should also be addressed in the REF: • Sediment and core analysis at dredge and placement sites. • Comparison of dredge and disposal locations to determine consistency between habitat forming sediments. • Categorisation of benthic fauna at dredge and placement sites. • Modelling of baseline sediment transport within the relevant Coffs Harbour sand compartments. • Modelling of sediment dispersal for each dredging and placement options. • Comparison of environmental risk between each option (1-3) and proposed placement area (A-C).	criteria for Marine Parks Permits and recommends safeguards and mitigation measures to minimise the risk of harm to the marine park. Those safeguards have been included in part 6 of this REF. Part 2 of this REF considers the options available to achieve the objectives of the proposal, including how alternatives were assessed and justification for the preferred option. Part 6 of this REF details the safeguards and mitigation measures that are proposed to minimise potential environmental impacts. Sediment and core analysis at proposed dredge sites would be undertaken prior to each dredging campaign. The aquatic ecology assessment at Appendix C

Agency	Issue raised	Response/where addressed in REF
	- Long to medium term monitoring of sediment dispersal post-dredging to inform future dredging campaigns. In addition, DPIRD Fisheries requests post-dredging monitoring to estimate the recovery of benthic organisms at the sediment placement sites: - Immediately following dredging - Six months following dredging. Proposed disposal locations: At this stage DPIRD Fisheries is most supportive of option 3 and the use of placement area A. This option appears to use natural sediment transport pathways to distribute dredged sediment and is likely to have the beneficial outcomes captured below: - Facilitate soft-engineering coastal erosion mitigation methods. - Potentially less loss of marine invertebrates through not landing and stockpiling materials. - No land-based dewatering. - No loss of sediment from the sediment budget of the coastal system. Care must be taken to ensure that that placement area A will not be adjacent to a natural sub-tidal reef which must be avoided during this phase of the works. DPIRD Fisheries will consider the results of initial modelling from the REF to better inform a preferred option that best meets the design outcomes of the dredging campaign and the objectives of the MEM Act and regulations. The proposed works would constitute dredging and reclamation in Key Fish Habitat. Consequently, TfNSW is required to undertake consultation with DPIRD Fisheries, in accordance with section 199 of the FM Act, so that we may raise any matters for consideration, prior to undertaking or authorising the undertaking of these works. Impacts to marine vegetation, including seagrass, mangroves, saltmarsh and kelp, are not covered under s199 consultation. A separate authority under s205 of the Fisheries Management Act 1994 is required for any works that will cause harm to marine vegetation.	considers the habitats and benthic fauna at dredge and placement sites. The sand movement study at Appendix G considers sediment transport. Sediment dispersal has been considered in the sediment assessment at Appendix D, for the preferred option. The environmental risks of each option have been considered in the analysis of options in Part 2 of this REF. Long to medium term monitoring of sediment dispersal post-dredging has been included in the safeguards in Part 6 of this REF to inform future dredging campaigns. Support for option 3 and placement area A is noted. Appropriate buffer areas have been included in biodiversity

Agency	Issue raised	Response/where addressed in REF
	Key fish habitats (KFH), as defined in the DPIRD Fisheries P&G, are classified based on their sensitivity and importance to fish survival. All marine parks within NSW are considered to be Type 1 KFH. A key objective of the FM Act is to conserve these habitats. DPIRD Fisheries requires proponents to prioritize avoiding impacts on key fish habitats. When avoidance is not feasible, efforts should focus on minimising and mitigating impacts, with a preference for impacting less sensitive habitats over more sensitive ones. Any unavoidable impacts must be mitigated and offset in accordance with Section 3.3.3 of the DPIRD Fisheries P&G. Dredging can cause immediate issues, such as water pollution and poor water quality, as well as longer-term problems, like channel instability and the destruction of aquatic habitats. All potential impacts of the proposed dredging activities—whether direct, indirect, short-term, long-term, or cumulative—must be thoroughly assessed. This includes evaluating alternative options with lesser impacts to minimize environmental harm. For long-term dredging projects, ongoing monitoring is necessary to assess environmental impacts and the effectiveness of mitigation measures, with management practices adapted based on the findings of these programs. The REF should specifically address the following requirements: • Consideration of Alternatives: Information on alternative options with lesser impacts that have been considered, and justification for why these options were not selected. • Impact Justification: A detailed explanation of the impacts and why they are in the best interest of the community. • Impact Assessment and Mitigation: Identification of all impacts to key fish habitats, including detailed plans of dredge areas, volumes, and sensitive receivers (e.g., seagrass beds, mangroves, threatened species). Additionally, the methodology and timing of the dredging, potential impacts on water quality and how they will be monitored and mitigated particularly during the placement stages of the project, in addition to measures to control off-site impacts should be outlined.	safeguards to ensure the integrity of any reef environments. It is not likely that the proposal would cause harm to marine vegetation. The aquatic ecology assessment at Appendix C assesses the potential for avoidance of key fish habitats and recommends a series of safeguards, monitoring and mitigation measures which have been included in part 6 of this REF. This REF and its supporting specialist studies (refer to appendices) assesses to the fullest extent possibly the likely impacts of the proposal. Ongoing monitoring would be undertaken to assess environmental impacts and the effectiveness of the safeguards, with management practices adapted

Agency	Issue raised	Response/where addressed in REF
	Monitoring and Rehabilitation: Details of a monitoring program to identify where impact mitigation and adaptive management may be required, and a site rehabilitation plan with appropriate offset proposals for unavoidable impacts to sensitive habitats. DPIRD Fisheries enforces a "no net loss" habitat policy. An offset ratio of 2:1 applies for harm to marine vegetation, requiring proponents to conduct habitat rehabilitation or provide environmental compensation for all unavoidable impacts. DPIRD Fisheries manages threatened aquatic species under Part 7A of the FM Act. The site falls within the known or expected distribution of the threatened species Brown Alga (<i>Nereia lophocladia</i>). A test of significance must be undertaken to determine whether the proposed dredging is likely to significantly affect this species.	based on the findings of the monitoring. Part 2 of this REF considers the alternatives and the justification for the proposal. Part 6 of this REF includes an assessment of potential impacts and recommended safeguards, as well as monitoring to allow adaptive management for future campaigns. Mitigation measures and safeguards have been included to ensure that potential impacts on <i>N. lophocladia</i> are minimised.

5.9 Ongoing or future consultation

The REF would be placed on public exhibition for not less than 21 days. All submissions received during the exhibition period would be formally considered and responses provided in a submissions report, which would also be made available to the public. In addition, consultation would continue throughout the 10-year campaign with all relevant stakeholders, including prior to each dredging campaign.

Given the dynamic nature of the harbour, on-going surveys discussed in section 6 below and stakeholder consultation are considered to be key risk mitigating factors.

6 Environmental assessment

This section of the REF provides a description of the potential environmental impacts associated with the proposal. This includes consideration of the factors specified in the guidelines *Is an EIS required?* (DUAP, 1995/1996) and as required under section 171 of the Environmental Planning and Assessment Regulation 2021 and the *Marinas and Related Facilities EIS Guideline* (DUAP, 1996). The factors specified in section 171(2) of the Environmental Planning and Assessment Regulation 2021 are also considered in Appendix A.

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Hydrological issues

6.1.1 Methodology

The hydrological processes of the Coffs Harbour area involve the dynamic interactions of tides, catchment runoff, waves and sediment transport.

A Sand Management Strategy has been prepared for the proposal and is included in Appendix G. That Strategy includes a conceptual sediment transport model that considers annual accretion rates, and the challenges posed by current sediment transport pathways and increased sediment deposition at coastal structures. The conceptual sediment transport model indicates that Coffs Harbour accumulates approximately 100,000 m³ of sediment annually, primarily from beaches to the south. Significant sediment deposition occurs at the entrance to the newly constructed Coffs Harbour Boat Ramp and along Jetty Beach. The hydrological processes associated with this area have been well documented in numerous studies as referenced in Appendix G and **Table 6.1**. All of these studies have been considered in this assessment.

Table 6.1. Hydrological processes document review

Author	Year	Information Source
BMT WBM Pty Ltd	2023	Coffs Creek and Park Beach Flood Study
Southern Cross University	2018	Investigating Water Quality in Coffs Coastal Estuaries
BMT WBM Pty Ltd.	2018	Coastal Zone Management Study
University of New England	2016	Coffs Harbour Eco-health Project 2014 - 2015
BMT WBM Pty Ltd	2011	Coastal processes and hazards study
Manly Hydraulics Laboratory	1998	Coffs Harbour November 1996 Flood Event Report

6.1.2 Existing environment

Marine based

Coffs Harbour abuts the Solitary Islands Marine Park to the north and as such, the harbour itself is a hub for both recreational and commercial vessels. The harbour contains the Coffs

Harbour International Marina, a popular all-weather port, easily accessed from the southern aspect of nearby Mutton Bird Island. The marina accommodates 165 berths ranging in size from 10m to 20m and is an integral mainstay for the broader Coffs Harbour economy.

The tides in Coffs Harbour are semi-diurnal (two highs and two lows each day). Regular fluctuations of tide levels in the sea cause an inflow (flood tide) of oceanic water into the harbour as well as an outflow (ebb tide).

Due to the tidal influence, longshore sediment transfer, and other factors such as wave climate, and the effects of varying currents, the harbour is susceptible to sand infilling through these coastal processes. Sediments within both navigation channels (of the harbour and boat ramp area) are dominated by marine sand, with some decaying organic material (primarily kelp) present, particularly in proximity to the boat ramp.

Potential acid sulphate soils (PASS) are present within the harbour. Sediment sampling would be undertaken prior to each dredging campaign, so that the risk of actual acid sulphate soils (AASS) and contaminants can be mitigated, and management strategies can be further developed.

Estuarine habitats within Coffs Harbour and its neighbouring Park Beach to the north, are known to support various threatened species, that may include fish, sharks and various marine mammals and shorebirds. Estuarine vegetation that occurs in Coffs Harbour and its neighbouring Park Beach to the north, may also include seagrasses and macroalgae stands, which provide Key Fish Habitat.

Land based

All of the Coffs Harbour beaches are highly valued by the community, for different reasons. The natural values of the marine and estuarine ecosystem north of the harbour have been recognised by their inclusion in the Solitary Islands Marine Park.

The most heavily used beaches are those that are most accessible, being Park Beach and Jetty Beach. These beaches are highly valued as they offer a range of recreational opportunities, such as protected swimming, surfing and walking. Community surveys noted the natural setting for the more developed beaches as a key value. The natural green outlook for these beaches gives a sense of nature, while still in proximity to parking, cafes, restaurants and hotels. The Coffs Harbour coastal zone also provides an important fauna corridor between relatively large patches of remnant vegetation at the northern and southern ends of the coastal strip. In addition to its ecological value, the habitat corridor provides a natural green back drop to the beach that is also of key value to the community.

Jetty Beach is well protected from the effects of swell and wave action by the break wall of the harbour and Mutton Bird Island, whilst south Park Beach, although offering limited, minor protection from Little Mutton Bird Island, is largely open to coastal erosion from the effects of swell, tides, currents, wave action and sea level rise.

The breakwaters forming Coffs Harbour were completed in 1946. The harbour construction has had a significant impact upon the coastline character of the Coffs region. The breakwaters have interrupted natural northerly sand transport, resulting in significant accretion at the northern end of Boambee Beach, and recession of the beaches north of the harbour, particularly Park Beach.

6.1.3 Potential impacts

The preferred methodology for placement of the dredged sand is Option 3. This would see the dredged sand removed from the harbour and ocean-transported to placement area A. All dredging and placement activities under this preferred option would occur below water level.

The dredging works would occur within the bay of Coffs Harbour itself, immediately south of the Solitary Islands Marine Park. The preferred option is to ocean transport the dredged material to placement area A that lies within the Solitary Islands Marine Park for nearshore (underwater) placement. Modifying the bed form through sand placement can potentially change wave refraction and lead to unintended wave focussing if placement is not undertaken to mimic the natural seabed form. This could change the morphological characteristics of inshore areas and could, for example, cause the formation of new channels, bars or beach erosion. Placement of sand for the proposal would be subject to a sand placement management plan to minimise the risk.

While this activity is consistent with the objectives of the Coffs Harbour Coastal Zone Management Plan (CZMP) 2019 in terms of providing for on-going navigable depths for maritime activities, the management of biological diversity, habitat and ecological function must also be considered.

Dredging activities may have some potential to temporarily disturb macroalgae assemblages due to a reduction in water quality (increased turbidity) caused by mobilisation of sediments. Sedimentation generated from dredging within the Harbour is expected to be directed towards the shore by current, whilst sediments placed offshore of Park Beach (placement area A) would likely be transported towards shore and northward, by the northward littoral drift. Disturbances are typically expected to be minor, short-term and very localised with sedimentation expected to dissipate quickly with coastal tide and current. This is discussed in further detail in section 6.6 and Appendix C.

During dredging there is the potential that shells and kelp may be picked up in the dredge and transported to the placement site. This may cause a temporary increase in shells and kelp in the on-shore environment, though natural wave action would be expected to mitigate this within a short period of time.

6.1.4 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Changes to morphological characteristics	A Sand Placement Management Plan (SPMP) would be prepared and implemented to ensure that sand placement mimics the natural seabed morphology.	Contractor	Prior to works	Additional safeguard
Changes to morphological characteristics	Monitoring of ocean bed changes at placement sites would be undertaken over the 10-year life of the project to understand sediment movement.	Transport	After completion of each campaign	Agency letter
Continued shoaling	Annual bathymetric surveys would be undertaken to track and monitor changes to shoaling.	Transport	Annually	Agency letter

Other safeguards and management measures that would address hydrological impacts are identified in sections 6.2 and 6.6.

6.2 Sediments, water quality and contamination

6.2.1 Methodology

Knowledge of sediment movement patterns within the harbour is important for understanding the linkages between potential contamination sources, the movement of any contaminants within the system and the likelihood of encountering unsuitable sediments or contaminated material during the proposed dredging.

The key physical properties of interest in relation to dredging and placement activities are particle size distribution, grain mineralogy, colour, degree of organic content and the amount of coarse debris.

Particle size distribution is of importance to evaluating sediment similarity and compatibility with the depositional environment. Ideally the particle size distribution would match the grain size proportions from the dredge site and deposition area. Other parameters such as grain shape and angularity are of less importance for general beach nourishment but can be influential when considering onshore placement, particularly when considering slope stability or resistance to factors such as wind erosion. Onshore placement is not proposed as part of this project.

An important aspect related to particle size is the proportion of sediments classified as 'fines', i.e. silt and clay. The presence of fines would give rise to water column turbidity due to suspension of this material in the water column. Introducing a high proportion of fines into a sand environment can lead to smothering of surface biota and clogging of sediments.

Grain mineralogy is typically not an issue with dredging projects on the NSW coast as nearly all the marine sediments are quartz grained and variation on a project scale is negligible.

Sediment colour is a function of several factors including mineralogy, amount of organic content and redox (reduction-oxidation) status of the sediment. Holocene marine sands in the Coffs Harbour area are typically light-tan to yellow in colour and low in organic matter. Sands dredged from depth tend to be anoxic and have a light to dark grey or even black colouration due to decomposing organic matter. This grey colour would lighten quickly with exposure and is only of concern generally in areas of high public usage, where visual amenity and potentially odours (for supra-tidal placement) are an issue. Discolouration and odours associated with these kinds of sands are generally temporary (two to three days).

Of greater concern, particularly for sediments utilised for beach nourishment, is the degree of embedded organic matter such as seagrass wrack, or kelp, as well as coarse debris such as oyster shell.

There is little information regarding physical properties of sands at Park Beach nor its nearshore zone however some evidence indicates coarse-grained gravelly beach berms. Sediment sampling would be undertaken prior to dredging to obtain baseline data for sand at Park Beach.

Previous sediment investigations have been conducted prior to dredging campaigns in limited areas around the marina and boat ramp between 2018 and 2020. These investigations were limited in scope both in relation to sampling locations, sediment depths and sample numbers. They do however provide guidance on potential contamination hotspots and locations where acid sulfate sediments may be encountered.

In 2018 a sampling investigation was undertaken of the sediments at the entrance to the inner harbour, central to proposed dredge area 1. The investigation was undertaken to assess sediments in accordance with National Assessment Guidelines for Dredging (NAGD) prior to dredging activities. Seven samples were collected from six locations to a maximum depth of 0.8 m below the sediment surface (Figure 10). Samples were analysed for the following:

- Tributyltin (TBT)
- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc)
- Polycyclic aromatic hydrocarbons
- Total recoverable hydrocarbons
- Benzene, toluene, ethylbenzene and xylene
- Organochlorine pesticides
- Polychlorinated biphenyls
- Acid sulfate soils (field screen)

The sediments sampled were found to be marine sands with field screening for Potential Acid Sulfate Soils (PASS) indicating the sediment was not PASS. All other analytes were below the NAGD screening levels.

In 2019 an investigation of sediments along the Coffs Harbour boat ramp breakwater was undertaken prior to dredging of the materials. Samples were analysed for the same analytes as the Coffs Harbour inner entrance investigation of 2018 (see above). Materials sampled were fine sands with concentrations all below the NAGD screening levels. Field screening indicated that the sediment was not PASS.

A preliminary assessment of the sediments within the boat ramp basin and at the location of the breakwater extension was undertaken in 2020 to investigate the presence and extent of acid sulfate soils and soil contamination. Analytes sampled were similar to analytes detailed in Section 3.1. The borehole logs indicate that fine to medium grained marine sands are present in most sample locations to approximate depths of between -7.5 and -8.5 m AHD. Median grain size within the upper sediment layers at the boat ramp area ranged from 0.178mm to 0.182mm. Sands were largely quartz with little to no shell material. This sediment is interspersed with clay fines. Underlying the marine sands is a silty clay layer to -10m AHD with extremely weathered argillite underlying this clay layer.

Eighteen samples were submitted for acid sulfate soil analysis (ASS). Nine samples were screened for the presence of actual or potential ASS.

PASS was found within marine sediments in one borehole at depths of between -5.0m and -6.5m AHD at the extended breakwater and also within the surface marine sand sediments in the boat ramp area.

Chemical analysis was undertaken on select samples from materials likely to be dredged to assess the potential for contamination. All samples returned results either below their Practical Quantitation Limit (PQL) or below the NAGD screening levels except for tributyltin in one sample located at the extended breakwater. This sample, from depths of -6.0m to -6.5m AHD significantly exceeded the NAGD screening level for tributyltin. The report speculates that as the marine sediments within the harbour are highly mobile, the contamination may have originated from the harbour precinct to the north, where the former Coffs Harbour Slipway was subject to extensive remediation works in 2016.

A sediment contamination assessment was undertaken in 2020 for four moorings of the inner harbour area and placement areas on Park and Jetty beaches. Sediments were found to be fine to medium grained sands with a greater proportion of fines than within the beach sediments. Analytes sampled were similar to those discussed above. Field screening and testing did not find actual or potential ASS. Contaminant analysis results were low for most metals, total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH). The exception was copper which was above the NAGD screening levels in two surface samples.

Tributyltin concentrations were significantly elevated in seven samples to an approximate depth of 2.0 m below sediment surface.

A desktop assessment of sediments and water quality characteristics has been prepared for this REF and is included at Appendix D.

6.2.2 Existing environment

Coffs Harbour lies within the New England Fold Belt province with outcrops that spur outward from coastal ranges in the west to the coastline, forming relatively narrower beach embayments than areas either to the north or south. The bedrock geology is typically composed of highly deformed Palaeozoic meta-sedimentary rock. The geology of the area is not overly mineralised and is not expected to contribute in any way to sediment contamination.

Coastal sand in the Coffs Harbour region is primarily of marine origin transported in a general northerly direction by coastal processes. Prior to causeway and breakwater construction, South Coff and Muttonbird Islands were separated from the mainland by a nearshore channel, through which the net northerly littoral drift could proceed uninterrupted from Boambee Beach through the harbour area, North Wall Beach, Park Beach and beyond. Sand buildup in the channel from the sheltering effects of South Coff Island often slowed sand transport through the channel and sporadic southeast storm surges would transport sand slugs from this material northward. Apart from imported materials associated with reclamation activities, the sands underlying the harbour and nearshore area are considered likely to reflect the dynamic natural open coast sediment regime and consist primarily of quartz sand.

The harbour is now protected from the predominant southeast swell by the land bridge between the mainland and Corambirra Point which has effectively cut off this inshore sediment transport route, creating a new headland and encouraging sand accretion on Boambee beach to the south and offshore. Indications from the conceptual model (Appendix G) are that around 150,000m³ per annum of sediment is transported east from Boambee Beach, around Corambirra Point and along the eastern breakwater. Wave action within the harbour is greatly reduced with waves rarely greater than 0.5m in height.

Jetty Beach is 1.4km long and has a wide, low attached bar with no permanent rips, and displays a low tide terrace morphology. The enclosure of the harbour by the artificial breakwaters and land bridge has effectively transformed the embayment into a sand trap. Whilst some sand moving northward would bypass the entrance and Muttonbird Island to continue northward, much of the sand is considered to accumulate within the sediment lobe at the entrance to the harbour and is then pushed into the harbour through a combination of wave and tidal action.

Sediment investigations at the marina entrance and within the marina (GHD, 2018 and Advisian, 2020) indicate medium to fine grain yellow sands at these locations with similar particle size distributions to that of Jetty and Park Beaches, with slightly higher proportions of fine sediment. Depth of sand layer and other stratigraphic information was not available for the marina area. The lack of seagrass presence or other aquatic vegetation in this area (see Section 6) means it is unlikely that there is a high degree of organic matter within the sediment although sediment surface accumulations of dislodged kelp are known to occur after large swell events in other parts of the embayment.

Dredge Area 1: Given the geomorphic processes and source of the majority of the sand at dredge area 1, it is expected that the physical characteristics of sediments would be sufficiently similar to existing sediments at Park Beach to have no discernible influence at that site. Comparison of particle size distribution of sediment samples from the dredging and placement areas is required to confirm this expectation and would be undertaken prior to the commencement of dredging.

Dredge Area 2: The borehole logs in the geotechnical report for the boat ramp upgrade in 2020 show that surface sediments within the vicinity of the boat ramp are fine to medium grained sands. Deeper sediments contain silt/clay deposits which would not be suitable for beach nourishment; however they appear to occur significantly deeper than the proposed dredging (-2.5m LAT) for area 2, indicating that these fine sediments are unlikely to be encountered. There is low potential for embedded organic matter within the upper sand deposits in this area due to the lack of aquatic vegetation, however accumulation of dislodged kelp has been observed in deep areas, including dredged holes, following large swell events.

Previous investigations undertaken between 2018 and 2020 indicate that tributyltin is present in sediments on both the southern and northern sides of the harbour. The investigations were very site specific with only surface sediments sampled in some areas, not necessarily targeting the full analysis suite recommended by NAGD. Analysis methods for ASS consisted of field screening and suspension peroxide combined acidity sulfur (SPOCAS) for three of the four investigations. The table below is a summary of previous contamination results and locations:

Table 6.2: Contamination testing results and locations

Report	Location	Maximum Depth	No. Locations /Samples	Contamination	ASS/PASS
Coffs Harbour Inner Entrance Sediment Sampling, GHD 2018	Marina entrance	0.8m	6/7	Below NAGD criteria	None detected
Coffs Harbour Boat Ramp Sediment Assessment, GHD 2019	East of breakwater of Boat Ramp	Sediment surface to 0.1m	6/6	Below NAGD criteria	None detected
Geotechnical Report, Regional Geotechnical Solutions, 2020	Boat ramp and breakwater extension	-7.5 and - 8.5m AHD	10/9	Significant exceedance for tributyltin in one sample -6.0 m to -6.5 m AHD. Likely to be an outlier.	PASS -5.0 m and -6.5 m AHD at breakwater
Coffs Harbour Marine Centre Upgrade – Minor Works REF 2020	Within moorings in marina	Sediment surface to 2.0 m	5/12	Exceedance of tributyltin in 7 samples at 4 locations	None detected

Within the locations sampled in the previous investigations, significant widespread contamination has not been identified. There are however, two hotspot areas for tributyltin; one

located within the marina moorings adjacent to the slipway site and the other adjacent to the breakwater to the east of the boat ramp. Although proposed dredging activities would not be undertaken within the marina, there is potential for contaminated sediment to have spread to the marina entrance. The one sample with a high concentration of tributyltin in the vicinity of the boat ramp breakwater may be an outlier, as no other contamination was detected in this area, but further sampling within this area is required to confirm this.

The primary source of contaminated sediment is from the boatyard and slipway within Coffs Harbour marina. The boatyard and slipway were constructed in the 1970s for ship maintenance and repair until operations ceased in 2014. Contamination of terrestrial and marine sediments of nickel, lead and tributyltin were identified within a remedial action plan developed in 2015. Remediation including dredging of sediments adjacent to the slipway and boatyard was undertaken in 2016 by Soil Conservation Service. The works resulted in over 4,760 tonnes of contaminated sediment being removed. No validation reports for the remediation have been identified although the sediment investigations undertaken in 2020 indicated the presence of sediments contaminated with tributyltin within the marina and at the marina entrance after the completion of the remediation works. Although the degree of sediment transport from the inner harbour to the outer harbour is likely to be low, it is possible that sediment to the west of the marina entrance as well as within the marina entrance will have residual tributyltin and other potential contaminants from the boatyard and slipway operations. Sediment sampling and analysis in this area for tributyltin and other potential contaminants specified by the NAGD would be necessary to confirm the contamination status of the dredge area 1 sediments.

The high concentration of tributyltin in one sample in the location of the boat ramp breakwater may indicate contaminated sediment transport from the boatyard and slipway within the marina to the north or it may be an anomalous result from an outlier (e.g. a paint flake within the sediment). Again, further sampling and analysis for tributyltin and other contaminants would be required in this area to confirm the contamination status of the sediments at dredge area 2.

There is limited information on ambient water quality within Coffs Harbour however water quality is likely to be high given direct marine influences and lack of significant polluting urban and industrial development. The high level of ocean exchange and the dominance of medium-grained marine sands in all areas previously investigated indicate that water quality at the proposed dredging locations is likely to generally be high. Poor water clarity in the inner harbour has been observed, likely due to regular boating activities, soft sediment seafloor and poor flushing.

6.2.3 Potential impacts

The interruption in northerly sediment transport past Coffs Harbour has meant that North Wall Beach and Park Beach further to the north have experienced shoreline retreat and have required ongoing beach nourishment. Whilst sand placement to the south of Little Muttonbird Island has been discounted due to potential effects on the Coffs Creek entrance, sand placed further to the north off Park Beach is expected to generally move in a northerly direction.

Similarly, it is anticipated that nearshore currents will generally be in a northerly direction in keeping with the predominant south-easterly swell. In the absence of any specific modelling or data in this respect, it is assumed that any sediment plumes generated during deposition at placement Area A would tend to move in a northerly direction, away from the surf club, Little Muttonbird Island and the Coffs Creek entrance.

Physical sediment properties:

The physical properties of the sediment primarily influence water quality impacts at both the dredging and placement locations. The physical characteristics, in particular the particle size distribution, the presence of fines and organic matter is also influential on the retention of chemical contaminants.

At the dredge sites it is expected that some slope instability would occur at the edge of the dredge cut. At the extreme, a near-vertical 'box cut' would result in slumping of the of the wall of the dredge area. Further collapse is likely to occur over time and would be dependent on the insitu sediment characteristics and the degree of exposure to waves, currents and vessel movements. In general, the non-cohesive marine sands at both dredge locations would be highly mobile and it is anticipated that cut slopes steeper than 1 in 4 would be subject to excessive instability – potentially resulting in premature channel infilling or instability of benthic habitats. The dredge design should also consider whether stability of the rock breakwaters at either of the dredging locations is likely to be affected by sediment removal.

Dredging has the potential to expose sediments on the seabed that are not consistent with the surroundings, for instance exposure of a mud layer that continues to give rise to water quality impacts after dredging has been completed. Based on sediment sampling undertaken by H2O Consulting (Appendix C), the existing nature of the sediments at the preferred placement area off Park Beach are generally similar to the inshore beach sediments on Park Beach. The northern end of the preferred placement area had finer sands and lacked the gravel content detected at both the southern end of the placement area and on Park Beach.

The reason for the surface sediment variability in the placement area has not been fully evaluated but is considered to be a result of similar processes occurring on Park Beach, where lenses (layers) of gravelly material occur within the beach face, sorted by wave action and currents. These lenses of coarse material can be buried and/or exposed by the movement of the more mobile sand fraction in response to ocean conditions. The surface sediments sampled, whilst indicative of conditions at the time, may vary in nature in response to shifting sands on the seabed as well as localised variations in current caused by any seabed anomalies. The variable nature of the samples collected by H2O Consulting are likely to represent the natural variation of sediments at placement area A, which can be summarised as being sand dominated, with variable amounts of gravel, similar to Park Beach.

The sediment to be dredged is dominated by sand, has no gravel, but contains similar proportions of fines to that found in the placement area. Placement of sand off Park Beach would most likely be undertaken by bottom dumping. The depth range at which this is to occur has not been confirmed but is assumed to be in excess of 4m water depth. Dumped sediments would partially sort through differential suspension as they sink through the water column, with larger sediments settling faster and finer sediments settling last, potentially being distributed over a wider area as the sediment plume disperses. To avoid a significant change in the surface sediment characteristics it is important that the placed sediments do not contain excessive fines. Results of recent surface sediment sampling undertaken in conjunction with benthic habitat studies by H2O Consulting in December 2024 (Appendix C) indicate that the fines content within the sediments to be dredged is similar to that found in the nearshore area off Park Beach. On this basis it is concluded that there would be little impact to surface sediments in this regard. The lack of gravel in the dredged sediments is similarly not of concern. It is considered likely that existing beds of gravelly material would become buried and subsequently exposed regularly through natural processes. Although dumping of gravel-poor material may temporarily alter the surface sediment characteristics, such changes would be relatively minor, as the placement area was found to be dominated (93-98%) by sand and have relatively modest (maximum 6%) gravel content. Any changes would be temporary due to the likely redistribution of dumped material by coastal processes over time. It is considered therefore that sediment to be dredged from areas 1 and 2 in the harbour can be placed nearshore at Park Beach with low risk of altering the sediment characteristics of that site.

Sediment contamination:

There is a low potential for the dredging of contaminated or otherwise unsuitable material due to the predominance of clean marine sediment at both dredge areas. Despite this, there is uncertainty regarding the extent of current contamination due to the limited scope of previous investigations and the past occurrence of contaminants in or in proximity to the proposed

dredging areas. Further work would need to be undertaken prior to the commencement of dredging.

Both areas are thought to have been previously dredged, although it is not known whether the previous dredging depths and extents fully cover the current proposal. For dredge Area 1, the majority of infill material is likely to be derived via the sand transport pathway along the southern edge of Muttonbird Island and the inner harbour breakwater, hence it would be predominantly high-quality marine sand. Whilst of lower probability, infill of dredge Area 1 by siltier material, potentially containing contaminants from the inner harbour, cannot be fully discounted at this stage.

Continued recent accretion at dredge Area 2 principally due to sand moving westwards along the southern sand transport pathway, indicates that there is little scope for contamination of infill sediments. The recent extension of the boat harbour breakwater, which appears to have contributed to the increased recirculation of sand at the southern end of Jetty Beach is not likely to have resulted in the movement of contaminants from the northern end of the harbour; the only known source of contamination. The presence of high levels of tributyltin at depth in Area 2 is considered to be anomalous, however, again further work is required to fully determine the contamination status of sediments at Area 2 prior to the commencement of dredging.

Placement:

The risk of contamination at the placement area would be minimal to nil if the safeguards identified in this REF are implemented. These measures would ensure that sufficient sampling of the source sediments would be undertaken to characterise the sediments and any areas of sediment with contamination above NAGD guideline levels would not be transferred to any placement area.

Any reuse of contaminated dredged materials for beach nourishment in a high public use area could pose a risk to the general public from contact with contaminated sediment. The NAGD screening levels are generally more stringent than that of NEPM Health-based investigations levels (HILs) for soil contaminants (Recreational C) and in the case of placement nearshore off Park Beach, the NEPM HILs are not considered to apply.

Water quality:

Key water quality risks arising from dredging and placement activities relate to sediment plumes and plume dispersal direction, turbidity and reduced light availability, sediment settlement on benthic habitats and release of contaminants into the water column.

There are general water quality risks associated with any on-water mechanical activity. The specific risks would depend on the selected contractor's equipment; however the key risks are associated with spills of fuel, lubricants, engine coolant or hydraulic fluids. These risks would be managed through standard mitigation measures and are not considered significant for the project. All commercial vessels are required by law to address environmental risks associated with discharges.

The generation of sediment plumes during dredging would be minimised by the use of suction dredges (trailing suction hopper dredge) technology. Suction dredges can lead to generation of turbidity at the dredge head, however much of the suspended sediment is drawn into the dredge's suction hose and transferred with the rest of the dredged material. This is in contrast to mechanical dredging (e.g. excavator or grab) which can result in significant sediment agitation and suspension of sediments with no real mechanism to reduce this impact. Although some sediment plume bypass of the suction field does occur, the rate of suspension is expected to be minimal for the sediment at dredge areas 1 and 2 due to the sandy nature of these sediments.

If the dredge encounters unexpected fine sediments (i.e. silt and/or clay), it is likely that a visible sediment plume would be generated in the vicinity of the dredge. The sustained

presence of such a plume would be indicative that the dredge is accessing material that is not consistent with 'clean marine sand', thereby giving rise to not only localised water quality impacts but also elevating the risk of encountering chemical contaminants which are more commonly associated with fines, or potential for excessive siltation at the sediment placement site.

One drawback associated with the use of a trailing suction hopper dredge is that excess water from the dredged sediment slurry would need to be discharged in the vicinity of the dredge area. Any discharge of this nature is the most likely to lead to turbid plume generation and would need to be avoided (i.e. reduced sediment transfer loads) or managed utilising the mitigation measures in this REF.

Assessment of previous sediment investigations indicates that there is only one likely contamination source, that of the previous boatshed and slipway within the inner harbour (which is not proposed for dredging). Copper and TBT contamination was found in the sediments within the inner harbour moorings however elutriate testing of sediments confirmed that release of contaminants from sediment during dredged material disposal is possible but unlikely to exceed marine water trigger values. Given the generally sandy nature of both dredge areas, the isolated occurrences of sediment contamination and low solubility contaminants found during previous elutriate testing, it is considered that there is very low risk of liberation of dissolved contaminants in excess of the default marine water quality objectives.

Bottom dumping of dredged sediments would result in a vertical plume of sediment through the water column. Most of this sediment, being sand, would settle quickly and result in only localised and short-term turbidity, similar to natural storm events. The inclusion of any fines in the dredged material would increase the extent and persistence of any turbidity plumes. Whilst some turbidity is unavoidable any excessive or sustained turbidity at the deposition location is indicative that poor quality sediment is being accessed by the dredge and would therefore require works to cease and further investigations be undertaken. Given the relatively large grain size of dredged materials, the occurrence of sediment plumes and turbidity is anticipated to be localised and short term.

It is likely that anoxic sediments would be dredged for deeper cut areas. The use of suction dredge technology reduces the risk to the environment as the dredged material is mixed with good quality water drawn into the dredge hopper. In this way gradual re-oxidisation of the sediments is initiated during dredging and transport, thereby reducing the potential for localised dissolved oxygen depletion at the placement site.

Overall, water quality issues at the placement site are largely mitigated by the substantial mixing and dilution associated with discharge into an open coast environment. It is expected that any water quality issues would be minor, temporary and localised.

6.2.4 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Water quality	A comprehensive water quality management plan (WQMP) will be prepared. The WQMP will include the following at a minimum: Identification of key water quality risks specific to the contractor's	Contractor	Prior to works	Appendix D

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	equipment and methodologies to be employed. Monitoring protocols to detect water quality issues associated with the works. Visual monitoring of turbidity on a continuous basis by the dredge operator to confirm that dredged and deposited sediment is clean marine sand. Issue response protocols including triggers for stop-work. Responsibilities of personnel in relation to water quality monitoring, management and response. Recording and reporting protocols.			
Sampling	A Sediment Sampling and Analysis Plan is to be prepared. Sediment sampling investigations are to be undertaken in accordance with that Plan at all proposed dredge areas within 12 months prior to each dredging campaign. The Plan must be specific to dredging volumes, locations and depths of each campaign and consider the results of previous investigations.	Transport	Prior to works	Appendix D
Particle size compatibility	Particle size distribution compatibility between the dredge cut location	Transport	Prior to works	Appendix D

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	and the intended deposition area is to be tested prior to each dredging campaign.			
Plant and equipment	All plant is to be in good working order. Regular inspections should be undertaken for hydrocarbon spills/slicks, equipment leaks and maintenance issues.	Contractor	During works	Appendix D
Refuelling	Refuelling of marine plant and equipment and storage of hazardous materials on barges should only occur within a double-bunded area.	Contractor	During works	Appendix D
Slurry supernatant	The location of any slurry supernatant discharge during dredging should be sited to minimise the proximity to environmental receptors which may be sensitive to turbidity. The location is to be determined through a review of marine habitats, likely water circulation patterns within the harbour and the practicalities of the dredging operation.	Contractor	During works	Appendix D
Allowable turbidity levels	In the event that a turbid plume propagates towards any specific sensitive marine habitat (as defined by a marine ecologist), the maximum allowable increase in turbidity at the boundary to that habitat due to the works is 10 NTU.	Contractor	During works	Appendix D
Surface water turbidity	Surface water turbidity is to be monitored utilising field equipment	Contractor	During works	Appendix D

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	at an up-current/un-impacted reference location and 100m down-current of active dredging and placement areas twice daily. The recommended 'investigation' level for excessive turbidity is to be the turbidity corresponding to 50 mg/L total suspended solids above the reference condition and is to be determined by a correlation study utilising the sediments to be dredged.			
Dredge design	The dredge design will take into account likely sediment slumping at the edge of the dredge cut. A minimum batter slope of 1 in 4 is to be used for all dredge areas. Where the dredge area is constrained by rock walls and a shallow batter cannot be maintained, the stability of the structure is to be considered and the impact of slumping of any loose sediment in these areas allowed for in the dredge design.	Contractor	During works	Appendix D
Extent of works	Dredging extents and depths are to be consistent with the extents considered in this assessment.	Contractor	During works	Appendix D
Visual monitoring	Visual monitoring is to be undertaken during works to confirm that sediment being dredged and deposited is consistent with the description of 'clean marine sand'. Whilst direct observation is not	Contractor	During works	Appendix D

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	always possible, the dredge/delivery barge operator should maintain a frequent watch of the following aspects: In situ appearance of dredge area sediment when in shallow water and/or clear water. Characteristics of the hopper/barge sediments and supernatant, in particular sediment colour and presence of coarse debris (shell etc.) or large amounts of organic material. Sediment plume characteristics during placement. Where significant levels of turbidity or coarse debris occur, works will cease and the dredged material will be examined and the relevant actions in the WQMP will be applied.			
Contamination extents	Any dredge areas considered to be contaminated (i.e. in excess of guideline values specified by the NAGD) are to be further investigated to fully demarcate the extent of contamination. Dredging of any such locations is not to be undertaken without further planning and assessment.	Transport	During works	Appendix D

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Unexpected finds	If unexpected indicators of sediment contamination risk are evident during dredging, works will cease in that location pending sampling, analysis and classification of the material. If this occurs, dredging and placement/disposal considerations will be guided by the sampling results.	Contractor	During works	Appendix D
Nearshore placement	Dredge sediment assessed as ASS or PASS can be placed at placement area A as the risk of acidification or water column deoxygenation at this placement site is negligible given the open water nature of this site and the pH buffering effects of seawater. This is under the provision that all other sediment characteristics are consistent with 'clean marine sand'.	Contractor	During works	Appendix D
Incidents	If an incident (e.g. spill) occurs, the <i>Roads and Maritime Services Environmental Incident Classification and Reporting Procedure</i> is to be followed, and the TfNSW Contract Manager notified as soon as practicable.	Contractor	During works	Appendix D
Accidental spills	All vessels and the site compound are to have on hand appropriate spill kits and bins for disposal of all rubbish and debris. This would include adequate	Contractor	During works	Appendix C

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	hydrocarbon booms. All contractors must be trained in the use of spill kits and hydrocarbon booms.			
Sediment transport	Long to medium term monitoring of sediment dispersal post-dredging will be undertaken to inform future dredging campaigns.	Transport	After each dredging campaign	DPIRD letter

Other safeguards and management measures that would address water quality and waste impacts are identified in section 6.6.

6.3 Air quality

6.3.1 Methodology

As the proposal is not expected to generate more than minor air quality impacts, a qualitative assessment has been undertaken.

6.3.2 Existing environment

The existing air quality in Coffs Harbour is typical of an Australian east coast city. With a population of nearly 80,000 people (according to the 2021 Census) and whilst supporting traffic from the Pacific Highway and its own airport, air quality remains relatively clean. The NSW DPE Air Quality Concentration Data (DPE, 2024), updated daily, generally measures a “good” level for this region with an hourly average small particulate matter (PM_{2.5}) of 4.5µg per cubic metre.

6.3.3 Potential impacts

All dredging and all dredged material placement would occur below water level during the nearshore placement off Park Beach and would not result in any exposed sediments that would generate odours.

Limited plant and machinery would be required for the proposal, though emissions generated from the dredge and work boats would contain particulate matter and gaseous emissions. Air quality degradation due to exhaust emissions is likely to be minor.

6.3.4 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Emissions generated from machinery and equipment.	Machinery will be adequately serviced and maintained to ensure minimisation of emissions.	Contractor	Prior to and during works	Additional safeguard

6.4 Noise and vibration

6.4.1 Methodology

The potential noise and vibration impacts of the proposal have been assessed using the *Construction Noise and Vibration Guideline* (CNVG) (RMS, 2016) and the *Interim Construction Noise Guideline* (ICNG) (DECCW, 2009). The *Noise Assessment for the Sand Transfer System - Coffs Harbour Boat Ramp Project Coffs Harbour, NSW* (Muller Acoustic Consulting, April 2023) was used to provide information on the background noise environment.

6.4.2 Existing environment

The figure below demonstrates that all residential noise receivers are located at a significant distance (greater than 170m) from the proposed dredging and placement areas.



Figure 8: Noise Catchment and Receivers. Muller Acoustic Consulting, April 2023.

The Noise Management Levels (NMLs) for construction activities for relevant receivers are:

Commercial premises: 70 dB LAeq (15 min).

Passive Recreation: 60 dB LAeq (15 min).

Residential: RBL + 10 (standard working hours).

Noise monitoring has been undertaken in the study area for previous maritime infrastructure projects in Coffs Harbour, and results of background noise levels have been used in this assessment. Noise monitoring was undertaken in residential areas noted as L1 and L2 in the figure above. Background noise levels (dB LAeq) in nearby residential areas were generally between 55 and 59, which is typical of a busy urban environment. Within the harbour itself, background noise levels (dB LAeq) of 48 were recorded for ocean noise, 73 for trucks and 43 for birds and insects (Muller Acoustic Consulting, 2023). This is typical of a working and recreational waterway environment.

An additional noise assessment was completed using the TfNSW Noise Estimator Tool to consider the potential noise impacts from the dredging equipment to be used in the proposal and to determine if any non-standard safeguards would be required to mitigate potential impacts. The assessment used the Transport Estimator Tool (Individual Plant) with an R3 Noise Area Category and a Representative Distance of 170 metres.

6.4.3 Potential impacts

Dredging and nourishment activities would occur in campaigns with a duration of up to 8 weeks per campaign, undertaken every one to three years. The size of the dredging vessel, tides and weather conditions may influence times when dredging can take place. Therefore, extended construction hours of Monday to Sunday 5am to 10pm would apply when required, and subject to an “out-of-hours” working plan.

The results of the TfNSW Noise Estimator Tool indicate that works during standard hours would not result in any increase in noise levels above NMLs at surrounding receivers.

No noise impacts from any compound or laydown area are anticipated given that these areas would be used for storage only, if required at all. There may be some minor noise impacts associated with deliveries of plant and equipment to the boat ramp, however these would be limited to short periods (not more than 4 hours) and would be consistent with the existing background noise environment (vehicles, trailers, boats etc) and activities already occurring at the boat ramp.

It is also unlikely that any vibration from the proposal would be an issue with residential receivers as there are minimal activities associated with the proposal that would create vibration.

Noise is not expected to be a nuisance due to large distances between the residential areas and proposed dredge and placement areas and the short duration of the dredging campaigns. In addition, residents have experienced dredging within Coffs Harbour over the past twenty-five years or more and are accustomed to the presence of a dredge, as well as boat engines and other watercraft.

6.4.4 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Dredge engine and equipment noise	Stationary noise sources must be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.	Contractor	During works	Appendix D of AS2436:2010
Unused plant	There is to be no idling of plant or equipment. Plant or equipment that is not being used will be turned off.	Contractor	During works	NSW Construction Noise and Vibration Strategy 2018, ST-157/4.1
Working hours	Works are to be undertaken within standard working hours wherever possible. Where work within standard working hours is not possible due to tidal and weather conditions (or other unforeseen factors) noise impacts are to be minimised in accordance with the TfNSW Noise Estimator Tool, including additional measures as applicable. Any works outside of standard working hours will be subject to an out-of-hours works methodology and plan and approval from the relevant Transport representative. The community must be notified of all work outside standard hours, which has the potential to impact noise-sensitive receivers. Notification zones must be determined using the TfNSW Noise Estimator Tool. Notification requirements must comply with the RMS	Contractor	During works	Environmental Assessment Procedure for Routine and Minor Work: Standard Safeguard List (N1). NSW Construction Noise and Vibration Strategy 2018, ST-157/4.1

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	<i>Construction Noise and Vibration Guideline.</i>			
Loading and unloading of materials and equipment	Loading and unloading of materials/deliveries is to occur as far away as possible from sensitive receivers. Dedicated loading/unloading areas are to be shielded if close to sensitive receivers.	Dredging contractor	During works	EMF-NV-GD-0060 Construction Noise and Vibration Guidelines.

Other safeguards and management measures that would address noise and vibration impacts are identified in section 7.1 of the TfNSW Construction Noise and Vibration Guideline.

6.5 Landscape character and visual impact

6.5.1 Methodology

Landscape character is the combined quality of the built, natural and cultural aspects that make up an area and provide its unique sense of place. Landscape in this context is taken to include all qualities and characteristics of a tract of land – landform, vegetation, built form and infrastructure. In this case, the landscape includes Coffs Harbour, the foreshore along Jetty Beach, the headland to the south and the distant view of the offshore islands, as well as Park Beach and its surrounds.

As the proposed works would primarily be undertaken on and under the water, a qualitative assessment has been undertaken.

6.5.2 Existing environment

The Coffs Harbour entrance lies immediately south of the Solitary Islands Marine Park and is regarded as the primary access point for commercial and recreational activities within the local area. It affords high visual amenity and scenic value to locals and tourists alike. The Coffs Harbour Jetty is registered within the NSW Governments' State Heritage Inventory due to its historic role in accelerating the economic growth of the area, and the region of the Coffs Coast also boasts being credited as the first Eco Certified Destination within NSW.

The coastline of Coffs Harbour is a major focus for recreation and the basis for much of the tourism in the region. Jetty Beach and the boat ramp offer accessible developed recreational facilities within a high amenity marina, beach, dune and headland environment.

In conjunction with the (then) Department of Planning and Environment, the Coffs Harbour City Council, and the local community, a *Coffs Jetty Revitalisation Refined Masterplan* was developed in December 2022. The masterplan outlines a vision to improve the foreshore precinct by way of repurposing existing land for future development whilst retaining the natural

amenity, size and scale of the existing Jetty Foreshore Park and improving connections between new public open space with the existing Foreshore Park.

6.5.3 Potential impacts

Throughout the dredging process, there may be a decrease in the visual amenity of the area due to the temporary presence of machinery, plant, fencing and noise. Although the amenity will be decreased, it is contained within a small area of the broader landscape and is likely to be tolerated well by the community as the proposal has generally had strong and widespread community support, and dredges have been present in the harbour for 25 years or more. In addition, the harbour is a busy working waterway with large vessels coming and going and high levels of traffic at certain times. The impact is likely to be minimal as the operation of a dredge within the harbour is generally consistent with its use and character of the area as a working and recreational waterway.

The proposed works would improve navigation in around the harbour and assist with achieving the objectives of the *Jetty Precinct Masterplan* to promote and enhance the area for recreational activities. The proposal would also be likely to have a long-term positive impact on the amenity of beaches north of the harbour by way of reducing beach and dune erosion and restoring depleted sand stocks.

6.5.4 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Amenity	Any laydown areas and compound sites will be kept clean and free of rubbish at all times.	Contractor	During works	Additional safeguard
Visual Character	Any laydown areas and compound sites will be returned to pre-works state once each dredging campaign has been completed.	Contractor	Post-works	Additional safeguard

6.6 Biodiversity

6.6.1 Methodology

An aquatic ecology assessment has been prepared by H2O Consulting Group to assess the potential aquatic ecology impacts of the proposal. This is included at Appendix C.

The following databases and information sources were searched:

- Bionet, Atlas of NSW Wildlife (last 20 years) (NSW Environment and Heritage 2024),
- NSW DPI Fisheries Threatened Species Lists (NSW DPI 2024a),
- EPBC Act Protected Matters Report tool (DCCEE 2024); and
- Atlas of Living Australia (FM Act listings only) (ALA 2024).

A threatened species assessment was undertaken by desktop review of 'sightings', assessment of the habitat in the study area, and determining the likelihood of occurrence of each species. Species considered further were those in the 'Known', 'High' and 'Moderate' categories and where impacts on the species from the proposed works are considered to possibly or likely occur. Those species with a moderate or higher likelihood of occurrence within the study area, which would potentially be impacted by the proposal, were identified for further assessment through a 5 / 7 Part Test and/ or Impact Assessment criteria.

Mapping of aquatic ecological features was reviewed using the following online tools:

- Fisheries NSW Spatial Data Portal - Mapping of Estuarine Macrophytes, Aquaculture, Marine Protected Areas, Key Fish Habitats and Resilience and Hazards SEPP layers (NSW DPI 2024b)
- NSW DPI Estuarine Habitat Dashboard (NSW DPI 2024c)
- Various recent aerial imagery captures (Nearmap 2024)
- Habitat mapping data collected in Coffs Harbour during previous investigations for the Coffs Harbour Sand Transfer System to monitor reef communities, including the Critically Endangered *N. lophocladia* (H2O Consulting Group 2024a).

A review of the potential environmental constraints identified via these maps was undertaken. These data sources were also used to develop habitat maps.

Site investigations included survey and visual inspection of representative areas of the seabed during December 2024. This included the entirety of the seabed within the Harbour, with a focus inside the proposed dredging areas, and intertidal and subtidal habitat within 50m of the sand placement areas.

Visual observations to verify the seabed habitat were made using a combination of towed camera transects and spot observations using a bathyscope. The towed camera was towed within 1m of the seabed and positioned so imagery was being provided from directly under or within 2m of the stern of the survey vessel. The towed camera allowed for in-situ field verification of mapping by providing video imagery live to the topside monitor on the survey vessel. The vessel sonar incorporates a thin, wide beam to provide clear images of structure and fish below the vessel. This was also used to aid mapping and target seabed areas with structure.

Site investigations within the dredging areas and the potential placement areas (options considered) at Jetty Beach, Park Beach and nearshore of Park Beach, completed as part of this assessment included:

- Inspection and description of general habitat within and adjacent to the dredge area and proposed placement areas,
- Description of intertidal flora and fauna present,
- Opportunistic, diurnal records of any marine birds or shorebirds, mammals or reptiles,
- Verification and mapping of subtidal habitat, including marine vegetation – in the Dredge Areas and Sand placement area A; and
- Collection of subtidal sediments to describe infauna communities.

Habitat mapping focused on marine vegetation and rocky reef habitat within the study area. Existing ecological habitat mapping and recent aerial imagery were verified insitu with visual observations made using a towed camera, side scan sonar and diver observations. Data collected included habitat type (seagrass, soft sediment, rock/reef/rubble, macroalgae, soft coral) and macroalgae types, including a measure of density (high, moderate or low).

Data was imported into GIS-based mapping software and created into shapefiles and polygons based on interpretation of the following data sources:

- Previous in situ mapping data (H2O Consulting Group 2024a),
- In situ habitat verification data,
- Existing estuarine macrophyte mapping (NSW DPI 2024b); and

- Recent aerial imagery.

Infauna were collected from marine sediments using a grab at four subtidal sites within the potential dredge areas and placement areas and hand cores (90 mm diameter) at three sites within the intertidal placement areas. At each site four replicate infauna samples were collected with approximately 1L of homogenised sediment sample retained for analysis. Samples were washed through a 1mm sieve and the retained material was preserved in 90% ethanol for later analysis. To aid analysis samples were stained using Rose Bengal dye. Once stained the dyed samples were sorted under a dissecting microscope and identified to Class (and as low as Family where possible) by a marine ecologist.

6.6.2 Existing environment

In total, 59 marine birds, 11 marine mammals, 5 marine reptiles, 9 sharks and rays, 3 fish, 1 macroalga and 1 threatened ecological community which are considered threatened and/or migratory were identified with potential for occurrence within the wider locality. The likelihood for occurrence within the study area was considered for further for each of these species as detailed in Appendix C.

Existing mapping of estuarine macrophytes conducted by NSW DPI (2024b) did not identify any seagrass, mangroves, or saltmarsh to occur within the study area. The nearest occurrence of estuarine macrophytes is recorded within Coffs Creek, where extensive fringing mangroves, some saltmarsh, and fringing patches of the *Zostera sp.* seagrass are mapped east of the Orlando St bridge.

The study area on the northern side of the Coffs Harbour Marina and Muttonbird Island is within the Habitat Protection Zone (IUCN IV) of the Solitary Islands Marine Park.

The entirety of the study area and adjacent waters are mapped as Key Fish Habitat (KFH) - Northern Rivers.

Mapping conducted as part of the Resilience and Hazards SEPP (2021) identifies vegetated land behind Jetty Beach and Park Beach as Littoral Rainforest Area under the SEPP, with some Littoral Rainforest Proximity Areas within the study area, including placement area B and directly adjacent to placement area C. Coastal Wetland Areas are mapped within Coffs Creek and other small sections southwest of the study area. Additionally, parts of the study area are mapped as coastal vulnerability, coastal environment and coastal use areas under the SEPP.

No aquaculture leases are present within 10km of the study area. The nearest leases are mapped to occur approximately 20km south in the Bellinger River near Mylestom (NSW DPI 2023b).

Existing bathymetry mapping conducted by the (then) NSW Department of Planning and Environment as part of the Seabed NSW Program indicates the presence of extensive rocky reef habitat landforms in the vicinity of the study area. A number of large rocky reef formations are present offshore to the east of Coffs Harbour, as well as on the northern side of the Coffs Harbour Marina and to the east of Little Muttonbird Island. These formations are comprised of peaks, scarps and rugose outcrops with the majority of reef formations in close proximity to the study area at depths of between -15.0 to -20.0 m. A small outcrop of rocky reef is also evident within Coffs Harbour, close to shore approximately 120 m north of the end of the Coffs Harbour Boat Ramp breakwater.

6.6.3 Potential impacts

Dredging activities can have significant impacts on benthic marine organisms, particularly phototrophic macrophytes (e.g. seagrasses) and fauna of limited mobility living in seabed sediment (e.g. infauna such as worms and bivalves) (Fraser et al. 2017). Such disturbances

may occur through mechanisms such as direct removal for those situated on/in sediments to be dredged, and excessive sedimentation and reduction in light availability as a result of increased mobilisation and suspension of sediments during dredging. Direct and indirect impacts may also occur at the site of sand placement as a result of changed water quality. Dumped sediments in sand placement areas can result in a temporary reduction of water quality as sediments settle, resulting in altered physical chemistry, increased turbidity and reduced water clarity. Where sediments are placed on beaches or intertidal areas, they may become mobile and impact on adjacent habitats.

Dredging mobilises sediments into the water column as sediments are removed from the seabed. Increases in suspended sediments in the water column can alter the physical chemistry of the water, increase turbidity and reduce available light to the seabed, eventually settling on the seabed. No seagrasses occur within the study area, with vegetation confined to marine macroalgae. Dredging is expected to include the use of an ocean-going trailing suction hopper dredge (TSHD) or split hopper barge (SHB) to remove material from the dredging areas and transport material underwater to the nearshore placement area A. Dredging events utilising the TSHD would likely result in increased sedimentation to surrounding habitats as a result of sediment pluming during the placement of sand. Sediment plumes in Coffs Harbour and in the vicinity of placement area A as a result of dredging and sand placement works are expected to be short-term and regularly dissipate with the coastal ocean currents for the duration of the works.

Given the significant sediment accretion that currently occurs inside of Coffs Harbour, pulse increases in sedimentation and turbidity associated with dredging is not expected to result in ecologically significant disturbances. Notably, it is not intended to pursue any land placement options as part of this REF.

Risks associated with acid sulfate soils (ASS) are limited to onshore placement of sands, as sediments transported to the nearshore placement area A would remain under the water. NO onshore placement of dredged sand is proposed as part of this proposal.

Unplanned spills and discharges may lead to detrimental impacts on water quality, habitats and associated flora and fauna. Unplanned spills may include hydrocarbon-based products such as diesel fuel and lubricants from water-based machinery, sand slurry from burst pipes and spills of other potential environmental contaminants required on site during the project. Accidental spills pose a significant risk to both fauna and the wider Solitary Islands Marine Park. Where possible the use of booster pumps and floating machinery would be avoided or minimised to reduce these risks, while suitable measures to mitigate residual risk of unplanned spills would be in place. Discharges may include operational wastewater and ballast water from vessels during dredging activities, as well as discharge from onshore dewatering. These works would require suitable measures to avoid, minimise and mitigate the risk of unplanned spills and discharges during project works and to ensure these risks are within acceptable limits for works within the Marine Park.

Injury and fatality of vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris is considered a Key Threatening Process under both the FM and EPBC Acts. The planned or unplanned disposal of any wastes, petroleum-based products and other debris has the potential to have direct and indirect impacts on marine fauna in the study area. The introduction of non-indigenous fish and marine vegetation to the coastal waters of NSW is considered a Key Threatening Process under the FM Act. Introduced fish and marine vegetation, or noxious (invasive or toxic) species, that may occur and be transferred between locations on dredging equipment and associated vessels can pose a risk in terms of infestation by non-native or invasive species.

Macroalgae:

Dredging activities may have some potential to temporarily disturb macroalgae assemblages due to a reduction in water quality (increased turbidity) caused by mobilisation of sediments.

Sedimentation generated from dredging within the Harbour is expected to be directed towards the shore by current, whilst sediments placed offshore of Park Beach (placement area A) would likely be transported towards shore and northward, by the northward littoral drift. Disturbances are typically expected to be minor, short-term and very localised with sedimentation expected to dissipate quickly with coastal tide and current.

Subtidal sand placement at placement area A is expected to result in temporary pulse disturbances following sand placement, including increased sedimentation and turbidity. Little Muttonbird Island, approximately 195m to the south of the proposed placement area A includes extensive fringing reef habitat, whilst seabed bathymetry also indicates extensive rocky reef formations east of the island and toward Muttonbird Island and extending east from Macauley's Headland to the north of the study area. Previous reef monitoring studies recorded macroalgae communities in these locations to be dominated by brown macroalgae such as Kelp (*Ecklonia radiata*) and Gulfweed (*Sargassum sp.*), and red macroalgae such as *Amphiroa anceps* and *Delisea pulchra*. It is possible that macroalgae in the vicinity of placement area A and macroalgae communities inhabiting rocky reef habitat to the north of Park Beach associated with Macauley's Headland may experience some smothering, which may result in some loss of some smaller macroalgae stands. It is expected that placement of larger volumes of sand in placement area A would be reflective of sediment transport during a storm event.

The Critically Endangered Marine Brown Alga (*Nereia lophocladia*) is known to occur in the study area. The species occurs on hard substrate at the sand and rock interface, with habitats supporting known occurrences including dynamic areas of reef, rockpools or submerged rocky outcrops. Targeted surveys in October 2023 identified the species around the bommie at the southern end of Hole in the Wall Beach to the north of the Coffs Harbour northern breakwater, however, it was not present at Little Muttonbird Island, Muttonbird Island or Macauley's Headland (H2O Consulting Group 2024a).

Sand movement following storms or coastal development has been identified to threaten the species. However, scouring driven by sand movement may also benefit the species by removing marine growth and providing opportunities for *Nereia* to establish. Considering the sediment transport pathways and loads, it is unlikely that suitable habitat would be present for the species inside of the harbour as sediment accretion on sand-rock interfaces would smother the species in these locations in vicinity of the proposed dredging. Based on the current known distribution of *N. lophocladia* in the area, which is restricted to the sand-rock interface along the northern Coffs Harbour breakwater/Marina Reef (outside of the harbour), the maintenance dredging is unlikely to result in impacts to the species.

Potential impacts on *Nereia lophocladia* over the 10-year period were considered further through a 7-Part Test (Appendix C) which concluded that based on the current known distribution of *N. lophocladia*, the proposed dredging and sand placement activities are not considered to have a significant impact on the species such that it would result in the extinction of the local population. The known, consistently observed population on reef north of Coffs Harbour is not within the dredge areas and is protected from dredging by the northern breakwater and Muttonbird Island. The population that has previously been recorded on Little Muttonbird Island may experience some minor, short-term sedimentation where extensive pluming occurs from subtidal placement, however, is over 160m from the placement area and in the opposite direction of the natural current flow. Further 7-Part tests and surveys may be required over the 10 year approval period where dredging is required within 50 m of the natural subtidal rocky reef on the southern side of Muttonbird Island, where *N. lophocladia* may have the potential to occur.

Marine birds, shorebirds and waders:

The proposed dredging is confined to subtidal areas within Coffs Harbour, however, would be in close proximity to rocky intertidal areas associated with the marina and boat ramp breakwaters and natural rocky intertidal habitat at the western extent of Muttonbird Island. Sand placement activities would also include some areas of sandy shoreline which may

provide foraging, roosting or nesting habitat for some shorebird species. Impacts on marine birds, shorebirds and waders in the study area that may result from dredging and sand placement activities are expected to predominantly include short-term disturbances to habitat quality relating to reduced water quality, shifts in prey abundances, construction noise and machinery disturbance and modification of some existing shoreline/foreshore foraging and roosting habitats if the sand placement occurs onshore.

Marine birds that may use resources in the study area include several species of migratory and threatened birds, with those considered to have a moderate or higher likelihood of occurrence including the Wedge-tailed Shearwater (*Ardenna pacifica*) protected under the Japan Australia Migratory Bird Agreement (JAMBA) and the Short-tailed Shearwater (*A. tenuirostris*) protected under China Australia Migratory Bird Agreement (CAMBA), JAMBA and Republic of Korea Australia Migratory Bird Agreement (ROKAMBA). *Ardenna pacifica* are known to breed in the thousands on the upper parts of Muttonbird Island and to a lesser extent on Little Muttonbird Island.

The proposed dredging activities, specifically involving the use of dredge vessels and equipment on the water and sand placement, have the potential to increase the likelihood of injury and/or mortality to migratory birds in the vicinity of Muttonbird and Little Muttonbird Islands if conducted during the end of migration period. Shearwaters have naturally high mortality rates upon return from migratory journeys. Already incapacitated birds would likely be unable to disperse from the path of work vessels, machinery or placement activities and may be subject to further mortality. Works during April/May may also have potential to injure fledglings that have had unsuccessful flights and have landed nearby. Common landing spots include Coffs Harbour Marina, Harbour Drive, Park Beach and the Deep Sea Fishing Club. Additionally, *A. pacifica* use the moonlight for navigation and would typically fly in the direction of the brightest horizon, with documented disturbances from artificial land-based or vessel light sources causing birds to fly in the wrong direction, particularly as fledglings first leave. Any artificial lighting from work vessels or sites, particularly around dusk, has the potential to contribute to these disturbances.

There is potential that reduced prey detection success from waters with elevated levels of turbidity may impact on some species that forage aerially. Changes to prey availability may also occur, which may be detrimental to the species where prey is deterred by dredging works, or beneficial to the species as prey are attracted to smaller biota elutriated from sediment plumes. The potential for detrimental impacts to the water quality from the proposed dredging operations is considered to be generally minor in spatial extent considering the vast areas of coastal waters these species utilise for foraging. Any potential impacts are also likely to be very short-term, given the tidal exchange of the area and the clean marine sand substrate, allowing the substrate to settle and disperse quickly. Given the above, it is highly unlikely that any disturbance to aerial foraging for these species would be of ecological significance.

Threatened and migratory shorebirds and waders with a moderate or higher likelihood of occurrence include the Pied Oystercatcher (*Haematopus longirostris*), Sooty Oystercatcher (*H. fuliginosus*), Little Tern (*Sterna albifrons*) and Crested Tern (*Thalasseus bergii*), whilst other species such as godwits and sand plovers may utilise foraging or roosting habitat in the study area at times. A majority of shorebirds that frequent the locality do not breed locally nor on the Australian mainland. The study area provides only marginal nesting habitat for those species that do breed locally. Any potential nesting habitat within the study area would likely be limited to upper dunes on Park Beach, however, it is expected that birds would naturally be deterred from these locations due to the high amount of human activity. It is likely that shorebirds breeding in the direct locality would utilise sandbar and wetland habitat of Coffs Creek upstream of Orlando Street bridge. There still remains some potential that sand placement activities may result in disturbance, smothering, crushing, injury or mortality to nesting shorebirds that are defending their nest or to eggs/chicks as a result of placement of material or movement of vehicles/equipment if onshore placement is used. Disturbance may also occur to other species utilising habitats in the sand placement areas or rocky intertidal areas directly

adjacent to dredge areas for foraging or roosting from construction noise or presence of workers or equipment. The placement of sand may also attract birds to the area if material contains smaller prey items, which may encourage an increased presence in areas that are not usually preferred by these species, thereby increasing potential for interaction with work vehicles or equipment.

Considering the above, potential impacts to the Pied Oystercatcher, Sooty Oystercatcher, Wedge-tailed Shearwater, Short-tailed Shearwater, Little Tern and Crested Tern were considered further through 5-Part Tests and Significant Impact Criteria (Appendix C). A 5-Part Test concluded that disturbances to the Pied Oystercatcher and Sooty Oystercatcher from the proposed works include short term and minor disturbances to a small area of potential foraging and very marginal highly disturbed roosting habitat that may be used opportunistically. Given the absence of previous nesting records, and the high recreational use of the area, it is unlikely that the site provides suitable nesting habitat for the Pied Oystercatcher. The Sooty Oystercatcher is known to breed in offshore locations. The proposal is not considered likely to result in a significant impact on the local population of the Pied Oystercatcher and Sooty Oystercatcher.

A 5-Part Test for Little Terns concluded that individuals that may potentially at times utilise habitat in the vicinity of the works are unlikely to be significantly affected by the proposed activity. The Little Tern only has a moderate likelihood of occurrence in this area, while the adjacent sandy shoreline areas associated with Jetty Beach and Park Beach, and waters within and adjacent to the study area only provide marginal habitat for the species. Disturbances to the species are expected to be confined to temporary modification of roosting habitat that may be used opportunistically and a temporary reduction in foraging habitat quality.

Additionally, a Significant Impact Criteria for migratory marine birds concluded potential impacts to migratory marine birds from the proposed maintenance dredging and sand placement at Coffs Harbour are confined to areas of marginal habitat inside of the study area, including modification of marginal sandy roosting habitat and temporary disturbances to subtidal foraging habitat quality. It is not expected that these impacts would affect important migratory marine bird habitat associated with Muttonbird or Little Muttonbird Island, whilst it is also not expected that works would seriously disrupt the life cycle of migratory marine bird species.

Marine mammals:

Smaller marine mammals such as various species of dolphin live in the Solitary Islands Marine Park throughout the year and are likely to occur on occasions as part of transient movement through the locality for opportunistic foraging. Fur-seal species may also transiently use habitat in the vicinity of the study area for opportunistic foraging or refuge. When present, fur-seals may utilise areas of rocky shoreline associated with breakwaters, Muttonbird Island or Little Muttonbird Island to haul-out. Dredging works may disturb fur-seals using adjacent rocky shoreline associated with breakwaters inside of Coffs Harbour or the southern shoreline of Muttonbird Island. The mobilisation of sediments from dredging and nearshore sand placement may also reduce foraging habitat value for these species, either by deterring prey or reducing success in detecting prey. Given these marine mammals forage over very large expansive areas of coastal and estuarine waters, when considered against the relatively small extent of the study area the potential for ecologically significant impacts on foraging habitat used by these species as a result of the proposed works is minimal.

Physiological impacts of underwater noise are typically considered to be auditory injuries, which can result in a reduction in an animal's hearing sensitivity, or an increase in hearing threshold. Trailer Suction Hopper Dredges (TSHD) typically produce a sound exposure level (SEL) of 189 dB at 1m, whilst Cutter Suction Dredges (CSDs) produce between 157-186 dB. Some behavioural impacts may possibly occur to small marine mammals within Coffs Harbour as a result of dredging and affected mammals may avoid or disperse from the area. Dredging has the potential for physiological impacts on dolphins in close proximity if continuous over 24

hours, however, individuals would be expected to disperse from the disturbance before physiological impacts would occur, and dredging is not proposed to be continuous over 24 hours.

It is unlikely that larger marine mammals such as cetaceans (whales) would enter Coffs Harbour, particularly around the shallow dredge areas, however, they may transiently pass by the open coastline during migration seasons. Baleen whales are low-frequency cetaceans, with similar underwater noise criteria to toothed whales. Thus, similarly to dolphins, baleen whales in close proximity to dredging would be expected to show behavioural avoidance of the area with potential for temporary physiological responses if exposed to noise in close proximity for 24 hours.

The works are not considered likely to result in any significant short-term or sustained increases in vessel movements that could potentially pose an increased risk of vessel strike for any marine mammals that may transiently occur during dredging or sand placement operations. The movement of the dredge vessel along the ocean transport route to placement area A holds some low risk of potential collision with a marine mammal, however, risk can be adequately managed through additional controls for marine megafauna.

Marine reptiles:

The study area may provide intermittent habitat for some marine reptiles including the Green Turtle (*Chelonia mydas*), the Loggerhead Turtle (*Caretta caretta*) and the Hawksbill Turtle (*Eretmochelys imbricata*), which are regularly recorded within the Solitary Islands Marine Park. Numerous records of Green and Loggerhead Turtle nesting events have been recorded along the Coffs Coast in the past five years.

Potential habitat for marine turtles within and in vicinity of the study area includes sandy and rocky shorelines and subtidal rocky reef. Rocky reef habitat associated with the natural rock reef of Muttonbird Island and surrounding rocky reef outcrops, as well as rock armouring comprising the numerous breakwaters in Coffs Harbour support common marine macroalgae species which provide foraging value for turtles. Marine turtles may experience short-term disturbances to foraging habitat quality when dredging or nearshore sand placement is occurring, as a result of increased sedimentation and turbidity in the locality. As the dredge areas and placement area A are exposed to ocean coastal processes, it is expected that turbidity would dissipate quickly. These changes to foraging habitats are considered to be of minimal ecological significance to foraging prospects for marine turtles.

Sandy shoreline habitat associated with Park Beach and Jetty Beach provide marginal nesting habitat for Green and Loggerhead Turtles. Considering the high amount of human activity in the northern portion of Jetty Beach between the jetty and marina, it is highly unlikely that turtles would choose habitat in this area for nesting. Whilst Park Beach is also exposed to a high level of human activity, the longer and more open beach may provide potential nesting habitat for turtles in the region. Onshore sand placement activities have potential to smother nests. Relevant to this assessment, impacts from climate change resulting in changes to water temperature and sand temperature may affect species range and habitat suitability, particularly for nesting sites. Increasing numbers of Green and Loggerhead Turtle nests are being recorded in NSW, potentially in response to climate change impacts. Thus, following current trends the likelihood of marine turtle nesting in or in close proximity to the study area over the next decade increases with time. A 5-Part Test and Significant Impact Criteria was conducted for marine turtles to further assess potential impacts on nesting habitat.

The proposed maintenance dredging works are not expected to generate any ecologically significant levels of underwater noise that have potential for detrimental physiological or behavioural responses by marine turtles should they be present in the vicinity. Marine turtles are not considered as sensitive to underwater noise as some fish and marine mammals, however there is anecdotal evidence that marine turtles may still experience acoustic annoyance and mild tactile detection or physical discomfort from underwater noise.

The works are not considered likely to result in any short-term or sustained increases in vessel movements that could potentially pose an increased risk of vessel strike for any marine turtles that may transiently occur in the study area during dredging operations. Dredging areas are directly adjacent to the Coffs Harbour Marina and Coffs Harbour Boat Ramp, which facilitate a moderate amount of vessel movements daily.

A 5-Part Test and Significant Impact Criteria concluded that marine turtles that may potentially utilise habitat in the vicinity of the proposal are unlikely to be significantly affected by the proposed activity. Habitat use in the vicinity of the proposed works is likely to be very occasional and limited to opportunistic foraging as part of transient movements, with any nesting considered unlikely on Jetty Beach or Park Beach. Disturbances from the proposed works are limited to temporary reductions in habitat quality associated with the operation of the dredge and during sand placement, due to increased turbidity and sedimentation and disturbances from underwater noise.

Fish, sharks and rays:

The proposed maintenance dredging involves both dredging works in shallow subtidal areas and sand placement in subtidal habitat nearshore of Park Beach. Given the relatively slow forward progress of dredging vessels during operations, it is expected that most fish, sharks and rays in the path of the dredge vessel and machinery would have sufficient levels of alertness and mobility to evade disturbances. Direct detrimental impacts are likely to be confined to smaller, less mobile benthic or epibenthic species, which may be disturbed by dredging or by subtidal sand placement. Some short-term disturbances may occur to fish, sharks or rays in close proximity to dredging as a result of underwater noise, however, the works are not expected to result in levels of underwater noise that would cause injury or mortality to these organisms.

Impacts from the proposed maintenance dredging in Coffs Harbour are expected to be predominantly indirect on fish, sharks and rays, because of pulse disturbances to habitat and modifications of benthic habitat through the mobilisation of sediments and the creation of sediment plumes, with expected pulse increases in turbidity surrounding works areas and sedimentation of adjacent habitats. These habitat disturbances may reduce habitat quality for larger, more pelagic species of fish, sharks and rays, as well as their prey, during works because of reduced water quality, underwater noise and potential dispersal of prey species from the immediate area. Species disturbed by temporary decreases in habitat quality would likely move to adjacent areas for the duration of works. It is also possible that the disturbed seabed immediately behind the operating dredge machinery and associated sediment plume would attract many of these species due to the expected elutriation of substantial amounts of benthic infauna prey items into the water column.

Various other threatened and/or migratory species of larger predatory fish, sharks and rays may transiently occur in the waters of the study area. The Critically Endangered Grey Nurse Shark (*Carcharias taurus*) occurs in the locality, with known aggregation sites in the Solitary Islands Marine Park. These sites are confined to the north and south Solitary Islands with South Solitary Island approximately 15 km northeast of the study area. Whilst known aggregation sites do not occur within the study area, some individuals may transiently utilise rocky reef habitat throughout or adjacent to the study area for foraging efforts, predominantly at night. Given that dredging operations would be confined to subtidal habitats close to shore, the marina and the boat ramp, and the species typically occupies deeper waters beyond the surf zone direct impacts from maintenance dredging on *C. taurus* or their habitat are considered unlikely. The species may experience some temporary reduced foraging habitat following any sand dumping nearshore Park Beach as sand settles. In addition to the above, habitat disturbances may reduce habitat quality for larger, more pelagic species of fish, sharks and rays, as well as their prey, during works. It is also likely that some larger, transient predatory species, such as the endangered White Shark (*C. carcharias*), may utilise habitat within the harbour at times. Habitat quality for these large predators may be reduced via lower

water quality, fewer prey species and temporary underwater noise. Any impacts on water quality are expected to be very minimal and localised and would not be expected to impact large pelagic species such as the White Shark.

Rocky reef habitat associated with Muttonbird Island, Little Muttonbird Island and armouring breakwaters throughout Coffs Harbour may provide suitable habitat for the Vulnerable Black Rockcod (*Epinephelus daemeli*), which utilises deeper shoreline areas along rocky drop-offs where ledges, overhangs and caves occur (NSW DPI 2012b). The small reef area adjacent to the Coffs Harbour Boat Ramp may also provide some habitat value for the species at times. Impacts to the species from proposed maintenance dredging is expected to be limited to indirect disturbances as a result of reduced habitat quality from turbidity and sedimentation associated with works.

Whilst most fish, shark or ray species in Coffs Harbour or in the vicinity of placement area A would experience pulse events of indirect disturbances with each dredging and/or placement campaign, sedimentation and turbidity increases are likely to be of minimal ecological significance to these species compared to existing coastal processes. Sediment accretion within Coffs Harbour has been estimated at between 20,000 – 50,000m³ annually.

Marine invertebrates:

The removal of soft sediment from the dredge areas would result in the direct removal and/or physical disturbance of the infaunal invertebrate community inhabiting sediments. These invertebrates are a key component of the benthic ecosystem and of marine food webs, providing a food source for fish, turtles and birds. It is expected that those infauna communities inhabiting sands to be dredged would be lost, removed or displaced.

Infauna occupying surface sediments may be smothered or buried during sand placement, both in subtidal habitats and onshore. Some benthic fauna may perish where they cannot escape from the sediment being placed. Sand placement also has potential for longer-term impacts on the habitat for invertebrate species by changing the critical habitat requirements in regard to sediment particle size distribution. Impacts would be lesser where the composition of sediments are most similar to the existing sediment composition of the placement site. Infauna in intertidal areas on Jetty Beach and Park Beach are also likely to experience some short-term impacts from smothering, which is expected to predominantly be confined to the high intertidal zones. It is likely that infauna communities along Park Beach, which has been modelled as a receding shoreline, may already be quite deprived. Recent infauna monitoring at a beach with active coastal erosion on the mid NSW coast found no significant differences in infauna abundance or richness between pre and post beach nourishment works, with the highly active sands providing unstable habitat for these communities. It is predicted that recovery would occur more quickly in subtidal habitats, with those more stable sediments in deeper water likely to recover quicker than shallow areas, where greater disturbance from wave energy occurs. Additionally, the active northward littoral drift along Park Beach at placement area A and its location behind the surf zone may distribute placed sediment over a larger area, reducing magnitude of impact in the direct area. Typically, early stages of recovery may be detectable from weeks to months after sand placement but would depend on seeding potential for these communities, patchiness and volume of nourishment and other disturbances of sediments and the physical properties of the sediment used. Where losses do occur, the recolonisation of the seabed sediment in the newly dredged seabed sand placement areas would likely begin soon after dredging and recover to pre-dredging diversity and abundance. Estimates of infauna recovery from previous studies has indicated this to be typically less than 12 months and as little as 1 month from dredging of navigation channels and at placement areas. Thus, the extent and magnitude of any disturbance to or loss of infauna as a result of this proposed maintenance dredging is not expected to occur at any ecologically relevant scale.

Other larger soft sediment invertebrates such as larger gastropods and crustaceans, sea cucumbers, sand and tube anemones, sea pens and other cnidarians may sporadically occur

in the study area, and slow moving and solitary species would likely be smothered by the works.

Invertebrates associated with hard substrata of natural rocky reef of Muttonbird Island and the numerous rock ballast breakwaters in Coffs Harbour may also experience some short-term, temporary habitat disturbances associated with works. Impacts to these species are expected to be confined to indirect impacts associated with reduced habitat quality as a result of increased turbidity and sedimentation.

Conclusion on significance of impacts:

The proposal is not likely to significantly impact threatened species, populations or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* or *Fisheries Management Act 1994* and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required.

The proposal is not likely to significantly impact threatened species, populations, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Government Department of Climate Change, Energy, the Environment and Water is not required for biodiversity matters.

6.6.4 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Benthic fauna	A Benthic Assessment Procedure (BAP) has been prepared for the duration of the 10-year project (refer to Appendix C). The BAP identifies requirements and procedures to be adhered to, which will be included in the PEMP.	Contractor	Prior to works, during works	Appendix C
Biodiversity Management Plan	A Biodiversity Management Plan (BMP) will be prepared to incorporate relevant procedures, surveys, inspections, habitat mapping, timing restrictions, programs and permits.	Contractor	Prior to works, during works	Additional safeguard
Marine habitat survey	A Marine Habitat Survey will be conducted prior to each dredging campaign to identify potential impacts on any threatened species under the FM Act and to update the	Transport	Prior to works	Appendix C

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	distribution of ecologically significant habitats e.g., reef structures, macroalgae stands and benthic communities. These distribution maps will be incorporated into the PEMP or equivalent to identify habitat boundaries and required buffers. Note: A Marine Habitat Survey will not be required for areas considered as part of this initial assessment within 12 months of survey.			
Marine Brown Alga	Dredging and sand placement for all campaigns should maintain a minimum 100m buffer from areas of known or previously known occurrences of <i>N. lophocladia</i>. Where dredging or sand placement must occur within 100 m of known or previously known occurrences, a management plan must be prepared in consultation with the relevant agencies.	Contractor	Prior to works	Appendix C
Pre-works inspection	A pre-works inspection for fauna habitat will be conducted by an ecologist within 4 weeks prior to commencement of works, especially for threatened shorebirds and/or nesting turtles, and where required fauna clearance works must be undertaken before any works in these areas	Contractor	Prior to works	Appendix C

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	commence. Inspections are to include breakwaters adjacent to dredging areas. Should nesting fauna be found, further consultation and the preparation of an appropriate management plan will be prepared in consultation with the relevant agency.			
Nesting turtles	If works are to occur within October to March (inclusive breeding season of Green, Loggerhead and Hawksbill Turtles) the local NPWS office should be contacted prior to works to confirm whether nesting turtles have been recorded on Jetty Beach or Park Beach. Should nesting turtles be found, further consultation and the preparation of an appropriate management plan will be prepared in consultation with the relevant agency.	Contractor	Prior to works	Appendix C
Migratory birds	Timing of works should avoid important migration periods of Shearwaters, which nest on Muttonbird and Little Muttonbird Island, when birds are most vulnerable to external impacts. These periods include: April – early May: fledglings begin first migratory flight from Muttonbird and Little Muttonbird Island.	Contractor	Prior to works	Appendix C

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	August: adults return to Muttonbird and Little Muttonbird Island at the end of their migration. If works are unavoidable within these time periods, a Migratory Marine Bird Management Plan will need to be prepared to mitigate risks to vulnerable birds in consultation with the relevant agency.			
Soft sediment communities	A monitoring program to measure ecological recovery of soft sediment communities within the subtidal placement area A will be undertaken and pre-dredging data obtained within six months of commencing dredging works. This data should include: a. Measurement of infauna assemblages, diversity and abundance using replicated sampling to account for spatial variability (Min n = 4). b. Measurement of key sediment characteristics TOC and PSD. c. Sampling of a minimum of two impact (within placement area) and two appropriate control sites.	Transport	Prior to works, post-works	Appendix C
Licensing and permits	A Section 199 notification must be current for each campaign. Any conditions from the	Transport	Prior to works	Appendix C

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	notification must be incorporated into the PEMP.			
Licensing and permits	A Section 205 permit must be current for each campaign and associated notification issued, where identified as a requirement within the Marine Habitat Survey or requested by NSW DPI Fisheries. Note that the initial campaign does not require a Section 205 permit.	Transport	Prior to works	Appendix C
Licensing and permits	Where any works involve sand placement or transport of sand to the Solitary Islands Marine Park, a permit will be required under the Marine Estate Management Act 2014 and Marine Estate Management (Management Rules) Regulation 1999 prior to the commencement of the activity.	Transport	Prior to works	Appendix C
Buffer zones	Dredging areas and placement areas will need to maintain a minimum 100m buffer from areas of known or previously known occurrences of <i>N. lophocladia</i> and a minimum 50m buffer from areas of natural subtidal rocky reef.	Contractor	During works	Appendix C
Reef habitat	Dredge area 2 must avoid the small outcrop of rocky reef located north of the Coffs Harbour Boat Ramp breakwater toe.	Contractor	During works	Appendix C
Key fish habitat (KFH)	For dredging and sand placement works a 50m buffer zone will	Contractor	During works	Appendix C

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	need to be maintained to any Type 2 KFH and 50 – 100m for Type 1 KFH for waters outside the Marine Park. For works within the Marine Park (where all KFH is considered Type 1 KFH), works should maintain a minimum 100m buffer to natural rocky reef habitats. Note: Dredging may occur in close proximity to Type 2 macroalgae associated with breakwaters, which cannot be avoided. The proposed placement area A currently maintains a 150m buffer from Little Muttonbird Island. This buffer will be in place for subtidal placement works over the 10 year period.			
Marine vegetation	No mooring or beaching of vessels is to be within any marine vegetation.	Contractor	During works	Appendix C
Dredge pipelines	No dredge pipelines are to be placed over natural rocky intertidal or subtidal formations.	Contractor	During works	Appendix C
Fur seals	The NSW NPWS Guidelines for approach distance to Seals must be adhered to at all times. Should this not be possible the project ecologist and NPWS must be notified immediately.	Contractor	During works	Appendix C
Nesting fauna	If any marine or shorebirds or turtles are found to be nesting, or fur seals	Contractor	During works	Appendix C

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	resting within 100m of the works, the works should cease immediately and the local NPWS office notified.			
Injured birds	Injured Shearwaters should be covered with a towel and put in a box with air flow. The contractor should contact WIRES or NPWS.	Contractor	During works	Appendix C
Vessel strike	To manage potential impacts of vessel strike and underwater noise on marine fauna inside of the harbour, the following will be undertaken: a. The entire harbour is to be considered an observation zone for marine mammals and turtles. b. The observation zone will be monitored for marine mammals and turtles for a period of no less than 30 minutes before start-up of the dredge. c. A shut down zone for marine mammals and turtles should be implemented for an area that extends 500m from the entrance to the boat ramp basin. Incursions of marine mammals and/or turtles into this zone during dredging operations triggers a temporary shutdown of operations.	Contractor	During works	Appendix C
Vessel speed	Works vessels will travel at no greater	Contractor	During works	Appendix C

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	than 8 knots of speed within 500m of the proposal footprint during construction works to minimise potential for interaction and/or vessel strike on marine fauna.			
Hydrocarbon spills	All hydrocarbons must be appropriately managed at all times, including: a. The storing of hydrocarbon-based products on water must be avoided and must be stored in a suitable bunded area within the site laydown area on land. b. Hydrocarbons are to be stored in a bunded area with adequate spill kits available. All staff are to be made aware of the location of the spill kit and trained in its use. c. Hydrocarbon booms will be placed around all stationary machinery on the water and be on hand for deployment around vessels. d. All machinery must be routinely checked for leaks, with an emergency spill kit to be kept on site at all times. e. Where practical, floating containment	Contractor	During works	Appendix C

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	booms will be in place to control any spills of hydrocarbons around machinery operating on or over water.			
Turbidity	Visual and turbidity monitoring of dredge pluming will be undertaken as part of standard water quality monitoring during dredging works at both the dredge and placement sites.	Contractor	During works	Appendix C
Introduced species	All equipment to be brought to the study area must be thoroughly cleaned and free of substrate to avoid introduction of species such as <i>C. taxifolia</i> . Equipment should be thoroughly cleaned following the completion of the project to prevent spread of potential invasive species to other areas.	Contractor	During works	Appendix C
Introduced species	If <i>C. taxifolia</i> is found within the works area, it should be avoided and not disturbed to minimise further spread to other areas. If dredging vessels or equipment are found to have caught <i>C. taxifolia</i> during works, they should be thoroughly cleaned with fresh water, with all biota safely disposed of on land.	Contractor	During works	Appendix C
Independent inspections	Environmental controls should be inspected weekly by a Transport environmental officer	Transport	During works	Appendix C

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	or an independent consultant.			
Waste	All materials, machinery and rubbish must be removed from site.	Contractor	Post works	Appendix C
Final inspection	A final inspection of any works sites must be undertaken by a TfNSW environmental officer or an independent consultant.	Transport	Post works	Appendix C
Licenses and permits	Any requirements of the Section 199 notification or 205 permits must be filled and documentation submitted.	Transport	Post works	Appendix C
Post-dredging survey	A post-dredging survey of ecological recovery of soft sediment communities within the subtidal placement areas and control sites is to be implemented within 6 months of completion of the dredging works. The survey must follow the monitoring protocols adopted for pre-dredging survey.	Transport	Post works	Appendix C
Further surveys and mapping	No dredging of additional areas is to occur without further consideration of biodiversity impacts. For future dredging works scheduled to occur greater than 12 months following completion of the site surveys prepared for this REF, mapping of sensitive habitats will need to be updated for inclusion into an updated version of the PEMP. This should include updates to	Transport	Post works	Appendix C

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	habitat maps and any required buffers.			
Offsetting	In circumstances where marine vegetation is likely to be negatively impacted to a degree that cannot be avoided or mitigated, environmental compensation will be required and calculated at the rate of 2:1 habitat offset requirement. Where Type 1 or 2 KFH with marine vegetation is directly impacted during future campaigns offset requirements will be determined as part of the Marine Habitat Survey, detailed in the BAP. For indirect impacts monitoring would need to be undertaken to determine the amount of offset that is required. Once an area has been offset, it will be exempt from further offset for the duration of the 10-year approval.	TfNSW	In accordance with licence or permit	Appendix C

Other safeguards and management measures that would address biodiversity impacts are identified in section/s 6.1 and 6.2.

6.7 Socio-economic impacts

6.7.1 Methodology

Socio-economic impact assessment (SEIA) involves analysing the social and economic consequences of a proposal. It involves identifying and evaluating likely changes to, or impacts on, communities and businesses as a result of a proposed development and to mitigate or manage impacts and maximise benefits.

An assessment of the socio-economic impacts of the proposal has been undertaken with reference to the RMS *Environmental Impact Assessment Practice Note on Socio-economic assessment EIAN05* (RMS, n.d.) The proposal has been assessed at a 'basic level' in accordance with the provisions of the Practice Note. In assessing the level of significance of impacts, consideration is given to:

- The range of potential direct and indirect impacts during works.
- Cumulative impacts with other proposals.
- Whether potential impacts may be positive, negative or neutral.

6.7.2 Existing environment

According to the 2021 Census, Coffs Harbour at that time, had a population of 78,759 people. It is estimated that the 2024 figure would be 82,629 people, projected to grow to 106,575 residents by the year 2041.

Coffs Harbour is a significant growth area and popular tourist destination for boaters and other visitors to the marina and surrounding area. The harbour is extensively used by commercial fishing operators, charter dive, fishing and whale watching operators and recreational boaters. In addition, the harbour provides important access to the Solitary Islands Marine Park and hosts several major boating events. The Coffs Harbour boat ramp is the only major ramp between Woolli and Nambucca Heads with the exception of a number of smaller beach launches, and often does not meet the needs of recreational boaters due to sand build-up in the navigation channel.

The NSW Government and Coffs Harbour City Council is progressing a precinct plan for the jetty foreshore which will provide opportunities to partner with others to facilitate complementary onshore development in addition to making better use of land surrounding the marina and improving connections to the CBD. In conjunction with the (then) Department of Planning and Environment, the Coffs Harbour City Council, and the local community, a *Coffs Jetty Revitalisation Refined Masterplan* was developed in December 2022. The masterplan outlines a vision to improve the foreshore precinct by way of rezoning existing land for future development whilst retaining the natural amenity, size and scale of the existing Jetty Foreshore Park.

Recent government investment in the precinct and surrounds includes \$37.5 million in funding towards the northern and eastern breakwaters, remediation of the slipway area and outer harbour access way, investment under the *Coastal Dredging Strategy* to improve boating access into Coffs Harbour moorings and marina area and significant investment to improve the Coffs Harbour Boat Ramp. Under the Boating Now program \$170,000 has been allocated to non-powered boating access improvements in the area as well as \$3 million to construct a new vessel maintenance and repair facility (travel lift).

Coffs Harbour also hosts several regionally significant maritime competitions and events. School holiday periods also see significantly increased maritime activity within the harbour area. To continue support for the commercial fishing industry and grow tourism and recreational boating opportunities, priority infrastructure outcomes have been identified to inform future investment in the area.

The proposal would be undertaken in a busy recreational and commercial waterway, where dredges have been operating intermittently for several years, and various other watercraft are highly prominent. The concept of routinely dredging the harbour has been supported by the majority of the existing harbour users and the broader community over a significant period, in recognition of the beneficial socio-economic impacts of maintaining navigable waterways. Furthermore, routine dredging aligns with the recommendations in the Coffs Harbour CZMP 2019.

The Proposal would restore safe navigable depths to the entrance channels of both the marina and the boat ramp, facilitating the return of larger vessel movements and positively impacting local businesses. The proposal would also renourish the popular destination of Park Beach with clean, marine sand dredged from the harbour to assist with maintaining the recreational amenity and useability of the beach.

6.7.3 Potential impacts

There may be some minor visual and noise impacts associated with the storage of materials at the compound and laydown area/s (if required), and restriction of public access. Although this would result in a slight reduction in the appeal of the area, it would be temporary and have a small footprint. As the dredging of the harbour has been historically supported, it is likely to be well tolerated by the community.

The presence of a dredge at both the opening to the marina and boat ramp would cause some minor inconvenience to other vessels utilising the harbour in terms of clear navigation being afforded. The dredge itself would only inhabit these areas outside of peak traffic times for these two areas and a navigation management plan would be in place to ensure disruptions are minimised.

The preferred option is for the movement of dredged sand by ocean to the nearshore placement area at Park Beach and therefore, most associated activities would take place within the marine environment, thus, confining inconveniences primarily to waterway users.

Notification would be given to the community before the work occurs, and complaints would be recorded in the complaints register so they can be addressed and practices continuously improved.

6.7.4 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Ongoing stakeholder and community engagement	A community and stakeholder engagement plan will be prepared in consultation with Council and community stakeholders prior to the commencement of works to ensure that works occur outside of scheduled events or other maritime infrastructure projects.	Transport	Prior to works	Additional safeguard

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Community information	Notification is to be given to affected community members before the work occurs. The notification is to include: • Details of the proposal. • Duration of work and working hours. • Changes to traffic or access. • Lodging a complaint or obtaining information.	Transport	10 days prior to works	Environmental Assessment Procedure for Routine and Minor Work: Standard Safeguard List (C1).
Complaints	All complaints are to be recorded on the complaints register and attended to promptly.	Contractor, Transport	During works	Environmental Assessment Procedure for Routine and Minor Work: Standard Safeguard List (C2).

Other safeguards and management measures that would address socio-economic impacts are identified in section/s 6.3, 6.4, 6.5.

6.8 Water transport

6.8.1 Methodology

As the potential impacts on vessel traffic are likely to be minor, this methodology involved a review of the existing navigational environment and restrictions affecting commercial operations and other vessels.

6.8.2 Existing environment

Currently, shoaling around the entry points to the marina and boat ramp creates a navigational hazard for vessels using the marked navigational pathways. The proposed dredging and maintenance regime aims to ensure a safe navigational channel for vessels. The bathymetric

comparison plan at figure 2 illustrates the areas in the harbour that have experienced erosion and accretion.

6.8.3 Potential impacts

There would be localised restrictions on vessel traffic during dredging operations and while moored between dredging and pipelines (if required). These impacts, however, would be minor and confined to specific areas. The benefits of removing shoals from the channel to enhance overall navigation and vessel safety far outweigh any temporary inconveniences.

A Vessel Traffic Management Plan (VTMP) would be developed and implemented in consultation with the local Boating Safety Officer to mitigate impacts on vessel traffic during dredging. This plan would outline protocols to manage vessel traffic effectively and safely, including the installation of navigation markers, warnings, lighting, and signage as specified in the VTMP. These measures are designed to clearly demarcate dredge and placement areas, as well as the locations of pipelines and dredging operations.

All work vessels would comply with the *Marine Safety (Domestic Commercial Vessel) National Law Act 2012*, the *Marine Safety Act 1998*, and relevant subordinate legislation. This compliance includes adhering to *International Regulations for Preventing Collisions at Sea 1972* (COLREGS) and ensuring that all vessels display appropriate lights and shapes during operations to reduce the risks to vessel navigation and safety.

The following safeguards and management measures are intended to ensure navigation safety during works.

6.8.4 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Navigation safety	A Vessel Traffic Management and Navigation Plan (VTMNP) will be designed in consultation with local authorities and experts in boating safety. The VTMP will outline protocols for managing vessel traffic during the works, including the installation of necessary navigation aids, lighting, signage, and compliance with marine safety regulations.	Contractor	Prior to works	Additional safeguard

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Compliance of vessels	All work vessels will comply with the <i>Marine Safety (Domestic Commercial Vessel) National Law Act 2012</i> , the <i>Marine Safety Act 1998</i> , and all relevant subordinate legislation.	Contractor	During works	Additional safeguard
Preventing collisions via COLREGS	All work vessels will exhibit lights and shapes in accordance with <i>International Regulations for Preventing Collisions at Sea 1972 (COLREGS)</i> .	Contractor	During works	<i>International Regulations for Preventing Collisions at Sea 1972 (COLREGS)</i> , Rules 20-30.
Marking equipment to reduce risk to vessels	All pipes and associated equipment that will restrict or vary existing navigation conditions will be clearly marked, including the use of lights at night, to reduce the risk to vessel navigation and safety. Appropriate markings shall be identified within the VTMP.	Contractor	During works	<i>Marine Safety (Domestic Commercial Vessel) National Law Act 2012</i>

6.9 Aboriginal cultural heritage

6.9.1 Methodology

The following were considered in assessing the potential impacts of the proposal on Aboriginal cultural heritage:

- an AHIMS basic search of the harbour area;
- a search of the Aboriginal Land Claims Register;

- consultation with the Coffs Harbour and District Local Aboriginal Land Council (LALC) which included a workshop with the LALC to explain the proposal and invite feedback;
- a review of the Coffs Harbour Boat Ramp Aboriginal Heritage Due Diligence Assessment (McCardle Cultural Heritage, 2020); and
- completion of Stage 1 of the Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI).

6.9.2 Existing environment

There are 16 Aboriginal sites recorded around the inner harbour, indicating that the area is of cultural and archaeological importance to the local Aboriginal community.

A Due Diligence Assessment (McCardle Cultural Heritage, 2020) undertaken for the upgrade of the Coffs Harbour Boat Ramp notes that the closest traditional fresh water source was likely to be Coffs Creek. Whilst the beach area would have provided an abundance of marine resources, the local area has been subject to extensive works associated with the boat ramp, roads, car parks and other foreshore infrastructure and additional disturbances would have derived from natural processes. The urbanisation of the foreshore area would have had significant impacts on the landscape through the excavation works required for such facilities and would have also displaced any cultural materials that may have been present.

6.9.3 Potential impacts

The PACHCI assessment prepared for the proposal by Transport's Aboriginal Cultural Heritage Officer (Appendix F) assessed the proposal as being unlikely to have an impact on Aboriginal cultural heritage.

- The assessment was based on the following due diligence considerations:
- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did indicate moderate to high concentrations of Aboriginal objects or places in the study area. (This project, being water based, does not impact on registered sites).
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on Due diligence Code of Practice for the Protection of Aboriginal objects in NSW and the Transport for NSW procedure.
- The cultural heritage potential of the study area appears to be reduced due to past disturbance.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

6.9.4 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Native Title	Prior to each dredging campaign, a Native Title search on the works area would be undertaken to check whether	Transport	Prior to works	Additional safeguard

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
	any claim has been lodged.			
Unexpected finds	If suspected Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and Transport's Aboriginal cultural heritage officer and regional environment manager contacted immediately. Steps in <i>Transport's procedure: Unexpected Archaeological Finds</i> must be followed.	Contractor	During Works	Transport procedure: <i>Unexpected Archaeological Finds</i> .
Consultation	The Coffs Harbour and District Local Aboriginal Land Council must be notified not less than 6 weeks prior to each dredging campaign.	Transport	During Works	Additional safeguard

6.10 Non-Aboriginal heritage

6.10.1 Methodology

A search of the following heritage registers has been undertaken:

- Schedule 5 of the Coffs Harbour Local Environmental Plan (LEP) 2013
- NSW State Heritage Register
- Australian Heritage Database
- Maritime Heritage Database.

The Coffs Harbour Boat Ramp Upgrade Heritage Impact Assessment (CoAssociates Pty Ltd, September 2020) was also reviewed.

6.10.2 Existing environment

Heritage items listed on the LEP in the vicinity of the works include:

- Buried trestle bridge, tramway line site and World War II gun turret.
- Line of Former Rail Tracks, Coffs Harbour Breakwaters and Foreshore (archaeology).
- Coffs Harbour Jetty.

The NSW State Heritage Inventory lists the following items in the vicinity of the works:

- Coffs Harbour Jetty.

The Coffs Harbour Jetty is of state heritage significance as the longest coastal timber jetty built by the Harbours and Rivers Section of the (then) NSW Public Works department in the 19th century during a key period of shipping transportation in NSW. It is described in the inventory as a rare and representative example of a surviving timber ocean jetty which once formed part of the extensive coastal network. The Coffs Harbour Jetty is of state heritage significance for the technical significance of its timber construction and maintenance over its eighty-year operational life (1892-1973). The item includes the jetty structure and the land and water in the immediate vicinity (5m) of the structure.

The Australian Heritage Database lists the following items in the vicinity of the works:

- Coffs Harbour Jetty
- Mutton Bird Island Nature Reserve
- Solitary Islands Marine Area.

There are no shipwrecks or maritime heritage listed within the works area.

6.10.3 Potential impacts

The dredging works would be limited to the active shoals, navigation channels and approaches within the harbour. A suitable buffer area to the jetty (25m) would be maintained throughout the dredging works to ensure that the structure is not inadvertently damaged.

Provided that the safeguards are implemented during works it is not expected that there would be any impacts on non-Aboriginal heritage.

6.10.4 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Coffs Harbour Jetty	A buffer of not less than 25m is to be maintained between the dredge and the Coffs Harbour jetty.	Contractor	During works	Additional safeguard

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Unexpected finds	If unexpected heritage items are uncovered during the proposal, all works must cease in the vicinity of the material/find and the steps in the <i>Roads and Maritime Services Standard Management Procedure: Unexpected Heritage Items</i> must be followed. Roads and Maritime Services Senior Environment Specialist - Heritage must be contacted immediately.	Contractor	During works	Additional safeguard

6.11 Coastal Hazards

6.11.1 Methodology

A review of existing studies and reports was undertaken to assess the natural hazards likely to affect the proposal, in particular, the *Coffs Harbour Coastal Processes and Hazards Definition Study Volume 1: Final Report* (BMT WBM, 2011) and *Coffs Harbour Coastal Zone Management Study* (BMT WBM, 2013).

6.11.2 Existing environment

The study area is exposed to a range of hazards including:

- beach erosion
- shoreline recession
- sand drift
- coastal inundation
- storm surge
- flooding
- wave impact
- sea level rise

The above coastal processes are related or interact with each other to varying degrees.

The wave climate of the southeast Australian coastline has some seasonality due to the seasonal dominance of the major wave generation sources. While there is some seasonality to the timing of the wave generation sources, storms of sufficient magnitude to cause erosion and infilling of navigation channels may occur at any time during the year at Coffs Harbour.

Tropical cyclones most typically occur from November to May but are most frequent during February and March. Tropical cyclones tracking towards the Tasman Sea are usually well offshore of the coast but may generate north easterly swell directions arriving at the coast.

East coast cyclones may occur at any time of the year, but are most likely to occur in May, June and July (Short, 2007). These systems are said to generate the strongest winds, heaviest rainfall and largest waves experienced on the NSW Coast. Most of the storm activity in the area is produced by east coast low cyclones.

Mid-latitude cyclones occur throughout the year, particularly March to September, and these systems generate the predominant south easterly swell experienced along the coast.

6.11.3 Potential impacts

The interaction of coastal processes and the coastal hazards they result in, would likely affect the frequency and volume of dredging required, as well as the frequency and volume of beach nourishment. It is also likely that storms and other extreme coastal weather patterns will affect the ability of the works to be undertaken, with potential delays in programming during adverse weather events.

The proposal is unlikely to exacerbate coastal hazards, rather it is an action that is proposed to address the impacts of coastal hazards.

6.11.4 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Changes in the bathymetry of the harbour and Park Beach following significant weather events.	Undertake hydrographic surveys after significant weather events to assess changes in the bathymetry of the harbour.	Transport	After significant weather events	Additional safeguard

6.12 Climate change

6.12.1 Strategic framework

Climate change is expected to profoundly impact all regions of Australia. With 85% of the Australian population living on the coast, residents will continue to experience changing conditions accelerated by global warming, increasing the risks to industries, residential and business settlements, essential and non-essential services, and natural ecosystems. Table 6-3 outlines climate change scenarios for Eastern Australia, sourced from the IPCC Sixth Assessment Report (IPCC, 2021), projecting hazards from the present into the future for extreme weather including rainfall and drought increases, storm surges, cyclones and bushfires.

The NSW government has implemented strategies for climate change adaptation and coastal hazard management, incorporating key components of the NSW Coastal Management Framework, such as:

- Coastal Management Act 2016.
- State Environmental Planning Policy (Resilience and Hazards) 2021.
- Funding support to carry out coastal and estuary projects.

The entry channels to the Coffs Harbour boat ramp and marina are essential to the community's wellbeing. The infilling of the navigation channels is thought to be exacerbated by climate change, with adverse weather events and sea level rise contributing to littoral processes related to sand movement. The proposed works are being undertaken in response to the changing marine environment that is affected by climate change.

6.12.2 Potential impacts

The proposal is being implemented to address the adverse effects of coastal processes thought to be caused by the interactions of a changing climate and the construction of maritime infrastructure which disrupts natural northerly littoral sand drift. Although the proposal is unlikely to contribute to climate change or be influenced by current climate change considerations, the following impacts would need to be considered for each campaign:

Extreme weather patterns

As the climate continues to change in NSW, the likelihood of extreme weather events, including heavy rainfall and storm surges, increases. The Coffs Harbour area is susceptible to low-pressure systems and troughs, such as east coast lows, which may negatively impact bathymetry, shorelines and coastal infrastructure in and around the bay. This may affect the placement areas, the frequency of dredging and the practicalities and safety of implementing the works.

Storm surges

The heightened risk of severe storms increases the probability of storm surges, temporarily elevating sea levels and compounding the ongoing upward trend in sea levels and wave energy. This results in damage to shore structures and compromises shoreline protection infrastructure.

Sea level rise

The IPCC (2021) predicts an imminent and accelerating rise in sea level, ultimately posing long-term effects on Coffs Harbour. Anticipated impacts may include:

- Amplified tides.
- Loss or harm to coastal and aquatic ecosystems, including seagrasses, fish habitat, migratory shorebirds and rocky shorelines.
- Coastal inundation and recession, also causing substantial monetary risk to existing buildings and businesses.
- Increased capital costs for coastal infrastructure, to accommodate sea level rise and storm surges.
- Damage and inundation to stormwater drainage systems.
- Flood risk.

Coastal erosion and shoreline recession

With the predictions of increased sea level, east coast lows, and storm surges, further erosion of the beaches in and around Coffs Harbour is likely, causing the loss of beach foreshore and infrastructure. Beach erosion is also strongly linked to high wave levels. Coastal erosion is much more significant when combined with a high tide, particularly king tides.

6.12.3 Safeguards and management measures for each campaign

Impact / issue	Environmental safeguards	Responsibility	Timing	Reference
Increased erosion of Park Beach	Erosion at Park Beach will be monitored in collaboration with Council to ensure that sand placement areas and volume requirements are appropriate.	Transport	Prior to works	Additional safeguard
Changes in the bathymetry of Park Beach and the harbour	Hydrographic surveys will be undertaken prior to each dredging campaign to create a continuous record of bathymetry changes and adapt the program as required.	Transport	Prior to each dredging campaign	Additional safeguard

Other safeguards and management measures that would address climate change impacts are identified in section 6.6.

6.13 Cumulative impacts

6.13.1 Study area

The cumulative impact assessment area encompasses Coffs Harbour and Park Beach and the immediate surrounds, primarily the marine environment. During the proposed 10-year works period there is potential for on-water and land-based works and maintenance projects. These could include repairing or upgrading surrounding jetties, wharfs, boat ramps and recreational and commercial facilities. In particular it is expected that the jetty foreshore would continue to be improved and upgraded in line with the jetty precinct masterplan.

6.13.2 Potential impacts

If consultation and engagement with Council and the community is not undertaken early, there is the potential for the works to clash with important community events or other maritime infrastructure repairs or upgrades. Should the proposal clash with community events or other maritime infrastructure projects, there is an increased safety risk and also a risk to the efficiency and delivery of the proposal.

The proposal may also result in cumulative impacts associated with loss of amenity through reduced air quality and noise and vibration if the works are undertaken during construction projects on the foreshore or within the harbour, undertaken by others.

6.13.3 Safeguards and management measures

Safeguards and management measures that would address cumulative impacts are identified in sections 6.3, 6.4, 6.5 and 6.7.

7 Environmental management

7.1 Environmental management plans

A number of safeguards and management measures have been identified in this REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the proposed works.

A Project Environmental Management Plan (PEMP) would be prepared to describe the safeguards and management measures identified. The PEMP would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The PEMP would be prepared prior to commencement of the proposal and must be reviewed and certified by the Transport for NSW Environmental Officer, Northern Region, prior to the commencement of any on-site works. The PEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The PEMP would be developed in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System).

The following environmental management plans would be prepared as part of the Project's environmental management system to address specific issues and impacts:

- Sand Placement Management Plan
- Water Quality Management Plan
- Sediment Sampling and Analysis Plan
- Biodiversity Management Plan
- Vessel Traffic Management and Navigation Plan
- Community and Stakeholder Engagement Plan

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF would be incorporated into the detailed design phase of the proposal and during works, should the proposal proceed. These safeguards and management measures would minimise any potential adverse impacts arising from the proposed work on the surrounding environment. The safeguards and management measures taken from Part 6 are summarised below in Table 7-1.

Table 7.1: Summary of safeguards and management measures for each campaign

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN1	General - minimise environmental impacts during works	A PEMP will be prepared and submitted for the review and endorsement of the Transport for NSW Environmental Officer prior to commencement of the activity. As a minimum, the PEMP will address the following: • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating	Contractor / Transport for NSW Project Manager	Prior to works	Environmental assessment procedure for routine and minor works. Safeguard list. G2.

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review. The endorsed PEMP will be implemented during the undertaking of the activity.			
GEN2	General - notification	All businesses, residential properties and other key stakeholders affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor/Transport for NSW project manager	Prior to works	Environmental assessment procedure for routine and minor works. Safeguard list. G2.
GEN3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk.	Contractor/Transport for NSW project manager	Prior to works	Environmental assessment procedure for routine and minor works. Safeguard list. G2.
H1	Changes to morphological characteristics	A Sand Placement Management Plan (SPMP) would be prepared and implemented to ensure that sand placement mimics the natural seabed morphology.	Contractor	Prior to works	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
H2	Changes to morphological characteristics	Monitoring of ocean bed changes at placement sites would be undertaken over the 10-year life of the project to understand sediment movement.	Transport	After completion of each campaign	Agency letter
H3	Continued shoaling	Annual bathymetric surveys would be undertaken to track and monitor changes to shoaling.	Transport	Annually	Agency letter
WQ1	Water quality	A comprehensive water quality management plan (WQMP) will be prepared. The WQMP will include the following at a minimum: • Identification of key water quality risks specific to the contractor's equipment and methodologies to be employed. • Monitoring protocols to detect water quality issues associated with the works. • Visual monitoring of turbidity on a continuous basis by the dredge operator to confirm that dredged and deposited sediment is clean marine sand. • Issue response protocols including triggers for stop-work. • Responsibilities of personnel in relation to water quality monitoring, management and response. Recording and reporting protocols.	Contractor	Prior to works	Appendix D
WQ2	Sampling	A Sediment Sampling and Analysis Plan is to be prepared. Sediment sampling	Transport	Prior to works	Appendix D

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		investigations are to be undertaken in accordance with that Plan at all proposed dredge areas within 12 months prior to each dredging campaign. The Plan must be specific to dredging volumes, locations and depths of each campaign and consider the results of previous investigations.			
WQ3	Particle size compatibility	Particle size distribution compatibility between the dredge cut location and the intended deposition area is to be tested prior to each dredging campaign.	Transport	Prior to works	Appendix D
WQ4	Plant and equipment	All plant is to be in good working order. Regular inspections should be undertaken for hydrocarbon spills/slicks, equipment leaks and maintenance issues.	Contractor	During works	Appendix D
WQ5	Refuelling	Refuelling of marine plant and equipment and storage of hazardous materials on barges should only occur within a double-bunded area.	Contractor	During works	Appendix D
WQ6	Slurry supernatant	The location of any slurry supernatant discharge during dredging should be sited to minimise the proximity to environmental receptors which may be sensitive to turbidity. The location is to be determined through a review of marine habitats, likely water circulation patterns within the harbour and the practicalities of the dredging operation.	Contractor	During works	Appendix D
WQ7	Allowable turbidity levels	In the event that a turbid plume propagates towards any specific sensitive marine habitat (as defined by a marine	Contractor	During works	Appendix D

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		ecologist), the maximum allowable increase in turbidity at the boundary to that habitat due to the works is 10 NTU.			
WQ7	Surface water turbidity	Surface water turbidity is to be monitored utilising field equipment at an up-current/un-impacted reference location and 100m down-current of active dredging and placement areas twice daily. The recommended 'investigation' level for excessive turbidity is to be the turbidity corresponding to 50 mg/L total suspended solids above the reference condition and is to be determined by a correlation study utilising the sediments to be dredged.	Contractor	During works	Appendix D
WQ8	Dredge design	The dredge design will take into account likely sediment slumping at the edge of the dredge cut. A minimum batter slope of 1 in 4 is to be used for all dredge areas. Where the dredge area is constrained by rock walls and a shallow batter cannot be maintained, the stability of the structure is to be considered and the impact of slumping of any loose sediment in these areas allowed for in the dredge design.	Contractor	During works	Appendix D
WQ9	Extent of works	Dredging extents and depths are to be consistent with the extents considered in this assessment.	Contractor	During works	Appendix D
WQ10	Visual monitoring	Visual monitoring is to be undertaken during works to confirm that sediment being dredged and deposited is consistent with the description of 'clean marine sand'. Whilst direct observation is not always	Contractor	During works	Appendix D

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		possible, the dredge/delivery barge operator should maintain a frequent watch of the following aspects: • In situ appearance of dredge area sediment when in shallow water and/or clear water. • Characteristics of the hopper/barge sediments and supernatant, in particular sediment colour and presence of coarse debris (shell etc.) or large amounts of organic material. • Sediment plume characteristics during placement. Where significant levels of turbidity or coarse debris occur, works will cease and the dredged material will be examined and the relevant actions in the WQMP will be applied.			
WQ11	Contamination extents	Any dredge areas considered to be contaminated (i.e. in excess of guideline values specified by the NAGD) are to be further investigated to fully demarcate the extent of contamination. Dredging of any such locations is not to be undertaken without further planning and assessment.	Transport	During works	Appendix D
WQ12	Unexpected finds	If unexpected indicators of sediment contamination risk are evident during dredging, works will cease in that location	Contractor	During works	Appendix D

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		pending sampling, analysis and classification of the material. If this occurs, dredging and placement/disposal considerations will be guided by the sampling results.			
WQ13	Nearshore placement	Dredge sediment assessed as ASS or PASS can be placed at placement area A as the risk of acidification or water column deoxygenation at this placement site is negligible given the open water nature of this site and the pH buffering effects of seawater. This is under the provision that all other sediment characteristics are consistent with 'clean marine sand'.	Contractor	During works	Appendix D
WQ14	Incidents	If an incident (e.g. spill) occurs, the <i>Roads and Maritime Services Environmental Incident Classification and Reporting Procedure</i> is to be followed, and the TfNSW Contract Manager notified as soon as practicable.	Contractor	During works	Appendix D
WQ15	Accidental spills	All vessels and the site compound are to have on hand appropriate spill kits and bins for disposal of all rubbish and debris. This would include adequate hydrocarbon booms. All contractors must be trained in the use of spill kits and hydrocarbon booms.	Contractor	During works	Appendix C
WQ16	Sediment transport	Long to medium term monitoring of sediment dispersal post-dredging will be undertaken to inform future dredging campaigns.	Transport	After each dredging campaign	DPIRD letter

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AQ1	Emissions generated from machinery and equipment.	Machinery will be adequately serviced and maintained to ensure minimisation of emissions.	Contractor	Prior to and during works	Additional safeguard
NV1	Dredge engine and equipment noise	Stationary noise sources must be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.	Contractor	During works	Appendix D of AS2436:2010
NV2	Unused plant	There is to be no idling of plant or equipment. Plant or equipment that is not being used will be turned off.	Contractor	During works	NSW Construction Noise and Vibration Strategy 2018, ST-157/4.1
NV3	Working hours	Works are to be undertaken within standard working hours wherever possible. Where work within standard working hours is not possible due to tidal and weather conditions (or other unforeseen factors) noise impacts are to be minimised in accordance with the TfNSW Noise Estimator Tool, including additional measures as applicable. Any works outside of standard working hours will be subject to an out-of-hours works methodology and plan and approval from the relevant Transport representative. The community must be notified of all work outside standard hours, which has the	Contractor	During works	Environmental Assessment Procedure for Routine and Minor Work: Standard Safeguard List (N1). NSW Construction Noise and Vibration Strategy 2018, ST-157/4.1

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		potential to impact noise-sensitive receivers. Notification zones must be determined using the TfNSW Noise Estimator Tool. Notification requirements must comply with the RMS <i>Construction Noise and Vibration Guideline</i> .			
NV4	Loading and unloading of materials and equipment	Loading and unloading of materials/deliveries is to occur as far away as possible from sensitive receivers. Dedicated loading/unloading areas are to be shielded if close to sensitive receivers.	Dredging contractor	During works	EMF-NV-GD-0060 Construction Noise and Vibration Guidelines.
L1	Amenity	Any laydown areas and compound sites will be kept clean and free of rubbish at all times.	Contractor	During works	Additional safeguard
L2	Visual Character	Any laydown areas and compound sites will be returned to pre-works state once each dredging campaign has been completed.	Contractor	Post-works	Additional safeguard
B1	Benthic fauna	A Benthic Assessment Procedure (BAP) has been prepared for the duration of the 10-year project (refer to Appendix C). The BAP identifies requirements and procedures to be adhered to, which will be included in the PEMP.	Contractor	Prior to works, during works	Appendix C
B2	Biodiversity Management Plan	A Biodiversity Management Plan (BMP) will be prepared to incorporate relevant procedures, surveys, inspections, habitat mapping, timing restrictions, programs and permits.	Contractor	Prior to works, during works	Additional safeguard
B3	Marine habitat survey	A Marine Habitat Survey will be conducted prior to each dredging campaign to identify	Transport	Prior to works	Appendix C

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		potential impacts on any threatened species under the FM Act and to update the distribution of ecologically significant habitats e.g., reef structures, macroalgae stands and benthic communities. These distribution maps will be incorporated into the PEMP or equivalent to identify habitat boundaries and required buffers. Note: A Marine Habitat Survey will not be required for areas considered as part of this initial assessment within 12 months of survey.			
B4	Marine Brown Alga	Dredging and sand placement for all campaigns should maintain a minimum 100m buffer from areas of known or previously known occurrences of <i>N. lophocladia</i> . Where dredging or sand placement must occur within 100 m of known or previously known occurrences, a management plan must be prepared in consultation with the relevant agencies.	Contractor	Prior to works	Appendix C
B5	Pre-works inspection	A pre-works inspection for fauna habitat will be conducted by an ecologist within 4 weeks prior to commencement of works, especially for threatened shorebirds and/or nesting turtles, and where required fauna clearance works must be undertaken before any works in these areas commence. Inspections are to include breakwaters adjacent to dredging areas. Should nesting fauna be found, further consultation and the preparation of an appropriate management plan will be	Contractor	Prior to works	Appendix C

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		prepared in consultation with the relevant agency.			
B6	Nesting turtles	If works are to occur within October to March (inclusive breeding season of Green, Loggerhead and Hawksbill Turtles) the local NPWS office should be contacted prior to works to confirm whether nesting turtles have been recorded on Jetty Beach or Park Beach. Should nesting turtles be found, further consultation and the preparation of an appropriate management plan will be prepared in consultation with the relevant agency.	Contractor	Prior to works	Appendix C
B7	Migratory birds	Timing of works should avoid important migration periods of Shearwaters, which nest on Muttonbird and Little Muttonbird Island, when birds are most vulnerable to external impacts. These periods include: April – early May: fledglings begin first migratory flight from Muttonbird and Little Muttonbird Island. August: adults return to Muttonbird and Little Muttonbird Island at the end of their migration. If works are unavoidable within these time periods, a Migratory Marine Bird Management Plan will need to be prepared to mitigate risks to vulnerable birds in consultation with the relevant agency.	Contractor	Prior to works	Appendix C

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B8	Soft sediment communities	A monitoring program to measure ecological recovery of soft sediment communities within the subtidal placement area A will be undertaken and pre-dredging data obtained within six months of commencing dredging works. This data should include: a. Measurement of infauna assemblages, diversity and abundance using replicated sampling to account for spatial variability (Min n = 4). b. Measurement of key sediment characteristics TOC and PSD. c. Sampling of a minimum of two impact (within placement area) and two appropriate control sites.	Transport	Prior to works, post-works	Appendix C
B9	Licensing and permits	A Section 199 notification must be current for each campaign. Any conditions from the notification must be incorporated into the PEMP.	Transport	Prior to works	Appendix C
B10	Licensing and permits	A Section 205 permit must be current for each campaign and associated notification issued, where identified as a requirement within the Marine Habitat Survey or requested by NSW DPI Fisheries. Note that the initial campaign does not require a Section 205 permit.	Transport	Prior to works	Appendix C
B11	Licensing and permits	Where any works involve sand placement or transport of sand to the Solitary Islands Marine Park, a permit will be required under the Marine Estate Management Act	Transport	Prior to works	Appendix C

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		2014 and Marine Estate Management (Management Rules) Regulation 1999 prior to the commencement of the activity.			
B12	Buffer zones	Dredging areas and placement areas will need to maintain a minimum 100m buffer from areas of known or previously known occurrences of <i>N. lophocladia</i> and a minimum 50m buffer from areas of natural subtidal rocky reef.	Contractor	During works	Appendix C
B13	Reef habitat	Dredge area 2 must avoid the small outcrop of rocky reef located north of the Coffs Harbour Boat Ramp breakwater toe.	Contractor	During works	Appendix C
B14	Key fish habitat (KFH)	For dredging and sand placement works a 50m buffer zone will need to be maintained to any Type 2 KFH and 50 – 100m for Type 1 KFH for waters outside the Marine Park. For works within the Marine Park (where all KFH is considered Type 1 KFH), works should maintain a minimum 100m buffer to natural rocky reef habitats. Note: Dredging may occur in close proximity to Type 2 macroalgae associated with breakwaters, which cannot be avoided. The proposed placement area A currently maintains a 150m buffer from Little Muttonbird Island. This buffer will be in place for subtidal placement works over the 10 year period.	Contractor	During works	Appendix C
B15	Marine vegetation	No mooring or beaching of vessels is to be within any marine vegetation.	Contractor	During works	Appendix C

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B16	Dredge pipelines	No dredge pipelines are to be placed over natural rocky intertidal or subtidal formations.	Contractor	During works	Appendix C
B17	Fur seals	The NSW NPWS Guidelines for approach distance to Seals must be adhered to at all times. Should this not be possible the project ecologist and NPWS must be notified immediately.	Contractor	During works	Appendix C
B18	Nesting fauna	If any marine or shorebirds or turtles are found to be nesting, or fur seals resting within 100m of the works, the works should cease immediately and the local NPWS office notified.	Contractor	During works	Appendix C
B19	Injured birds	Injured Shearwaters should be covered with a towel and put in a box with air flow. The contractor should contact WIRES or NPWS.	Contractor	During works	Appendix C
B20	Vessel strike	To manage potential impacts of vessel strike and underwater noise on marine fauna inside of the harbour, the following will be undertaken: a. The entire harbour is to be considered an observation zone for marine mammals and turtles. b. The observation zone will be monitored for marine mammals and turtles for a period of no less than 30 minutes before start-up of the dredge. c. A shut down zone for marine mammals and turtles should be implemented for an area that extends 500m from the entrance to the boat ramp basin. Incursions of	Contractor	During works	Appendix C

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		marine mammals and/or turtles into this zone during dredging operations triggers a temporary shutdown of operations.			
B21	Vessel speed	Works vessels will travel at no greater than 8 knots of speed within 500m of the proposal footprint during construction works to minimise potential for interaction and/or vessel strike on marine fauna.	Contractor	During works	Appendix C
B22	Hydrocarbon spills	All hydrocarbons must be appropriately managed at all times, including: a. The storing of hydrocarbon-based products on water must be avoided and must be stored in a suitable bunded area within the site laydown area on land. b. Hydrocarbons are to be stored in a bunded area with adequate spill kits available. All staff are to be made aware of the location of the spill kit and trained in its use. c. Hydrocarbon booms will be placed around all stationary machinery on the water and be on hand for deployment around vessels. d. All machinery must be routinely checked for leaks, with an emergency spill kit to be kept on site at all times. e. Where practical, floating containment booms will be in place to control any spills of hydrocarbons around machinery operating on or over water.	Contractor	During works	Appendix C

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B23	Turbidity	Visual and turbidity monitoring of dredge pluming will be undertaken as part of standard water quality monitoring during dredging works at both the dredge and placement sites.	Contractor	During works	Appendix C
B24	Introduced species	All equipment to be brought to the study area must be thoroughly cleaned and free of substrate to avoid introduction of species such as <i>C. taxifolia</i> . Equipment should be thoroughly cleaned following the completion of the project to prevent spread of potential invasive species to other areas.	Contractor	During works	Appendix C
B25	Introduced species	If <i>C. taxifolia</i> is found within the works area, it should be avoided and not disturbed to minimise further spread to other areas. If dredging vessels or equipment are found to have caught <i>C. taxifolia</i> during works, they should be thoroughly cleaned with fresh water, with all biota safely disposed of on land.	Contractor	During works	Appendix C
B26	Independent inspections	Environmental controls should be inspected weekly by a Transport environmental officer or an independent consultant.	Transport	During works	Appendix C
B27	Waste	All materials, machinery and rubbish must be removed from site.	Contractor	Post works	Appendix C
B28	Final inspection	A final inspection of any works sites must be undertaken by a TfNSW environmental officer or an independent consultant.	Transport	Post works	Appendix C

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B29	Licenses and permits	Any requirements of the Section 199 notification or 205 permits must be filled and documentation submitted.	Transport	Post works	Appendix C
B30	Post-dredging survey	A post-dredging survey of ecological recovery of soft sediment communities within the subtidal placement areas and control sites is to be implemented within 6 months of completion of the dredging works. The survey must follow the monitoring protocols adopted for pre-dredging survey.	Transport	Post works	Appendix C
B31	Further surveys and mapping	No dredging of additional areas is to occur without further consideration of biodiversity impacts. For future dredging works scheduled to occur greater than 12 months following completion of the site surveys prepared for this REF, mapping of sensitive habitats will need to be updated for inclusion into an updated version of the PEMP. This should include updates to habitat maps and any required buffers.	Transport	Post works	Appendix C
B32	Offsetting	In circumstances where marine vegetation is likely to be negatively impacted to a degree that cannot be avoided or mitigated, environmental compensation will be required and calculated at the rate of 2:1 habitat offset requirement. Where Type 1 or 2 KFH with marine vegetation is directly impacted during future campaigns offset requirements will be determined as part of the Marine Habitat Survey, detailed in the BAP. For indirect	TfNSW	In accordance with licence or permit	Appendix C

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		impacts monitoring would need to be undertaken to determine the amount of offset that is required. Once an area has been offset, it will be exempt from further offset for the duration of the 10-year approval.			
S1	Ongoing stakeholder and community engagement	A community and stakeholder engagement plan will be prepared in consultation with Council and community stakeholders prior to the commencement of works to ensure that works occur outside of scheduled events or other maritime infrastructure projects.	Transport	Prior to works	Additional safeguard
S2	Community information	Notification is to be given to affected community members before the work occurs. The notification is to include: • Details of the proposal. • Duration of work and working hours. • Changes to traffic or access. Lodging a complaint or obtaining information.	Transport	10 days prior to works	Environmental Assessment Procedure for Routine and Minor Work: Standard Safeguard List (C1).
S3	Complaints	All complaints are to be recorded on the complaints register and attended to promptly.	Contractor, Transport	During works	Environmental Assessment Procedure for Routine and Minor Work: Standard Safeguard List (C2).
WT1	Navigation safety	A Vessel Traffic Management and Navigation Plan (VTMNP) will be designed	Contractor	Prior to works	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		in consultation with local authorities and experts in boating safety. The VTMP will outline protocols for managing vessel traffic during the works, including the installation of necessary navigation aids, lighting, signage, and compliance with marine safety regulations.			
WT2	Compliance of vessels	All work vessels will comply with the <i>Marine Safety (Domestic Commercial Vessel) National Law Act 2012</i> , the <i>Marine Safety Act 1998</i> , and all relevant subordinate legislation.	Contractor	During works	Additional safeguard
WT3	Preventing collisions via COLREGS	All work vessels will exhibit lights and shapes in accordance with <i>International Regulations for Preventing Collisions at Sea 1972</i> (COLREGS).	Contractor	During works	<i>International Regulations for Preventing Collisions at Sea 1972</i> (COLREGS), Rules 20-30.
WT4	Marking equipment to reduce risk to vessels	All pipes and associated equipment that will restrict or vary existing navigation conditions will be clearly marked, including the use of lights at night, to reduce the risk to vessel navigation and safety. Appropriate markings shall be identified within the VTMP.	Contractor	During works	<i>Marine Safety (Domestic Commercial Vessel) National Law Act 2012</i>
ACH1	Native Title	Prior to each dredging campaign, a Native Title search on the works area would be undertaken to check whether any claim has been lodged.	Transport	Prior to works	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
ACH2	Unexpected finds	If suspected Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and Transport's Aboriginal cultural heritage officer and regional environment manager contacted immediately. Steps in <i>Transport's procedure: Unexpected Archaeological Finds</i> must be followed.	Contractor	During Works	Transport procedure: <i>Unexpected Heritage items</i>
ACH3	Consultation	The Coffs Harbour and District Local Aboriginal Land Council must be notified not less than 6 weeks prior to each dredging campaign.	Transport	During Works	Additional safeguard
H1	Coffs Harbour Jetty	A buffer of not less than 25m is to be maintained between the dredge and the Coffs Harbour jetty.	Contractor	During works	Additional safeguard
H2	Unexpected finds	If unexpected heritage items are uncovered during the proposal, all works must cease in the vicinity of the material/find and the steps in the <i>Roads and Maritime Services Standard Management Procedure: Unexpected Heritage Items</i> must be followed. Roads and Maritime Services Senior Environment Specialist - Heritage must be contacted immediately.	Contractor	During works	Additional safeguard
CH1	Changes in the bathymetry of the harbour and Park Beach following significant	Undertake hydrographic surveys after significant weather events to assess changes in the bathymetry of the harbour.	Transport	After significant weather events	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
	weather events.				
CC1	Increased erosion of Park Beach	Erosion at Park Beach will be monitored in collaboration with Council to ensure that sand placement areas and volume requirements are appropriate.	Transport	Prior to works	Additional safeguard
CC2	Changes in the bathymetry of Park Beach and the harbour	Hydrographic surveys will be undertaken prior to each dredging campaign to create a continuous record of bathymetry changes and adapt the program as required.	Transport	Prior to each dredging campaign	Additional safeguard

7.3 Licensing and approvals

Table 7.2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Protection of the Environment Operations Act 1997 (s43)</i>	Environment protection licence (EPL) for non-scheduled activities for the purposes of regulating water pollution if sediment sampling indicates that water pollution is likely to occur as a result of the activity.	Prior to the start of works.
<i>Fisheries Management Act 1994 (s199)</i>	Under Section 205 of the FM Act, a permit is required to harm (cut, remove, damage, destroy, shade, etc.,) marine vegetation including saltmarshes, mangroves, seagrass, and seaweeds. The proposal is unlikely to involve any harm to marine vegetation and a Section 205 permit would not be needed for the initial dredging campaign. The requirement for future permits will be assessed as part of the Marine Habitat Survey undertaken prior to each dredging campaign Under Section 199 of the FM Act, written notification to the Minister is required before any dredging work is carried out. Any response from the Minister within 21 days must be taken into consideration. DPIRD Fisheries were consulted as part of the preparation of this REF, and their comments have been considered in this REF. DPIRD Fisheries would be notified again after the REF is determined and prior to commencement of works.	Prior to each dredging campaign and a minimum of 28 days prior to the start of works.
<i>Marine Estate Management Act 2014 (ss55 and 56)</i>	All near shore beach nourishment activities would occur within the Solitary Islands Marine Park, declared in accordance with Part 5, Division 1, section 23 of the <i>Marine Estate Management Act 2014</i> . A Marine Park Permit would be required for any part of the proposed activity located in the Habitat Zone and Special Purpose Zone of the Marine Park.	Prior to the start of works.
<i>Crown Land Management Act</i>	Under the <i>Crown Lands Management Act 2016</i> , Transport would be	Prior to the start of works.

Instrument	Requirement	Timing
2016 (Division 3.4, 5.5 and 5.6)	required to obtain a licence prior to the commencement of the proposed works on Crown land where no licence is currently in place. Transport has a current Crown licence over the harbour area. Note: Work on Crown land triggers the requirement for a 24KA notice under the <i>Native Title Act 1993</i>. The notice is to be prepared by the legal team and send to NTSCORP. This is required whether there is a claim on the land or not.	
<i>Marine Safety Act 1998</i>	The proposal is an aquatic activity as it would be undertaken on navigable waters and would temporarily restrict the availability of those waters for normal use by the public. As such, the proposal requires Transport (Maritime Operations) approval.	Prior to the start of works.

8 Justification and conclusion

This Part provides the justification for the proposal taking into account its biophysical, social and economic impacts and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the *Environmental Planning and Assessment Regulation 2021*.

8.1 Justification

The harbour area adjacent the jetty foreshore precinct is considered to be one of Coffs Harbours' most significant economic stimuli, providing a playground for visitors to the area and supporting local businesses.

The *NSW Coastal Dredging Strategy 2019-2024* recognises the Coffs Harbour entrance channel to the boat ramp as a key investment location to improve navigation and accessibility for commercial, recreational and tourist vessels, which has flow-on benefits for the local economy. The use of dredged sand from the harbour, for beach nourishment and erosion control, would increase the resilience of beaches north of the harbour which are impacted by increased coastal erosion events.

The *NSW Maritime Infrastructure Plan 2019-2024* has identified Coffs Harbour as a significant growth area and popular recreational boating destination that supports significant tourism activity and provides access to the Solitary Islands Marine Park. The Plan also notes that the area hosts several major boating events, which have significant economic benefit for the local area and require safe and reliable navigation channels.

The NSW Government and Coffs Harbour City Council are currently progressing strategic planning for the jetty foreshore to make better use of land surrounding the marina and adjacent the boat ramp. Ensuring that vessel access is consistently available to maritime infrastructure in Coffs Harbour would be crucial to ensuring the sustainability of the government's investment in the jetty foreshore.

In addition to maintaining navigable boating access, the *Coffs Harbour Coastal Zone Management Plan Final Report 2019* (CZMP) includes a management action to implement a dredging and sand placement program on Park Beach (reference BD.1).

Although the proposal has the potential to impact the marine environment, safeguards are proposed which are likely to be adequate for mitigating any adverse effects and on balance the proposal is justified.

8.2 Objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposal complies with this objective as it would create a better environment to achieve socio-economic benefits for the community.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	The potential impacts of the proposal on the natural and built environments have been considered to the fullest extent possible.

Object	Comment
1.3(c) To promote the orderly and economic use and development of land.	The proposal would promote the orderly and economic use of land by ensuring that navigation channels remain accessible and that a resource is used to manage coastal erosion.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the proposal.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	Safeguards are proposed to manage any potential environmental impacts. It is not expected that the proposal would result in significant adverse effects on the natural environment.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	Measures are proposed to protect the built and cultural heritage within the study area. The LALC has been consulted during the preparation of this REF.
1.3(g) To promote good design and amenity of the built environment.	The proposal would include measures to protect local amenity whilst works are being undertaken. The beach nourishment component of the works would contribute to improving local amenity.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not relevant to the proposal.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the proposal.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Public display of the REF and ongoing consultation would ensure that the community have the opportunity to be engaged in the proposal.

8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

The precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or

irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

This principle was considered during options development (refer to Part 2). The precautionary principle has guided the assessment of environmental impacts for this REF and the development of safeguards as follows:

- Issues that may cause serious or irreversible environmental damage as a result of the proposed project and where there is scientific uncertainty as to the nature of the damage have been identified, with the removal of option 2 due to environmental and cultural heritage risks, until further environmental assessment is undertaken to determine whether this is a feasible option.
- Best available technical information, environmental standards and measures have been used to minimise environmental risks.
- Conservative 'worst case' scenarios were considered while assessing environmental impact.
- Specialist studies were incorporated to gain a detailed understanding of the existing environment.

Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

The proposal takes intergenerational equity into account as the objectives are to provide a long-term solution to coastal hazards and a changing climate. Safeguards are proposed to minimise any long-term harm to the environment as follows:

- A preferred option that minimises disturbance of sensitive ecological areas to ensure that such areas are conserved for future generations has been selected.
- Impacts on the biodiversity of sensitive ecological areas would be minimised both for the short and long term.
- Consultation with the local Aboriginal community was carried out during the environmental assessment phase to avoid or minimise the potential for irreparable damage to occur to Aboriginal cultural heritage during the works.
- Issues that have potential long-term implications were minimised or avoided, for example waste disposal through beneficial re-use of dredged sand, impacts on water quality, the selection of the option with the least environmental and social impacts and the application of safeguards.
- Benefits that the project provides to current and future generations of local communities and the surrounding region that would maintain or enhance the health, diversity and productivity of the environment were identified.

Conservation of biological diversity and ecological integrity

The Biodiversity Assessment at Appendix C has identified that the proposed works are unlikely to have a significant impact on any species, ecological community or local population. Careful management and consideration of the timing of works over the 10-year period is proposed to minimise the risks of potential impacts on biodiversity.

To manage the potential risks that this project may pose to marine biodiversity, a series of recommendations have been provided. This includes recommendations for measures to avoid potential impacts at both the planning and implementation stages, while a series of additional

recommendations to minimise and mitigate remaining potential impacts have also been provided and should be adopted into the PEMP for the proposed activities.

With adoption of the recommendations, the project is considered unlikely to have a significant impact on any State or Commonwealth-listed threatened biodiversity. Given that the proposed action is for a period of 10 years, a detailed procedure (BAP) to guide ongoing assessment for future dredging campaigns and capture habitat and ecological changes has been provided in the Biodiversity Assessment at Appendix C and would be implemented on site.

Improved valuation, pricing and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by the carrying out of a project, including air, water, land and living things. Valuation of environmental resources has shaped the project and mitigation measures as follows:

- Environmental issues were considered as key matters in the option selection process.
- The value of the project to the community in terms of an improved environment has been recognised.
- Mitigation measures for the avoidance, reuse, recycling and management of waste during construction and operation are to be implemented.

8.3 Conclusion

The proposed dredging of Coffs Harbour is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity, and has included consideration of potential impacts on threatened species, populations and ecological communities and their habitats. It has also considered potential impacts to matters of national environmental significance listed under the Commonwealth EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the options assessment. The proposal as described in the REF best meets the project objectives and any potential adverse impacts would be minor and short-term. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts.

The proposal would improve navigational safety and potentially the safety and environment of beaches north of the harbour. On balance the proposal is considered justified and the following conclusions are made.

Significance of impact under NSW legislation:

The proposal would be unlikely to cause a significant impact on the environment, therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation:

The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

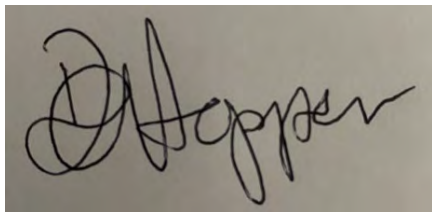
8.4 Certification

This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.



Lisa Proctor
Director
Blue Sky Planning and Environment Pty Ltd
Date: 02 September 2025

I have examined this review of environmental factors and accept it on behalf of Transport for NSW.



Dave Hopper
Principal Manager Dredging
Maritime Infrastructure Delivery Office
Transport for NSW
Date: 12 September 2025

9 References

BMT WBM on behalf of Coffs Harbour City Council, 2011. Coffs Harbour Coastal Processes and Hazards Definition Study Volume 1: Final Report.

BMT WBM on behalf of Coffs Harbour City Council, 2013. Coffs Harbour Coastal Zone Management Study.

BMT WBM on behalf of Coffs Harbour City Council, 2019. Coffs Harbour Coastal Zone Management Plan.

Muller Acoustic Consulting, 2023. Noise Assessment. Sand Transfer System – Coffs Harbour Boat Ramp Project, Coffs Harbour NSW.

NSW Government. NSW Coastal Dredging Strategy 2019 – 2024.

NSW Government. NSW Maritime Infrastructure Plan 2019-2024.

Short, A.D., (2007). Beaches of the New South Wales Coast A guide to their nature, characteristics, surf and safety, 2nd Edition, February, 398p.

McCardle Cultural Heritage. (2020). *Coffs Harbour Boat Ramp Aboriginal Heritage Due Diligence Assessment*.

Terms and acronyms used in this REF

Term/ Acronym	Description
AHD	Australian Height Datum
AS	Australian Standard
BC Act	<i>Biodiversity Conservation Act 2016 (NSW).</i>
CEMP	Construction environmental management plan
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW).</i> Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth).</i> Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
Fetch	An area where ocean waves are being generated by the wind.
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>
Gangway	A landing used by passengers to board or exit ships/vessels
Heritage Act	<i>Heritage Act 1977 (NSW)</i>
Jetty	A structure extending into the harbour as part of a wharf
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
MHWM	Mean high water mark
MNES	Matters of national environmental significance under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999.</i>
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
PEMP	Project Environmental Management Plan
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
QA Specifications	Specifications developed by Transport for NSW for use with road work and bridge work contracts let by Transport for NSW.
Wharf	A landing place or pier where ships may tie up and load or unload.

Appendix A

Consideration of section 171(2) factors

Consideration of matters of National Environmental
Significance and Commonwealth land

Section 171(2) Checklist

In addition to the requirements of the *Is an EIS required?* (DUAP 1995/1996) guideline and the *Marinas and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the REF, the following factors, listed in section 171(2) of the Environmental Planning and Assessment Regulation 2021, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
a) Any environmental impact on a community? The potential environmental impacts on the community relate primarily to the loss of use of beach and harbour areas while works are being undertaken. Reduced water quality may also have a minor impact, though the dredged material is expected to comprise clean marine sand, and impacts are therefore likely to be minimal. There may be slight increases in noise levels and increased construction traffic during the works. The proposed safeguards in Part 6 of this REF will be adequate for managing potential impacts. In the longer term, the community would have improved access to maritime infrastructure and potentially an improved beach environment, thereby having significant positive longer-term impacts.	Minor short-term negative, significant long-term positive.
b) Any transformation of a locality? The amenity and aesthetics of the dredging and placement areas would be slightly reduced whilst works are being undertaken due to the presence of machinery and equipment. The proposed safeguards in Part 6 of this REF would be adequate for managing potential impacts. In the longer term, the locality would be positively transformed as the beach dune environment is replenished and the harbour is deepened, allowing it to be used as a recreational and working waterway.	Minor short-term negative, significant long-term positive.
c) Any environmental impact on the ecosystems of the locality? The proposal would impact upon the marine ecosystem within the harbour and Solitary Islands Marine Park. Notably, the proposal would be limited to maintenance of existing navigation channels and placement of sand within areas that are devoid of marine vegetation. Whilst some minor and localised water quality impacts may occur during dredging and sand placement, the proposed safeguards in Part 6 of this REF would be adequate for managing potential impacts.	Minor short-term negative, long-term neutral.
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The proposal may result in a minor reduction in the environmental quality and value of the locality during works. Potential impacts would be primarily attributable to the presence of dredging	Minor short-term negative, long-term positive

Factor	Impact
vessels and equipment within the locality and some minor localised water quality impacts. The proposed safeguards in Part 6 of this REF would be adequate for managing potential impacts. In the longer term the proposal would also result in improved recreation and aesthetic outcomes associated with improvement of the harbour navigation channel and returning sand to the natural northward littoral drift.	
e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? Dredging works would be undertaken close to the Coffs Harbour Jetty, which is listed on the State Heritage inventory. The harbour is subject to an undetermined ALC. Provided that the recommended safeguards are implemented during works, no impacts are likely.	Nil
f) Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)? The habitat of native fauna would be disturbed during the works. Impacts are likely to be short-term and the proposed safeguards in Part 6 of this REF would be adequate for managing potential impacts.	Minor short-term negative, long-term neutral
g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? Provided that the proposed safeguards in Part 6 of this REF are implemented, it is unlikely that the proposal would endanger any species of animal, plant or other form of life, whether living on land, in water or in the air.	Nil
h) Any long-term effects on the environment? Provided that the proposed safeguards in Part 6 of this REF are implemented, the long-term effects on the environment are likely to be positive as the proposal would restore the natural northerly movement of sand.	Positive
i) Any degradation of the quality of the environment? There may be some minor short-term degradation of the quality of the environment associated with amenity and water quality impacts. The proposed safeguards in Part 6 of this REF would be adequate for managing potential impacts.	Minor short-term negative, long-term positive
j) Any risk to the safety of the environment? There may be minor risks to the safety of the environment due to the presence of machinery and equipment in areas used by the public. Any risks would be short term in nature and can be effectively mitigated through the implementation of the safeguards in Part 6. In the longer-term the dredging of the navigation channels and the return of sand to the natural littoral drift north of the harbour would provide a safer environment for the community.	Minor short-term negative, significant long-term positive

Factor	Impact
k) Any reduction in the range of beneficial uses of the environment? Whilst the works are being undertaken, there may be a minor loss of beneficial uses due to the presence of equipment and machinery. The proposed safeguards in Part 6 of this REF would be adequate for managing potential impacts. Longer term the range of beneficial uses create by the proposal would significantly increase as a greater range of vessels are able to access the marina and boat ramp, and beaches north of the harbour would be activated due to a safer and more consistent beach environment.	Minor short-term negative, significant long-term positive.
l) Any pollution of the environment? Whilst the works are being undertaken, there may be a minor reduction in water quality due to turbidity at both the dredging and placement sites. The proposed safeguards in Part 6 of this REF would be adequate for managing potential impacts.	Minor short-term negative, long-term neutral.
m) Any environmental problems associated with the disposal of waste? It is anticipated that the dredged material would be clean marine sand, as previous sediment sampling has classified the material as VENM. Sediment sampling would occur prior to each campaign to ensure that dredged material is suitable for beach nourishment. Where material is not suitable for beach nourishment it would be classified and appropriately disposed of according to its waste classification.	Nil.
n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The primary purpose of the proposal is to beneficially re-use a natural resource, therefore it is unlikely that it would increase demands on resources that are in short supply.	Nil.
o) Any cumulative environmental effect with other existing or likely future activities? Consultation would occur with Council and the community to ensure that works are undertaken when they cause the least disruption to planned events.	Nil.
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The purpose of the proposal is to manage the negative effects of coastal processes and coastal hazards on public infrastructure, places and activities. The proposal would result in long term positive coastal management outcomes through restoring navigation channels and re-instating Park Beach.	Significant long-term positive.
q) Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1?	Nil.

Factor	Impact
There are no applicable strategic plans made under Division 3.1 of the Act.	
r) Other relevant environmental factors? The potential environmental impacts of the proposal have been considered to the fullest extent possible.	Minor short-term negative, long-term positive.

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on the Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government's Department of Climate Change, Energy, the Environment and Water.

Factor	Impact
a) Any impact on a World Heritage property? No world heritage properties are located in proximity to the proposal.	Nil
b) Any impact on a National Heritage place? No National Heritage places are located in proximity to the proposal.	Nil
c) Any impact on a wetland of international importance? No wetlands of international importance are located in proximity to the proposal.	Nil
d) Any impact on a listed threatened species or communities? The proposal would impact upon the marine ecosystem within the harbour and Solitary Islands Marine Park. Notably, the proposal would be limited to maintenance of existing navigation channels and placement of sand within areas that are devoid of marine vegetation. Whilst some minor and localised water quality impacts may occur during dredging and sand placement, the proposed safeguards in Part 6 of this REF would be adequate for managing potential impacts on any Commonwealth listed threatened species or community.	Nil
e) Any impacts on listed migratory species? The proposal would impact upon the marine ecosystem within the harbour and Solitary Islands Marine Park. Notably, the proposal would be limited to maintenance of existing navigation channels and placement of sand within areas that are devoid of marine vegetation. Whilst some minor and localised water quality impacts may occur during dredging and sand placement, the proposed safeguards in Part 6 of this REF would be adequate for managing potential impacts on any Commonwealth listed migratory species.	Nil
f) Any impact on a Commonwealth marine area? No Commonwealth marine areas are located in proximity to the proposal.	Nil
g) Does the proposal involve a nuclear action (including uranium mining)? The proposal would not involve a nuclear action.	Nil

Factor	Impact
h) Additionally, any impact (direct or indirect) on the environment of Commonwealth land? The proposal would not impact any Commonwealth land.	Nil.

Appendix B

Statutory consultation checklists

Transport and Infrastructure SEPP

Certain development types

Development type	Description	Yes/No	If 'yes' consult with	ISEPP clause
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No	Coffs Harbour City Council	TISEPP cl. 2.10
Bus Depots	Does the project propose a bus depot?	No	Coffs Harbour City Council and adjoining landowners or occupiers	TISEPP cl. 2.10
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No	Coffs Harbour City Council and adjoining landowners or occupiers	TISEPP cl. 2.10

Development within the Coastal Zone

Issue	Description	Yes/No	If 'yes' consult with	ISEPP clause
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No. There is no certified CMP applying to the land. The proposal is consistent with the certified CZMP.	Coffs Harbour City Council.	TISEPP cl. 2.14

Council related infrastructure or services

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Stormwater	Is the work likely to have a <i>substantial</i> impact on the stormwater management	No	Coffs Harbour City Council	TISEPP cl. 2.10

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
	services which are provided by council?			
Traffic	Is the work likely to generate traffic to an extent that will <i>strain</i> the capacity of the existing road system in a local government area?	No	Coffs Harbour City Council	TISEPP cl. 2.10
Sewerage system	Will the work involve connection to a council owned sewerage system? If so, will this connection have a <i>substantial</i> impact on the capacity of any part of the system?	No	Coffs Harbour City Council	TISEPP cl. 2.10
Water usage	Would the work involve connection to a council owned water supply system? If so, would this require the use of a <i>substantial</i> volume of water?	No	Coffs Harbour City Council	TISEPP cl. 2.10
Temporary structures	Would the work involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, would this cause more than a <i>minor</i> or <i>inconsequential</i> disruption to pedestrian or vehicular flow?	No	Coffs Harbour City Council	TISEPP cl. 2.10
Road & footpath excavation	Would the work involve more than <i>minor</i> or <i>inconsequential</i> excavation of a road or adjacent	No	Coffs Harbour City Council	TISEPP cl. 2.10

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
	footpath for which council is the roads authority and responsible for maintenance?			

Local heritage items

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the work? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than <i>minor</i> or <i>inconsequential</i> ?	Yes. The proposal is unlikely to affect the heritage listed Coffs Harbour Jetty.	Coffs Harbour City Council	TISEPP cl. 2.11

Flood liable land

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Flood liable land	Is the work located on flood liable land? If so, would the work change flood patterns to more than a <i>minor</i> extent?	No	Coffs Harbour City Council	TISEPP cl. 2.12
Flood liable land	Is the work located on flood liable land? (to any extent). If so, does the work comprise more than minor alterations or additions to, or the demolition of, a building, emergency work or routine maintenance	No	State Emergency Service	TISEPP cl. 2.13

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled *Floodplain Development Manual: the management of flood liable land* published by the New South Wales Government.

Public authorities other than councils

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
National parks and reserves	Is the work adjacent to a national park or nature reserve, or other area reserved under the <i>National Parks and Wildlife Act 1974</i> , or on land acquired under that Act?	Yes	Biodiversity and Conservation Service	TISEPP cl. 2.15
National parks and reserves	Is the work on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Biodiversity and Conservation Service	TISEPP cl. 2.15
Aquatic reserves	Is the work adjacent to an aquatic reserve or a marine park declared under the <i>Marine Estate Management Act 2014</i> ?	Yes	Marine Parks Authority	TISEPP cl. 2.73
Bush fire prone land	Is the work for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	TISEPP cl. 2.16
Artificial light	Would the work increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Director of the Siding Spring Observatory	TISEPP cl. 2.15

Appendix C

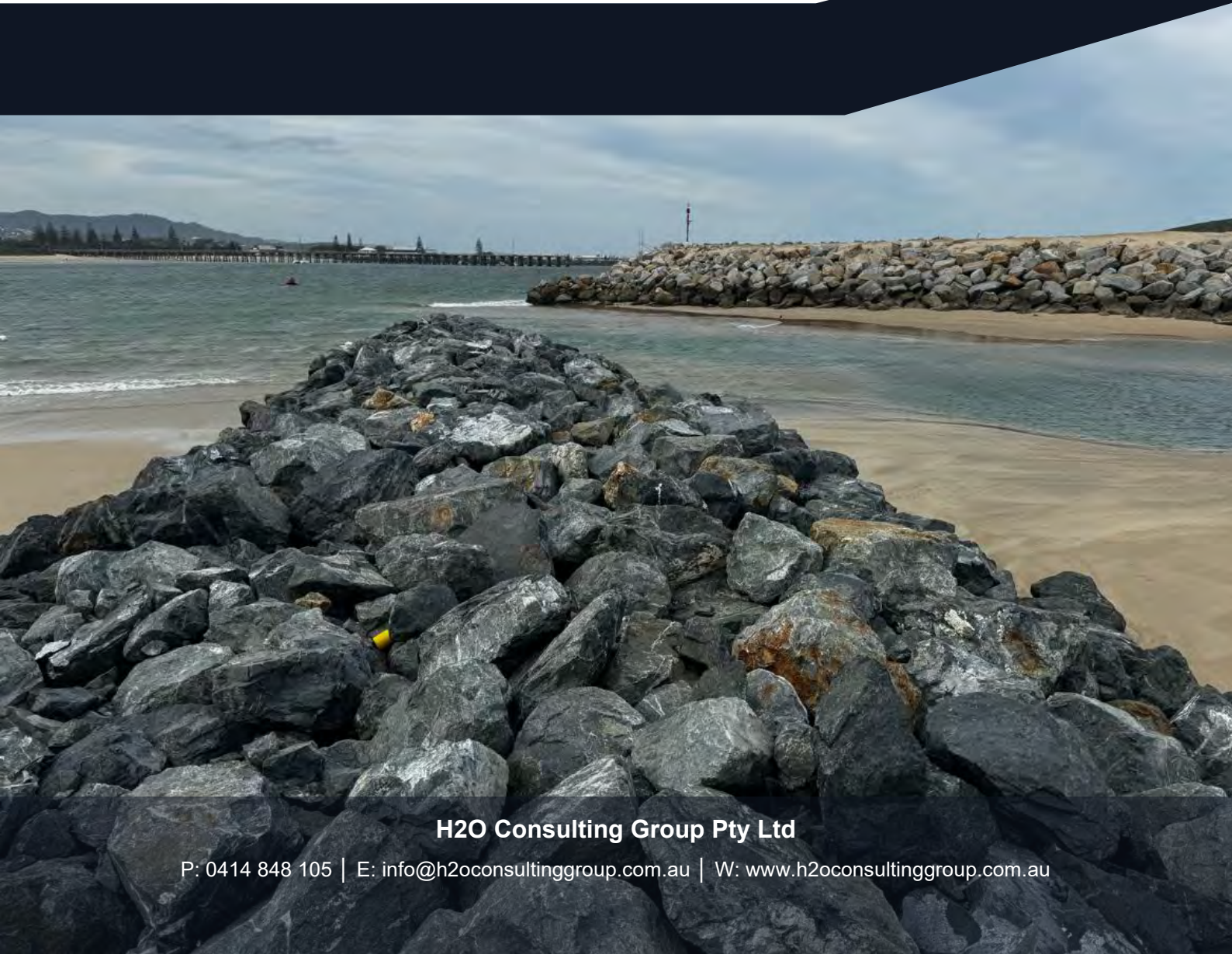
Aquatic Ecology Assessment

Aquatic Ecology Assessment

Coffs Harbour Maintenance Dredging Works

Prepared For: Blue Sky Planning and Environment

Report Date: 18 December 2024



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Cover photo: Coffs Harbour boat ramp harbour entrance

Executive Summary

H2O Consulting Group has been engaged by Blue Sky Planning and Environment to provide an Aquatic Ecology Assessment (AEA) for maintenance dredging works at Coffs Harbour, NSW (“the project”) to support a Review of Environmental Factors (REF) for 10-year approval (2025 to 2035) of maintenance dredging within the Harbour and placement of sand in the locality. The project will involve dredging of the marina and boat ramp navigational channels as part of maintenance dredging works. The objectives of the project are to restore and maintain navigable depths at the entrance to the boat harbour and the marina in Coffs Harbour.

The project proposes to remove up to a maximum of 96,000 m³ of channel-bed material, primarily clean marine sand, in any 12-month period. This will be achieved using either an ocean-going Trailing Suction Hopper Dredge or Split Hopper Barge to transfer sand slurry via ocean to the nearshore Sand Placement Area at Park Beach. Periodic levelling of high spot areas may occur when required to manage the impact of shoaling and accretion in the basin. For each campaign the dredging volumes for each area will be dependent on the rate of infill and whether further channel re-alignment is required.

Sand placement will be conducted by dumping sand from dredging vessels to the nearshore, subtidal Sand Placement Area at Park Beach. The dredging aims to maintain navigation channel depth of around –4.5 m Lowest Astronomical Tide (LAT) at the marina entrance and –2.5 m LAT at the boat ramp navigation channel.

Searches of threatened and migratory species databases identified 59 marine birds (including shorebirds and waders), 11 marine mammals, 5 marine reptiles, 9 sharks and rays, 3 fish, 1 macroalga and 1 Threatened Ecological Community which may potentially occur in the vicinity of the proposal. Review of existing mapping and previous studies identified that estuarine macrophytes (mangroves, saltmarsh and seagrasses) have not been previously recorded to occur within the footprint of this proposal, however, do occur in the wider vicinity of the work and Coffs Harbour within Coffs Creek. Some of the works, specifically those involving the placement of sand on to the north of Coffs Harbour, will occur within the Habitat Protection Zone of Solitary Islands Marine Park and within Littoral Rainforest proximity areas, coastal vulnerability area, coastal environment area and coastal use area mapped under the Hazards and Resilience SEPP (2021).

Site surveys indicated habitat in the Dredge Areas and Sand Placement Area predominantly comprised of unvegetated clean marine sands with some silts and shell debris, which were depauperate in the Sand Placement Area. A small rocky reef bommie was observed on the northern boundary of Dredge Area 2 that supported low-density assemblages of common macroalgae.

Direct impacts from the maintenance dredging program at Coffs Harbour will include the removal of up to 96,000 m³ of seabed material per campaign and the placement of this sediment to subtidal areas nearshore to Park Beach. Direct ecological impacts from the proposed dredging are expected to be the removal of and/or physical disturbance to invertebrate infauna and/or slower moving sessile epibenthic invertebrates, which will either be removed as a result of dredging or buried as a result of sand placement. These losses are not considered to be ecologically detrimental to the wider invertebrate community or ecological function within Coffs Harbour or the adjacent shoreline habitats, including the Marine Park. The affected infauna communities within both the Dredge Area and Placement Area are expected to recover within several months. This will result in the direct modification of Type 3 KFH during dredging, whilst placement nearshore at Park Beach will involve direct modification of Type 1 KFH, as this location is within the Marine Park.

The project at times may result in some indirect impacts to adjacent habitats as a result of reduced water quality and increased sedimentation. Habitats with sensitive receptors such as reef assemblages are most vulnerable to such disturbances. Although these impacts are expected to be minimal given the coarse nature of the dredge material being expected to settle quickly, the naturally high sediment loads along the Coffs Coast and the exposure of the project to coastal currents, adequate buffers to sensitive receptors and areas of elevated biological or ecological value will need to be adopted to mitigate these risks. This includes suitable buffers to the reef on the northern side of the Coffs Harbour northern breakwater and Little Muttonbird Island, where the Critically Endangered *N. lophocladia* has previously been known to occur. All adjacent habitats on the northern side of the northern breakwater are also considered Type 1 – Highly sensitive KFH as they are within the Marine Park.

Based on the current and previously known distribution of *N. lophocladia*, the proposed works are not expected to impact on the species to any ecological significance. Known distribution is outside of the dredge and placement areas. Where necessary works must occur within close proximity to suitable natural habitat for the species, it has been recommended that targeted surveys are conducted prior to works to mitigate potential impacts where changes in distribution may occur.

Various threatened and migratory marine species may occur in the area at times; however, most are likely to be transient visitors or only enter area in search or pursuit of prey items, which they forage across very large expanses of the coastal environment for. Thus, the habitat within the Study Area has minimal ecological significance for the majority of these species. Exceptions requiring further consideration included migratory marine birds, shorebirds and marine turtles which at times utilise habitat within Coffs Harbour and the Solitary Islands Marine Park. These species may experience impacts to foraging or refuge habitat due to dredging or sand placement works in subtidal areas. Further assessment has identified the proposed works are unlikely to have a significant impact on the species or local populations. However, careful management and consideration of the timing of works over the 10 year period will be required to mitigate potential impacts to these species.

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1 Background

1.1 Overview

H2O Consulting Group has been engaged by Blue Sky Planning and Environment to provide an Aquatic Ecology Assessment (AEA) for maintenance dredging works at Coffs Harbour, NSW (“the project”) to support a Review of Environmental Factors (REF) for a 10-year approval.

The project will involve dredging of the marina and boat ramp navigational channels as part of maintenance dredging works. The objectives of the project are to restore and maintain navigable depths at the entrance to the boat harbour and the marina in Coffs Harbour.

The maintenance dredging works have been planned to remove sands associated with the regular development of shoals within Coffs Harbour that prevent safe navigation of vessels within the Harbour. Additional areas within the channels and harbour may be dredged to catch and divert sand being transported toward important navigational areas. Over the 10-year period, maintenance dredging is expected to be required every one to three years depending on infill rates and ocean conditions. The project will be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* and development consent is not required. Chapter 2 (Infrastructure) Division 13, section 2.80(8)(a) Transport and Infrastructure SEPP (TISEPP) 2021 permits dredging of an existing navigation channel as development without consent.

The scope of this AEA includes for the identification and consideration of impacts on aquatic and marine habitat, Key Fish Habitat, estuarine macrophytes and species. This includes migratory and threatened species (marine birds and shore birds, marine mammals and reptiles, fish and sharks and other aquatic species) as well as aquatic populations and ecological communities listed under State and Commonwealth legislation.

Marine habitats around Coffs Harbour are known to support various threatened species, including the Vulnerable Black Rockcod and one of the only known populations of the Critically Endangered macroalgae *Nereia lophocladia*.

1.2 Locality and Site

Coffs Harbour is located in the Mid North Coast region of NSW and falls within the City of Coffs Harbour Local Government Area (LGA) (Figure 1). Coffs Harbour consists of a protected basin that allows for the safe launching and navigation of vessels within and between the basin and the open ocean. The basin is open to the ocean between the south breakwater and Muttonbird Island. The coastline of the locality is characterised by an open coast with northward littoral drift and receives a predominant southeasterly wind direction.

The dredge Study Area is delineated by the extent of subtidal area within the basin, enclosed by Jetty Beach, the marina, Muttonbird Island, Corambirra Point and the south breakwater. The specific priority areas for dredging within the basin are around the entrance to the marina in the north of the harbour (Proposed Dredge Area 1) and the approach to the boat ramp in the south of the harbour (Proposed Dredge Area 2) (Figure 1).

Three options for the re-use of dredge sand have been investigated, which include the transfer of small volumes of sand to the northern extent of Jetty Beach following adverse weather events (Option 1), to the southern extent of Park Beach following adverse weather events (Option 2) and to a nearshore placement area approximately 100 m offshore of the southern end of Park Beach, approximately 150 m north of Little Muttonbird Island (Option 3). For this REF, Option 3 is the preferred sand placement option. In this assessment, Option 3 will be referred to as the Sand Placement Area.

The entirety of the Harbour (including the Dredge Areas), the Sand Placement Areas and a 50 m buffer around the Sand Placement Area are referred to collectively as the 'Study Area' in this report (Figure 1).

A laydown site would be required to temporarily store small plant, machinery and materials for each dredging campaign. Sites will be identified depending on contractor requirements but will be located within Transport's existing Crown licence area.

The nearshore Sand Placement Area off Park Beach is located within the Habitat Protection Zone (IUCN IV) of the Solitary Islands Marine Park.

1.3 Description of the Works

Dredging campaigns over the 10-year approval period will maintain safe, navigable depths throughout the Coffs Harbour basin. Sediment throughout the channel will be dredged where necessary to facilitate safe access, with two priority areas identified for dredging works. The priority areas are identified as the entrance to the marina in the north and the approach to the boat ramp in the south (Figure 1), however dredging works may also include other areas in the basin as required. The location of dredging works may be variable between years but are expected to occur every one to three years for a duration of six to eight weeks each campaign, subject to weather conditions.

The project proposes to remove up to a maximum of 96,000 m³ of channel-bed material, primarily clean marine sand, in any 12-month period. This will be achieved using either an ocean-going Trailing Suction Hopper Dredge (TSHD) or Cutter Suction Dredge (CSD) to transfer sand slurry via ocean to the nearshore, subtidal Sand Placement Area at Park Beach. The dredging aims to maintain navigation channel depth of around -4.5 m Lowest Astronomical Tide (LAT) at the marina entrance and -2.5 m LAT at the boat ramp navigation channel. Periodic levelling of high spot areas may occur when required to manage the impact of shoaling and accretion in the basin. For each campaign the dredging volumes for each area will be dependent on the rate of infill and whether further channel re-alignment is required.

The preferred option for sand placement is the nearshore, subtidal Placement Area A at Park Beach. The movement of sand from Dredge Areas to Placement Area A is likely to be conducted by either:

- Sand slurry pumped directly from the dredge to Sand Placement Area by a TSHD or CSD. Additional equipment such as pipeline, floating pipe outlet, slurry booster pumps may be required.
- Bottom dumping of dredged material at nearshore and outer surf zone areas in Placement Area A. The barge will travel past Muttonbird Island and Little Muttonbird Island to dump material and will either open hopper doors or split its hull.

Placement at Sand Placement Area is intended to emulate a natural storm bar formation, for both protection of the coastline and redistribution of material onshore to Park Beach, which possesses a receding shoreline. Final placement volumes for each campaign would be determined following a pre-

placement hydrographic survey whilst sediment sampling of Dredge Areas will be undertaken prior to each campaign to inform suitability of sediment for nourishment.

1.4 Background Information

Sediment transport and dynamics at Coffs Harbour have been altered since the construction of the Harbour and breakwaters in the 1920s and 1930s, with much of the northerly littoral transport of sediment coming from the south intercepted by harbour structures. This results in significant accretion on the southern side and inside of the Harbour. Previous studies estimated sediment transport of 20,000 – 50,000 m³ per year into the main Harbour, including 4,000 – 6,000 m³ along each of the northern and southern shorelines (MHL 2020). Updated modelling indicates that approximately 150,000 m³ per year of sediment is transported northward around Corambirra Point, with wave focusing behind South Coff Island and the high energy of the wave breaking zone transporting 100,000 m³ per year into Coffs Harbour (RHDHV 2024 In prep). Once inside the eastern breakwater, the sediment pathway splits in three, with approximately 30,000 m³ transported along the southern shore, 10,000 m³ along the northern shore and 60,000 m³ towards the middle and onshore, per year (RHDHV 2024 In prep). This results in significant shoaling nearshore and at the entrances of the boat ramp and marina. The basin enclosing the boat ramp within Coffs Harbour was constructed in the mid-1970s and experiences operational difficulties when exposed to occasional periods of northeasterly swell. Sediment accumulation has exacerbated these challenges, requiring regular sediment removal to maintain navigable channels. Numerous works have been undertaken to mitigate these issues, including extension of the basin in 2015 (Kulmar *et. al.*, 2016) and extensive works in 2020 to extend the boat ramp and basin breakwater. Despite these modifications, sediment accumulation continues to impact the operation of the boat ramp and the marina (TfNSW 2022).

The Critically Endangered Marine Brown Alga (*Nereia lophocladia*) has been recorded to occur on the northern side of Muttonbird Island (various studies, see references in Table 1), along the Coffs Harbour northern breakwater (various studies, see references in Table 1), around the drying rocks and bommie at the southern end of North Wall beach (H2O Consulting Group 2024a), and around Little Muttonbird Island (Mamo *et. al.*, 2021). The Coffs Harbour coastline from Sawtell to Woolgoolga supports the only known populations of the species, which is found on hard substrate at the sand and rocky reef interface. The species typically prefers habitats in dynamic areas of reefs, rockpools, or submerged rocky outcrops. The movement of sand following storms of coastal development threatens the species (NSW DPI 2018), although scouring by sand movement may provide opportunities for *Nereia* establishment by removing existing marine growth (*pers. comm.* Nick Yee 2023). A summary of existing recorded sightings of the species is detailed below (Table 1).

Table 1: Summary of existing targeted studies of *N. lophocladia* distribution

Year/s Surveyed	Locations Surveyed	Location/s Species Observed	Study Reference or Scientist/s
1880s	Port Phillip Bay	Port Phillip Bay	(Agardh 1897)
1980, 1983, 1986, 1990	Coffs Harbour breakwater, northern and southern sides of Muttonbird Island	Northern side of Muttonbird Island	(Millar and Kraft 1994)
2002		Northern side of Muttonbird Island	(Yee 2007)
2004		Not found	Yee and Dixon
2005		Not found	Millar
2006		Not found	Yee
2007		Not found	Smith <i>et. al</i>

2015	Muttonbird Island and surrounding reefs	Northern side of Muttonbird Island, as well as nearby locations including along the toe of the northern breakwater, the western side of Coffs Reef, and Coffs Reef Gulch. Shallow water at Sawtell.	(Yee and Finley 2015) (Yee et. al., 2017)
2016	Coffs Harbour Northern Breakwater	Coffs Harbour Northern Breakwater	(Kelaheer 2016)
2018/2019/ 2020 (as part of monitoring)	Minnie Water, Diggers Camp, Woolgoolga, Charlesworth Bay, Little Muttonbird Island, Coffs Harbour, Eastern breakwater, Korff Island, Sawtell, Nambucca Heads, South West Rocks, Crowdy Head.	Minnie Water, Diggers Camp, Woolgoolga, Charlesworth Bay, Little Muttonbird Island, Coffs Harbour, Sawtell	(Kelaheer and Mamo 2018) (Yee 2017) (Mamo et. al., 2021)
2023	Little Muttonbird Island, Macauley's Headland, rocky reef and bommie at south North Wall Beach, northern and southern side of Muttonbird Island.	Rocky reef and bommie at south North Wall Beach (just north of Coffs Harbour northern breakwater).	(H2O Consulting Group 2024a)

Habitat in the vicinity of the Study Area is utilised by a number of other threatened species including marine mammals, turtles, sharks, rays and fish. The Solitary Islands Marine Park, in which the northern portion of the Study Area lays, extends from Coffs Harbour approximately 75 km to Sandon River and covers approximately 710 km² of marine habitat. The park features a range of habitat types and includes a number of important sites, including a significant aggregation site for Grey Nurse Sharks. The North and South Solitary Islands, as well as other islands in the vicinity, also support some of the most southern coral reefs communities along the east coast. Although not included in the marine park, migratory marine birds also utilise Muttonbird and Little Muttonbird Island for nesting.

1.5 Relevant Legislation and Policies

The following legislation and policies have been considered in this ecological assessment:

- NSW *Environmental Planning and Assessment Act 1979*
- NSW *Fisheries Management Act 1994*
- NSW *Biodiversity Conservation Act 2016*
- NSW *Coastal Management Act 2016*
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
- NSW *Protection of the Environment Operations Act 1997*
- NSW *Marine Estate Management Act 2014*
- TfNSW Biodiversity Policy - CP22004 2022

The legislative context for the assessment is outlined in the following sections.

1.5.1 Fisheries Management Act 1994

The objectives of the FM Act are to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations, and in particular to:

- conserve fish stocks and key fish habitats;

- conserve threatened species, populations and ecological communities of fish and marine vegetation;
- promote ecologically sustainable development, including the conservation of biological diversity, consistently with these objectives;
- promote viable commercial fishing and aquaculture industries;
- promote quality recreational fishing opportunities;
- appropriately share fisheries resources among the users of those resources;
- provide social and economic benefits for the wider community of NSW; and
- recognise the spiritual, social and customary significance of fisheries resources to Aboriginal persons, and to protect and promote the continuation of Aboriginal cultural fishing.

To meet the primary objectives, Part 7 of the FM Act deals with the protection of aquatic habitats, with Part 7A addressing the conservation of threatened species. Part 7 commonly applies to dredging and reclamation works, protection of marine vegetation including mangroves and seagrass, protection of spawning of certain fish, and noxious fish and marine vegetation.

If a public authority (including a local council or state agency) is a determining authority under Part 5 of the EP&A Act, they may still be required to obtain the following approvals or undertake consultation under the following provisions:

- Section 199 – Under s199 of the FM Act, the Minister for Primary Industries is required to be consulted over any dredging or reclamation works carried out, or proposed to be authorised, by a public authority (other than a local government authority) (i.e., any excavation within, or filling or draining of, water land or the removal of woody debris, snags, rocks or freshwater native aquatic vegetation or the removal of any other material from water land that disturbs, moves or harms these in-stream habitats). Section 199 consultation will be undertaken by TfNSW a minimum of 28 days before the commencement of the project.
- Section 200 – A permit is required for dredging or reclamation work carried out by a local government authority, unless these works are authorised by a relevant public authority (other than NSW DPI) such as TfNSW or under the Crown Lands Act 1989. A Section 200 permit would not be required for the project given that the project would be undertaken by TfNSW.
- Section 205 – A permit to harm (cut, remove, damage, destroy, shade etc) marine vegetation (saltmarshes, mangroves, seagrass and seaweeds). A Section 205 permit would not be required for the project given that impacts to marine vegetation are not anticipated (refer to Section 4.1.1 and Section 4.1.2).
- Section 219 – A permit to obstruct the free passage of fish. A Section 219 permit would not be required for the project given that fish passage would be maintained.

Listings of threatened species, populations and ecological communities gazetted under the FM Act are relevant to this assessment. Threatened biota impacted by this maintenance dredging must be assessed under section 5A of the EP&A Act.

Key fish habitat policy

NSW DPI recognises that certain types of activities have varying degrees of impact on key fish habitats and, as such, require different levels of control and regulation. As a general principle, NSW DPI requires that proponents should, as a first priority, aim to avoid impacts upon key fish habitats. Where avoidance is

impossible or impractical, proponents should then aim to minimise impacts. For any unavoidable remaining impacts consideration is to be given to establishment of suitable offsets or compensation.

Where key fish habitat is impacted by this construction proposal, suitable offsets or compensation may be required to be negotiated with NSW DPI Fisheries.

1.5.2 Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 (BC Act) provides for legal protections of biodiversity and threatened species in NSW. Specifically, it provides for the following:

- A process for declaring and protecting areas of outstanding biodiversity value.
- The listing of threatened species, populations and ecological communities, with critically endangered, endangered and vulnerable species under Schedule 1.
- The listing of critically endangered, endangered and vulnerable ecological communities under Schedule 2.
- The listing of extinct species, species extinct in the wild and collapsed ecological communities of animals and plants under Schedule 3.
- Requirements for the preparation of a species impact statement (SIS).
- Determining where the Biodiversity Offset Scheme (BOS) applies to proposals.

The BC Act sets the criteria for determining whether a proposal is likely to have a significant impact on threatened biodiversity listed under the BC Act. If significant impacts are identified, it would necessitate the preparation of a SIS or Biodiversity Development Assessment Report (BDAR).

To identify areas with outstanding biodiversity value the Biodiversity Values (BV) Map has been prepared under Part 7 of the BC Act to protected land sensitive to impacts from development and clearing. The map forms part of the Biodiversity Offsets Scheme Threshold. Types of land included on the BV Map relevant to this project include:

- Coastal wetlands and littoral rainforest mapped under the State Environmental Planning Policy – Resilience and Hazards SEPP 2021.
- Declared areas of outstanding biodiversity value.

Listed items of threatened biodiversity under the BC Act with potential to be impacted by this construction proposal will require further consideration. For Division 5.1 projects, a significant impact may trigger the requirement for determination under the BOS. Assessments of Significance where required have been undertaken in Section 4.6 of this AEA.

1.5.3 Environmental Planning and Assessments Act 1979

Development in NSW falls under the provisions of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and subordinate legislation. Under Division 5.1 of the EP&A Act, there is a duty for the determining authority to consider the environmental impacts of proposed activities. The specific aspects of these environmental considerations are detailed in Clause 171 of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation). Under section 5.5 of this Act, determining authorities are required to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity. These include items of biodiversity listed under the BC and FM Acts.

The 2024 REF (TfNSW In Prep) associated with the current scope of the dredging program schedule prepared for the proposed project, fulfils these requirements in terms of the currently proposed dredging activities.

1.5.4 Coastal Management Act 2016

The objectives of the *Coastal Management Act 2016* (CM Act) are to manage the coastal environment of NSW in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic wellbeing of the people of the State.

The CM Act defines the coastal zone, comprising four coastal management areas:

- Coastal wetlands and littoral rainforests area;
- Coastal vulnerability area;
- Coastal environment area; and
- Coastal use area.

Part 2 of the CM Act establishes management objectives specific to each of these management areas, reflecting their different values to coastal communities.

The CM Act, along with the Resilience and Hazards SEPP 2021, forms part of the Coastal Management framework. The proposed dredging works will be required to be carried out in a manner that is consistent with the objectives of the CM Act.

State Environmental Planning Policy (Resilience and Hazards) 2021

The Resilience and Hazards SEPP 2021 replaced the Coastal Management SEPP 2018. The SEPP promotes an integrated and coordinated approach to development assessment, with tailored development controls to ensure development proponents and consent authorities consider and address the most important issues for the coastal management area(s) their proposal falls within. The SEPP is supported by detailed mapping of Coastal Wetlands, Littoral Rainforests and associated proximity areas.

Clause 2.7 of the SEPP, which states that development on land in coastal wetlands or littoral rainforests requires an EIS and council consent, and Clause 2.8 requires proponents in proximity land to assess the potential for a significant impact on the adjacent coastal wetland or littoral rainforest. The proposed works will not impact on coastal wetlands or littoral rainforests, thus these approval requirements will not be required.

1.5.5 Environmental Protection and Biodiversity Conservation Act 1999

The purpose of the EPBC Act is to ensure that actions likely to cause a significant impact on matters of national environmental significance undergo an assessment and approval process. Under the EPBC Act, an action includes a project, undertaking, development or activity. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a controlled action and may not be undertaken without prior approval from the Commonwealth Minister for the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

Matters of National Environmental Significance (MNES) identified under the EPBC Act relevant to this project include:

- Threatened species and ecological communities
- Migratory species

- Commonwealth marine areas.

Listings of MNES deemed relevant to this construction proposal will require further consideration under the guidance provided by the EPBC Act, with additional consideration that where the dredging activity is undertaken as part of normal operations for maintenance of an existing navigational channel that would not normally be expected to have a significant impact and where the disposal of marine sediments does not have a significant impact (Department of Environment 2013). MNES listings are provided in Section 3.1.1 of this AEA, with further consideration given in Section 4, where appropriate.

1.5.6 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is the key piece of environment protection legislation administered by the NSW Environmental Protection Authority (EPA). The POEO Act relates to noise, air and water pollution and waste management. There is a broad allocation of responsibilities under the Act between the EPA, local councils and other public authorities.

The proposed dredging and sand placement is unlikely to cause pollution and is not a scheduled activity, therefore it does not require an Environment Protection Licence (EPL). Licensing in relation the POEO Act is discussed in the REF.

1.5.7 Marine Estate Management Act 2014

The *Marine Estate Management Act 2014* (MEMA Act) provides for strategic and integrated management of the whole marine estate, including marine waters, coasts and estuaries. The Act does this by providing for management of the marine estate consistent with principles of ecologically sustainable development, the establishment of two advisory committees, development of the Marine Estate Management Strategy and providing a comprehensive system of marine parks and aquatic reserves.

The Act is supported by regulations that detail management rules for the marine estate, marine parks and aquatic reserves.

Marine Estate Management Regulation 2017

Any person, business, company or local government authority proposing to dredge, excavate, move or remove material (including sand, mud, large woody debris, aquatic vegetation, boulders, gravel etc.) from a waterway, or reclaim or place fill within a waterway requires a permit from the Department of Primary Industries (DPI Fisheries) unless the work has been authorised under the Crown Lands Act 1989 or Crown Lands Management Act 2016 or by a relevant public authority (not a local government authority).

1.5.8 TfNSW Biodiversity Policy

Transport strives to protect and enhance biodiversity, with the goal of achieving a no net loss of biodiversity as a consequence of its infrastructure development activities. This Policy outlines what TfNSW do to protect and enhance biodiversity for NSW.

The development of transport infrastructure can lead to unavoidable direct and indirect impacts on biodiversity including habitat fragmentation effects that can persist long after the infrastructure is built. Mitigation measures can reduce the severity of impacts, including supporting habitat connectivity, and are critical to the ongoing sustainable operation of transport infrastructure.

The first priority is to avoid impacts to biodiversity from Transport infrastructure and then to minimise and mitigate remaining impacts as far as practicable. For these works sensitive areas have been avoided through dredge and spoil placement design.

1.6 Assessment Objectives

The objectives of this assessment are to:

- Identify any potential impacts from the proposed 10 year maintenance dredging on threatened biodiversity, MNES, water quality, fish habitat, marine vegetation and fauna, and areas of outstanding biodiversity value; and
- Provide recommendations regarding adoption of environmental controls and mitigation measures into the Construction Environmental Management Plan (CEMP).
- Outline further investigations required to be undertaken prior to each dredging campaign, regarding potential impacts on marine habitat and threatened biodiversity.
- Identify any consultation, additional permitting and approval requirements under the FM Act that may be required prior to each dredging campaign, including any requirements for an SIS or EPBC referral.



Figure 1: Location of proposed Dredge Areas and Sand Placement Area in the Study Area

2 Methodology and Approach

2.1 Desktop Review

2.1.1 Threatened Species Searches

Relevant databases were searched during September 2024, applying a ~10 km radius around the Study Area to identify threatened biodiversity, migratory species and MNES that may potentially occur at the locality. The following databases and information sources were searched:

- Bionet, Atlas of NSW Wildlife (last 20 years) (NSW Environment and Heritage 2024),
- NSW DPI Fisheries Threatened Species Lists (NSW DPI 2024a),
- EPBC Act Protected Matters Report tool (DCCEEW 2024); and
- Atlas of Living Australia (FM Act listings only) (ALA 2024).

2.1.2 Threatened Species Assessment

The threatened species assessment was undertaken by desktop review of 'sightings', assessment of the habitat in the Study Area, and determining the likelihood of occurrence of each species using the criteria outlined in Table 2. Species considered further were those in the 'Known', 'High' and 'Moderate' categories and where impacts on the species from the proposed works are considered to possibly or likely occur. For those species with a moderate or higher likelihood of occurrence within the Study Area, which have potential of being impacted were identified for further assessment through a 5 / 7 Part Test and/ or Impact Assessment criteria.

Table 2: Likelihood of occurrence criteria

Likelihood of occurrence	Criteria
Known	The species was observed within the Study Area. The species is known to inhabit the Study Area.
High	The species has frequently been recorded previously in the Study Area or similar habitats in the locality. The species is known or likely to maintain resident populations surrounding the Study Area. It is likely that the species utilises habitat or resources that are abundant or in good condition within the Study Area. The species is known or likely to visit the Study Area during regular seasonal movements or migrations.
Moderate	The species has infrequently been recorded previously in the Study Area or similar habitats in the locality. The Study Area contains potential marginal and/or modified habitat and resources for the species, which it may occasionally utilise. The species is unlikely to maintain sedentary populations but may seasonally use resources within the Study Area opportunistically or during migrations.
Low	The species has not been recorded previously in the Study Area or similar habitats in the locality. The Study Area is beyond the current distribution range of the species. If present in the Study Area the species would likely be a transient visitor. The Study Area contains only very marginal habitat for the species, which would not be relied upon for its on-going local existence.
Unlikely	The species is highly restricted to certain geographical areas not including the Study Area. The habitat within the Study Area is unsuitable for the species.

2.1.3 Existing Ecological Mapping

Mapping of existing aquatic ecological features important to this assessment was reviewed using the following online tools:

- Fisheries NSW Spatial Data Portal - Mapping of Estuarine Macrophytes, Aquaculture, Marine Protected Areas, Key Fish Habitats and Resilience and Hazards SEPP layers (NSW DPI 2024b)
- NSW DPI Estuarine Habitat Dashboard (NSW DPI 2024c)
- Various recent aerial imagery captures (Nearmap 2024)
- Habitat mapping data collected in Coffs Harbour during previous investigations for the Coffs Harbour Sand Transfer System to monitor reef communities, including the Critically Endangered *N. lophocladia* (H2O Consulting Group 2024a).

A review of the potential environmental constraints identified via these maps was undertaken. These data sources were also used to develop habitat maps.

2.2 Site Investigations

Site investigations included survey and visual inspection of representative areas of the seabed during December 2024. This included the entirety of the seabed within the Harbour, with focus inside each of the proposed Dredging Areas and Sand Placement Area options, including any intertidal or subtidal habitat within a 50 m buffer of each area (Figure 1).

Visual observations to verify the seabed habitat were made using a combination of towed camera transects and spot observations using a bathyscope. The towed camera was towed within 1 m of the seabed and positioned so imagery was being provided from directly under or within 2 m of the stern of the survey vessel. The towed camera allowed for *in situ* field verification of mapping by providing video imagery live to the topside monitor on the survey vessel. The vessel sonar, which included CHIRP ClearVu and SideVu sonar that incorporates a thin, wide beam to provide clear images of structure and fish below the vessel, was also used to aid mapping and target seabed areas with structure.

Site investigations within Coffs Harbour (Dredge Areas) and the proposed nearshore Sand Placement Area at Park Beach (i.e. the Study Area – see Figure 1), completed as part of this assessment included:

- Inspection and description of general habitat within and adjacent to the Dredge Area and proposed Sand Placement Area,
- Description of intertidal flora and fauna present,
- Opportunistic, diurnal records of any marine birds or shorebirds, mammals or reptiles,
- Verification and mapping of subtidal habitat, including marine vegetation – in the Dredge Areas and Sand Placement Area; and
- Collection of intertidal and subtidal sediments to describe infauna communities.

A summary of survey methodologies is presented in Table 3.

Table 3: Survey locations and methodology

Area	Location	Survey Methodology
Dredge Area 1	At the entrance to the Coffs Harbour Marina and along the marina breakwater.	Habitat verification of subtidal habitat using towed camera, side scan sonar and snorkel observations. Intertidal inspection of the breakwater at low tide. Infauna sampling at

		one location within the Dredge Area (See Figure 1).
Dredge Area 2	At the entrance to the Coffs Harbour Boat Ramp and around the breakwater.	Habitat verification of subtidal habitat using towed camera, side scan sonar and snorkel observations. Intertidal inspection of the breakwater at low tide. Infauna sampling at one location within the Dredge Area (See Figure 1).
Sand Placement Area	Between 100-200 m offshore of the southern end of Park Beach, to the north of Little Muttonbird Island.	Habitat verification of subtidal habitat using towed camera and side scan sonar. Infauna sampling at two locations within the Placement Area (See Figure 1).
Adjacent habitat (onshore)	Southern end of Park Beach, adjacent to the Coffs Harbour Surf Life Saving Club. Northern end of Jetty Beach, between the Coffs Harbour Jetty and the marina breakwater. North Wall Beach, between the marina and Park Beach.	Infauna sampling at three locations along the lower intertidal zone. Shoreline observations.
Adjacent habitat (nearshore)	Approximately 500 m offshore of Gallows Beach and the northern end of Boambee Beach, south of Coffs Harbour, as a reference site for subtidal habitat and sediment.	Infauna sampling at two nearshore locations.

2.2.1 Habitat Mapping

Habitat mapping focused on marine vegetation and rocky reef habitat within the Study Area. Existing ecological habitat mapping and recent aerial imagery were verified *in situ* with visual observations made using a towed camera, side scan sonar and diver observations. Data collected included Habitat Type (seagrass, soft sediment, rock/reef/rubble, macroalgae, soft coral) and Macroalgae Types, including a measure of density (high, moderate or low).

Data was imported into GIS-based mapping software and created into shapefiles and polygons based on interpretation of the following data sources:

- Previous *in situ* mapping data (H2O Consulting Group 2024a),
- *In situ* habitat verification data,
- Existing estuarine macrophyte mapping (NSW DPI 2024b); and
- Recent aerial imagery.

2.2.2 Infauna Sampling and Analysis

Infauna were collected from marine sediments using a Van Veen grab at four subtidal sites within the Dredge Areas, Placement Area and at two reference sites south of Coffs Harbour, and hand cores (90 mm diameter) at three sites within adjacent intertidal habitats (see Figure 1 and Table 4). At each site five replicate infauna samples were collected with approximately 1 L of homogenised sediment sample retained for analysis. Samples were washed through a 1 mm sieve and the retained material was preserved in 90% ethanol for later analysis. To aid analysis samples were stained using Rose Bengal dye. Once stained the dyed samples were sorted under a dissecting microscope and identified to Class (and as low as Family

where possible) by a marine ecologist. Two replicates were taken at site S03, as sediment was highly variable in this area.

Table 4: Infauna sediment sample locations

Infauna Sediment Sample Site	Location	Latitude	Longitude
S01	Dredge Area 2	-30.30049	153.141111
S02	Dredge Area 1	-30.293804	153.140406
S03	Southern end of Sand Placement Area	-30.292407	153.139983
S04	Northern end of Sand Placement Area	-30.309562	153.142336
S05	Reference site – nearshore to Gallows Beach	-30.305057	153.144685
S06	Reference site – nearshore to northern end of Boambee Beach	-30.293108	153.143558
I01	North Wall Beach	-30.290085	153.14346
I02	Park Beach adjacent to southern end of nearshore Sand Placement Area	-30.316677	153.143913
I03	Park Beach adjacent to northern end of nearshore Sand Placement Area	-30.318595	153.141048

2.3 Limitations

Threatened species sightings searches were limited to sightings data within Bionet (from the last 20 years), with the exception of fish, shark and rays (under the FM Act) for which sightings data from the Atlas of Living Australia were also reviewed (ALA 2024). Threatened species searches were undertaken in 2024 following engagement by Blue Sky Planning for this project. Some more current sightings data may be available for some species; however, this additional data is unlikely to include fish, sharks, rays or marine invertebrates that have potential to be impacted by this proposal.

Fauna surveys (unless otherwise specified) were limited to the assessment of habitat values and other opportunistic observations. Habitat assessments are conservative, defaulting to assume presence where there is insufficient knowledge to determine otherwise.

The field investigations conducted as part of this assessment are confined to aquatic habitat associated with the dredge and placement areas.

Numerous threatened species of fauna are seasonal in geographical distribution and/or may be transient in nature. For instance, some migratory bird species may be seen only at certain times of the year as they migrate to more significant nearby sites, while other fauna are only present during certain seasons (e.g. migration patterns or seasons).

Mapping is limited to broad-scale GPS mapping and a typical accuracy of +/- 3 m. More detailed spatial and temporal mapping may be required to identify more precise boundaries and seasonal changes in habitat.

The effectiveness of habitat searches is limited to in-water conditions and seabed water visibility at the time of the site investigations, which was typically 0.5-2 m. Inspection of the rock bommie within Dredge Area 2 was limited, with visibility only 0.5 m at time of survey.

No targeted surveys for *Nereia lophocladia* were undertaken as part of this assessment. The impact assessment on this species is reliant on known distribution of the species in locality as identified by

previous targeted monitoring and surveys. Most recent surveys undertaken by H2O Consulting Group in 2023 (H2O Consulting Group 2024) as part of reef monitoring included inspection of Muttonbird Island (north and south side), Little Muttonbird Island, rocky reef and bommie at south North Wall Beach and Macauley's Headland. The species was only observed on the rocky reef and bommie at south North Wall Beach, however, highly suitable habitat was identified on the south-western and north-western sides of Little Muttonbird Island and on the north-western side of Muttonbird Island, with lower potential suitable habitat identified at Macauley's Headland and the southern side of Muttonbird Island. Previous studies have not found the species to occur within Coffs Harbour and thus within or in proximity to the Dredge Areas. The species has however been identified at Little Muttonbird Island, in proximity to the Sand Placement Area (see Table 1).

3 Results and Findings

3.1 Desktop Review

3.1.1 Threatened Biodiversity and Protected Matters

Searches of the Bionet database identified sightings data for 24 items listings under the BC and EPBC Acts within a ~10 km radius of the Study Area (Figure 2). These included:

- 17 Threatened marine birds and/or shorebirds,
- 4 Threatened marine mammals; and
- 3 Threatened marine reptiles.

Review of Threatened Species Listings under the FM Act that may occur in the Study Area or wider locality (catchment or adjacent waters) identified the following listings relevant to the locality (marine waters within 10 km of the subject Site):

- 2 Threatened sharks and rays,
- 1 Threatened fish; and
- 1 Threatened macroalga.

The EPBC Protected Matters Report Search identified the following MNES relevant to this study (i.e. marine/estuarine species or those that use marine/estuarine habitat) within ~10 km radius of the Study Area (Appendix 2):

- 48 Listed Threatened species,
- 60 Listed Migratory species; and
- 1 Threatened Ecological Community.

Of the Commonwealth listed Threatened and/or Migratory species and communities, the following were identified for consideration as part of this assessment:

- 49 Marine birds and shorebirds,
- 10 Marine mammals,
- 5 Marine turtles,
- 9 Sharks and rays,
- 3 Fish; and
- 1 Threatened Ecological Community

In addition to the above, the EPBC Protected Matters Report Search identified 99 protected marine species that include certain species of fish, along with some marine birds, reptiles and mammals. A total of 28 marine mammals were identified as part of protected listings for cetaceans (Appendix 2).

In total 59 marine birds (including shorebirds and waders), 11 marine mammals, 5 marine reptiles, 9 sharks and rays, 3 fish, 1 macroalga and 1 Threatened Ecological Community, which are considered threatened and/or migratory were identified with potential for occurrence within the wider locality. The likelihood for occurrence within the Study Area was considered for further for each of these species (Table 5).

Species with a likelihood of occurrence of 'Moderate' or higher are considered further as part of this assessment in Section 4.1.

Table 5: Habitat and likelihood of occurrence table for threatened and migratory marine species identified from searches.

Common Name	Scientific Name	NSW status	Comm. Status	Sightings		Likelihood of Occurrence
				Bionet	ALA (FM Act only)	
Marine Birds and Shorebirds						
Common Sandpiper	<i>Actitis hypoleucos</i>	P	MA, MI	0		Low – No records in locality, may on occasion occur aerially or forage or roost along the shoreline in Coffs Harbour.
Common Noddy	<i>Anous stolidus</i>	P	MA, MI	0		Low – No records in locality, may on occasion occur aerially in Coffs Harbour but typically forage offshore and breed on offshore islands.
Fork-tailed Swift	<i>Apus pacificus</i>	P	MA, MI	1		Low – Infrequent records in locality, may on occasion occur aerially in Coffs Harbour.
Flesh-footed Shearwater, Fleshy-footed Shearwater	<i>Ardenna carneipes</i>	P	MA, MI	0		Low – No records in locality, may on occasion occur aerially in Coffs Harbour but typically remains offshore
Sooty Shearwater	<i>Ardenna grisea</i>	P	V, MA, MI	0		Low – No records in locality, may on occasion occur aerially in Coffs Harbour but typically remains offshore
Wedge-tailed Shearwater	<i>Ardenna pacifica</i>	P	MA, MI	13133		Known – Frequent records in the locality. Muttonbird Island adjacent to Study Area is an important breeding and roosting site.
Short-tailed Shearwater	<i>Ardenna tenuirostris</i>	P	MA, MI	50		High – Regular records in locality. Habitat occurs near Muttonbird Island and other offshore islands in the locality.
Australasian Bittern	<i>Botaurus poiciloptilus</i>	P	E	0		Low - No records in locality, only very marginal foraging habitat present in the Study Area, typically confined to freshwater wetlands.
Bush Stone-curlew	<i>Burhinus grallarius</i>	E, P		2		Low – Infrequent records in locality, only very marginal foraging habitat present in the Study Area, typically confined to grasslands, heathlands, or golf courses.
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	P	V, MA, MI	0		Low – No records in locality, may on occasion occur aerially or forage or roost along the shoreline in Coffs Harbour
Red Knot, Knot	<i>Calidris canutus</i>	P	V, MA, MI	0		Low – No records in locality, only marginal foraging and roosting habitat present in the Study

Common Name	Scientific Name	NSW status	Comm. Status	Sightings	Likelihood of Occurrence
					Area. Species typically confined to sandy estuaries or tidal mudflats.
Curlew Sandpiper	<i>Calidris ferruginea</i>	P	CE, MA, MI	0	Low No records in locality, may on occasion utilise sandy tidal flats within Study Area.
Pectoral Sandpiper	<i>Calidris melanotos</i>	P	MA, MI	0	Low – No records in locality, only very marginal foraging habitat present in the Study Area. Typically prefer grass-fringed freshwater wetland habitat.
Streaked Shearwater	<i>Calonectris leucomelas</i>	P	MA, MI	0	Low – No records in locality, may on occasion occur aerially in Coffs Harbour but typically remain offshore.
Greater Sand Plover, Large Sand Plover	<i>Charadrius leschenaultii</i>	P	V, MA, MI	0	Low – No records in locality, may on occasion occur aerially or forage or roost along the shoreline in Coffs Harbour. Uncommon on the east coast.
Antipodean Albatross	<i>Diomedea antipodensis</i>	P	V, MA, MI	0	Low – No records in locality. May occur aerially on occasion however likely to be only a transient visitor.
Gibson's Albatross	<i>Diomedea antipodensis gibsoni</i>	P	V, MA	0	Low – No records in locality. May occur aerially on occasion however likely to be only a transient visitor.
Southern Royal Albatross	<i>Diomedea epomophora</i>	P	V, MA, MI	0	Low – No records in locality. May occur aerially on occasion however likely to be only a transient visitor.
Wandering Albatross	<i>Diomedea exulans</i>	P	V, MA, MI	0	Low – No records in locality. May occur aerially on occasion however likely to be only a transient visitor.
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E, P		2	Low – Infrequent records in locality. Only marginal foraging habitat present in the Study Area, typically confined to coastal wetlands.
Lesser Frigatebird, Least Frigatebird	<i>Fregata ariel</i>	P	MA, MI	0	Low – No records in locality, may on occasion occur aerially in Coffs Harbour but typically forage offshore and breed on offshore islands.
Great Frigatebird, Greater Frigatebird	<i>Fregata minor</i>	P	MA, MI	0	Low – No records in locality, may on occasion occur aerially in Coffs Harbour but typically forage offshore and breed on offshore islands.

Common Name	Scientific Name	NSW status	Comm. Status	Sightings	Likelihood of Occurrence
White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian)	<i>Fregetta grallaria grallaria</i>	P	V	0	Low – No records in locality, may on occasion occur aerially in Coffs Harbour but typically forage offshore and breed on offshore islands.
Latham's Snipe, Japanese Snipe	<i>Gallinago hardwickii</i>	P	V, MA, MI	0	Low – No records in locality, only very marginal foraging habitat present in the Study Area. Typically prefer open freshwater wetlands.
Swinhoe's Snipe	<i>Gallinago megala</i>	P	MA, MI	0	Unlikely – No records in locality, only very marginal foraging habitat present in the Study Area. Species typically restricted to shallow freshwater wetlands of north-western Australia.
Pin-tailed Snipe	<i>Gallinago stenura</i>	P	MA, MI	0	Unlikely - No records in locality, only very marginal foraging habitat present in the Study Area. Species not typically observed in New South Wales.
Sooty Oystercatcher	<i>Haematopus fuliginosus</i>	V,P		8	Known – Occasional records in locality, observed during surveys. Habitat within the Study Area is confined to intertidal habitat along the perimeter of the Study Area where it may forage at low tide.
Pied Oystercatcher	<i>Haematopus longirostris</i>	E1,P		8	Known – Occasional records in locality, observed during surveys. Habitat within the Study Area is confined to sandy intertidal habitat associated with Jetty Beach where it may forage at low tide.
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V,P		5	Moderate – Occasional records in locality, likely to forage over large areas of Coffs Harbour including the Study Area.
White-throated Needletail	<i>Hirundapus caudacutus</i>	V, P	V, MA, MI	8	Moderate – Occasional records in locality, may on occasion forage over large areas of Coffs Harbour including the Study Area.
Bar-tailed Godwit	<i>Limosa lapponica</i>	P	MA, MI	0	Low – No records in locality, may on occasion occur aerially or forage or roost along the shoreline in Coffs Harbour.
Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit	<i>Limosa lapponica baueri</i>	P	E	0	Low – No records in locality, may on occasion occur aerially or forage or roost along the shoreline in Coffs Harbour.

Common Name	Scientific Name	NSW status	Comm. Status	Sightings	Likelihood of Occurrence
Southern Giant-Petrel, Southern Giant Petrel	<i>Macronectes giganteus</i>	P	E, MA, MI	0	Low – No records in locality, may on occasion occur aerially in Coffs Harbour but typically remain offshore.
Northern Giant Petrel	<i>Macronectes halli</i>	V, P	V, MA, MI	1	Low – Infrequent records in locality, may on occasion occur aerially in Coffs Harbour but typically remain offshore.
Eastern Curlew, Far Eastern Curlew	<i>Numenius madagascariensis</i>	P	CE, MA, MI	1	Low – Infrequent records in locality. Only marginal foraging habitat present within the Study Area, foraging typically confined to estuarine tidal mudflats and sandflats.
Little Curlew, Little Whimbrel	<i>Numenius minutus</i>	P	MA, MI	0	Low - No records in locality, only very marginal foraging habitat present in the Study Area. Typically confined to coastal or inland grasslands in northern Australia.
Fairy Prion (southern)	<i>Pachyptila turtur subantarctica</i>	P	V	0	Low – No records in locality, may on occasion occur aerially in Coffs Harbour but typically remain offshore.
Eastern Osprey	<i>Pandion cristatus</i>	V,P		22	Known – Records in locality, may on occasions forage over large areas of Coffs Harbour including the Study Area. Observed during surveys.
Osprey	<i>Pandion haliaetus</i>	P	MA, MI	0	Low - No records in locality, may on occasions forage over large areas of Batemans Bay including the Study Area.
White-tailed Tropicbird	<i>Phaethon lepturus</i>	P	MA, MI	0	Low – No records in locality, may on occasion occur aerially in Coffs Harbour but typically remain offshore.
Sooty Albatross	<i>Phoebastria fusca</i>	P	V, MA, MI	0	Low - No records in locality, only very marginal foraging habitat present in the Study Area.
Gould's Petrel, Australian Gould's Petrel	<i>Pterodroma leucoptera</i>	P	E	0	Low - No records in locality, only very marginal foraging habitat present in the Study Area.
Black Winged Petrel	<i>Pterodroma nigripennis</i>	V	MA	0	Moderate – The species is known to breed in the area, within burrowing previously recorded on Muttonbird Island.
Australian Painted Snipe	<i>Rostratula australis</i>	P	E, MA	0	Low - No records in locality, only very marginal foraging habitat present in the Study Area.

Common Name	Scientific Name	NSW status	Comm. Status	Sightings	Likelihood of Occurrence
					Typically prefer wetlands with muddy margins and low, patchy vegetation.
Common Tern	<i>Sterna hirundo</i>	P	MI	2	Low – Occasional records in locality, may on occasion forage over large areas of Coffs Harbour including the Study Area.
Little Tern	<i>Sternula albifrons</i>	E, P	MA, MI	4	Low – Infrequent records in locality. Potential roosting habitat within the Study Area is confined to protected sandy beach habitat associated with Jetty Beach where they may occasionally nest in small colonies above the high tide mark. The Study Area may provide suitable foraging habitat.
Australian Fairy Tern	<i>Sternula nereis nereis</i>	P	V	0	Low - No records in locality, only very marginal foraging habitat present in the Study Area.
Masked Booby	<i>Sula dactylatra</i>	V, P	MI	1	Low – Infrequent records in locality, may on occasion occur aerially in Coffs Harbour but typically remain offshore.
Buller's Albatross, Pacific Albatross	<i>Thalassarche bulleri</i>	P	V, MA, MI	0	Low - No records in locality. May occur aerially on occasion however likely to be only a transient visitor.
Northern Buller's Albatross, Pacific Albatross	<i>Thalassarche bulleri platei</i>	P	V, MA	0	Low - No records in locality. May occur aerially on occasion however likely to be only a transient visitor.
Indian Yellow-nosed Albatross	<i>Thalassarche carteri</i>	P	V, MA, MI	0	Low - No records in locality. May occur aerially on occasion however likely to be only a transient visitor.
Shy Albatross	<i>Thalassarche cauta</i>	E, P	E, MA, MI	1	Low - Infrequent records in locality. May occur aerially on occasion however likely to be only a transient visitor.
Campbell Albatross, Campbell Black-browed Albatross	<i>Thalassarche impavida</i>	P	V, MA, MI	0	Low - No records in locality. May occur aerially on occasion however likely to be only a transient visitor.
Black-browed Albatross	<i>Thalassarche melanophrys</i>	P	V, MA, MI	0	Low - No records in locality. May occur aerially on occasion however likely to be only a transient visitor.

Common Name	Scientific Name	NSW status	Comm. Status	Sightings	Likelihood of Occurrence
Salvin's Albatross	<i>Thalassarche salvini</i>	P	V	0	Low - No records in locality. May occur aerially on occasion however likely to be only a transient visitor.
White-capped Albatross	<i>Thalassarche steadi</i>	P	V	0	Low - No records in locality. May occur aerially on occasion however likely to be only a transient visitor.
Crested Tern	<i>Thalasseus bergii</i>	P	MI	5	Known – Occasional records in locality, likely to forage within the Study Area at times. Observed during surveys.
Greater Crested Tern	<i>Thalasseus bergii</i>	P	MA, MI	0	Low – No records in locality, may on occasion forage over large areas of Coffs Harbour including the Study Area.
Common Greenshank, Greenshank	<i>Tringa nebularia</i>	P	E, MA, MI	0	Low - No records in locality, may on occasion occur aerially or forage or roost along on the shoreline in Coffs Harbour.
Marine Mammals					
New Zealand Fur-seal	<i>Arctocephalus forsteri</i>	V, P		3	Moderate – Infrequent records in locality, may on occasion forage in the Study Area or use habitat within Study Area associated with breakwaters for refuge/haul out. No breeding is known to occur in NSW.
Australian Fur-seal	<i>Arctocephalus pusillus doriferus</i>	V, P		1	Low – Infrequent records in locality, may on occasion forage in the Study Area or use habitat within Study Area associated with breakwaters for refuge/haul out. The mid-north coast represents the species' northern limit. May on occasion occur in locality, likely to be only a transient visitor.
Sei Whale	<i>Balaenoptera borealis</i>	P	V, MA	0	Low – No records in locality, likely to be only a transient visitor. Typically remains in deeper water and unlikely to enter the shallow waters associated with the Study Area
Bryde's Whale	<i>Balaenoptera edeni</i>	P	MI	0	Low – No records in locality, likely to be only a transient visitor. Typically remains in deeper water and unlikely to enter the shallow waters associated with the Study Area
Blue Whale	<i>Balaenoptera musculus</i>	P	E, MI	0	Low – No records in locality, likely to be only a transient visitor. Typically remains in deeper

Common Name	Scientific Name	NSW status	Comm. Status	Sightings	Likelihood of Occurrence
					water and unlikely to enter the shallow waters associated with the Study Area
Fin Whale	<i>Balaenoptera physalus</i>	P	V, MI	0	Low – No records in locality, likely to be only a transient visitor. Typically remains in deeper water and unlikely to enter the shallow waters associated with the Study Area
Dugong	<i>Dugong dugon</i>	P	MI, MA	0	Low – No records in locality, likely to be only a transient visitor
Southern Right Whale	<i>Eubalaena australis</i>	E, P	E, MI	3	Low – Infrequent records in locality. May on occasion a transient visitor to Coffs Harbour, however unlikely to occur within the shallow waters associated with the Study Area.
Humpback Whale	<i>Megaptera novaeangliae</i>	P	MI	0	Low – No records in the Study Area but may on occasion be a transient visitor to Coffs Harbour. Typically remains in deeper water and unlikely to enter the shallow waters associated with the Study Area.
Killer Whale, Orca	<i>Orcinus orca</i>	P	MI	0	Low – No records in the Study Area but may on occasion be a transient visitor to Coffs Harbour. Typically remains in deeper water and unlikely to enter the shallow waters associated with the Study Area.
Sperm Whale	<i>Physeter macrocephalus</i>	V, P	MI	1	Low – No records in the Study Area but may on occasion be a transient visitor to Coffs Harbour. Typically remains in deeper water and unlikely to enter the shallow waters associated with the Study Area.
<i>Marine Turtles</i>					
Loggerhead Turtle	<i>Caretta caretta</i>	E, P	E, MA, MI	4	Moderate – Infrequent records in the Study Area but known to nest along the mid-north coast.
Green Turtle	<i>Chelonia mydas</i>	V, P	V, MA, MI	87	Known – Regular records within Study Area and observed during surveys. One individual rescued from Coffs Harbour Marina in 2023. Known to nest along the mid-north coast. Habitat within the Study Area is unlikely to be of ecological significance to the species.

Common Name	Scientific Name	NSW status	Comm. Status	Sightings		Likelihood of Occurrence
Leatherback Turtle, Leathery Turtle, Luth	<i>Dermochelys coriacea</i>	P	E	0		Low – No sightings recorded in the locality. Typically remains offshore and unlikely to enter Coffs Harbour.
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	P	V, MA, MI	7		Moderate – Occasional sightings within the locality. The species may on occasion frequent habitat within the Study Area, however it is unlikely to be of ecological significance to the species.
Flatback Turtle	<i>Natator depressus</i>	P	V, MA, MI	0		Low – No sightings recorded in the locality. Typically confined to more tropical waters, only likely to be a transient visitor to the area.
Fish						
Black Rockcod, Black Cod, Saddled Rockcod	<i>Epinephelus daemeli</i>	P	V	0	1	Moderate – Infrequent records in locality, the Study Area includes some marginal habitat for foraging and refuge.
White's Seahorse, Crowned Seahorse, Sydney Seahorse	<i>Hippocampus whitei</i>	P	E, MA	0		Unlikely – No records in locality. Typically confined to estuarine waters north of the Tweed River or south of Wallace Lakes.
Blue Warehou	<i>Seriola lalandi</i>	P	CD	0		Low – No records in locality. Typically remain offshore near the continental shelf edge. Juveniles may occasionally use shallow areas as refuge.
Sharks and Rays						
Oceanic Whitetip Shark	<i>Carcharhinus longimanus</i>	P	MA, MI	0		Low – No records in locality. Typically confined to tropical and subtropical waters, only likely to be a transient visitor to locality.
Grey Nurse Shark (east coast population)	<i>Carcharias taurus</i> (east coast population)	P	CD	0	3	Low – Occur in the locality, however use of habitat in the harbour and Study Area is considered rare.
White Shark, Great White Shark	<i>Carcharodon carcharias</i>	P	V, MI	0	25	Known – Known to occur within the locality, only very marginal habitat present that may be utilised for foraging within the Study Area, which is not considered to be of ecological importance to the species.
School Shark, Eastern School Shark, Snapper	<i>Galeorhinus galeus</i>	P	CD	0		Low – No records in locality. Typically remain offshore near the continental shelf edge.

Common Name	Scientific Name	NSW status	Comm. Status	Sightings	Likelihood of Occurrence
Shark, Tope, Soupfin Shark					Juveniles may seasonally use shallower areas as refuge and foraging habitat.
Porbeagle, Mackerel Shark	<i>Lamna nasus</i>	P	MI	0	Low – Rarely recorded in coastal areas. Typically remains offshore near the continental shelf edge and very unlikely to enter Coffs Harbour.
Reef Manta Ray, Coastal Manta Ray	<i>Mobula alfredi</i>	P	MI	0	Low – No records within locality, typically remain offshore near continental shelf edge and unlikely to enter Coffs Harbour.
Giant Manta Ray	<i>Mobula birostris</i>	P	MI	0	Low – No records within locality, typically remain offshore near continental shelf edge and unlikely to enter Coffs Harbour.
Whale Shark	<i>Rhincodon typus</i>	P	V, MI	0	Low – No records within locality, typically remain offshore near continental shelf edge and unlikely to enter Coffs Harbour.
Scalloped Hammerhead	<i>Sphyrna lewini</i>	P	CD	0	Low – Rarely recorded in coastal areas. Typically remains offshore near the continental shelf edge and very unlikely to enter Coffs Harbour.
Macroalgae					
Marine Brown Alga	<i>Nereia lophocladia</i>	CE		0	High – Known habitat on the northern side of Coffs Harbour and Muttonbird Island and at Little Muttonbird Island. Habitat is marginal in most of the Study Area, however, highly suitable habitat has previously been identified on the south-western and north-western sides of Little Muttonbird Island.
Threatened Ecological Community					
Subtropical and Temperate Coastal Saltmarsh			V		Low – Coastal Saltmarsh is expected to be confined to shoreline areas along Coffs Creek, with some low potential to occur along areas of mapped Coastal Wetlands, however, presence within the shoreline Placement Areas within the Study Area is considered low.

CD = Conservation Dependent, P = Protected, V = Vulnerable, E = Endangered, CE = Critically Endangered, MA = Marine Species, MI = Migratory, C = Cetacean.

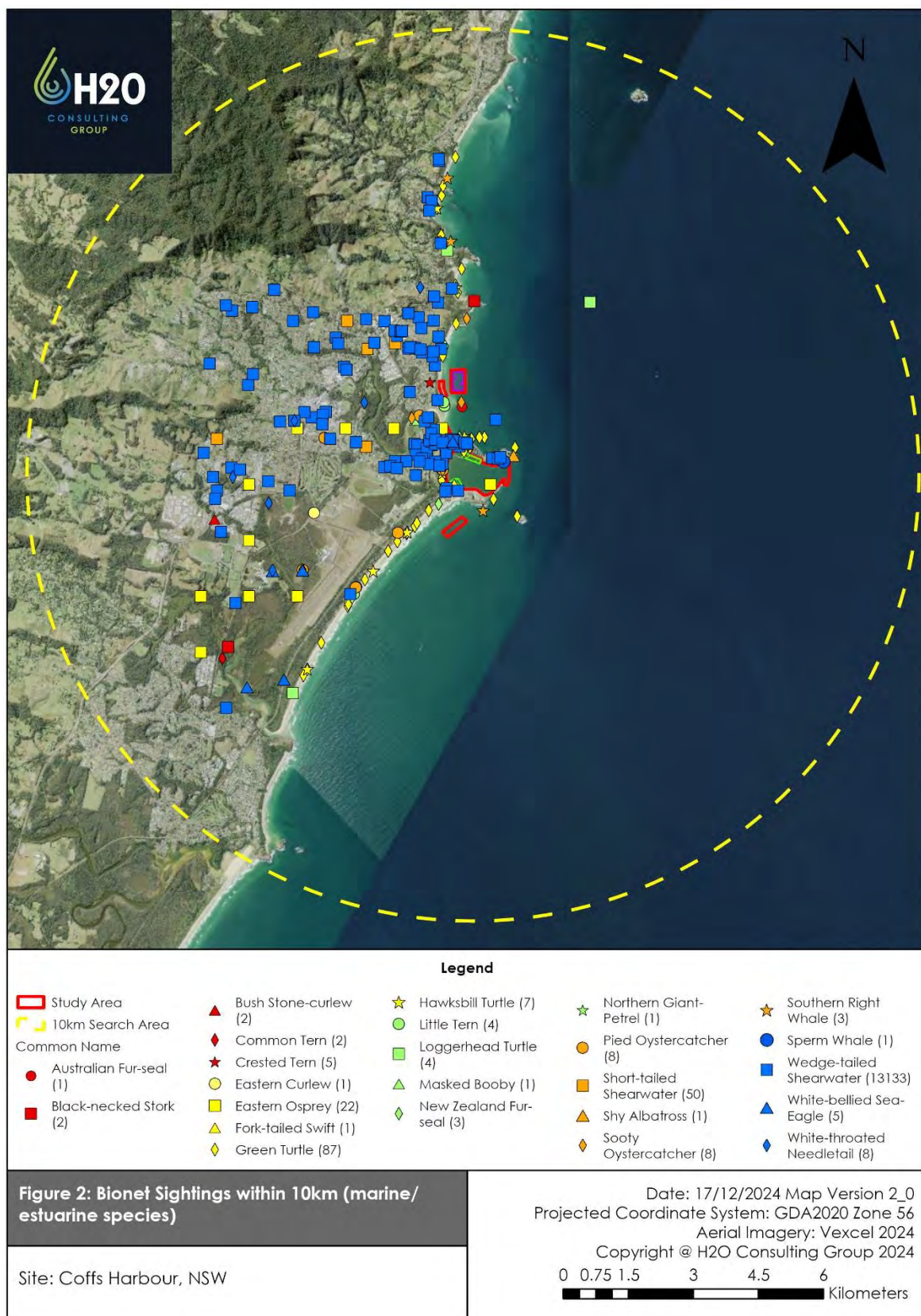


Figure 2: Bionet sightings of threatened species within 10km of the Study Area

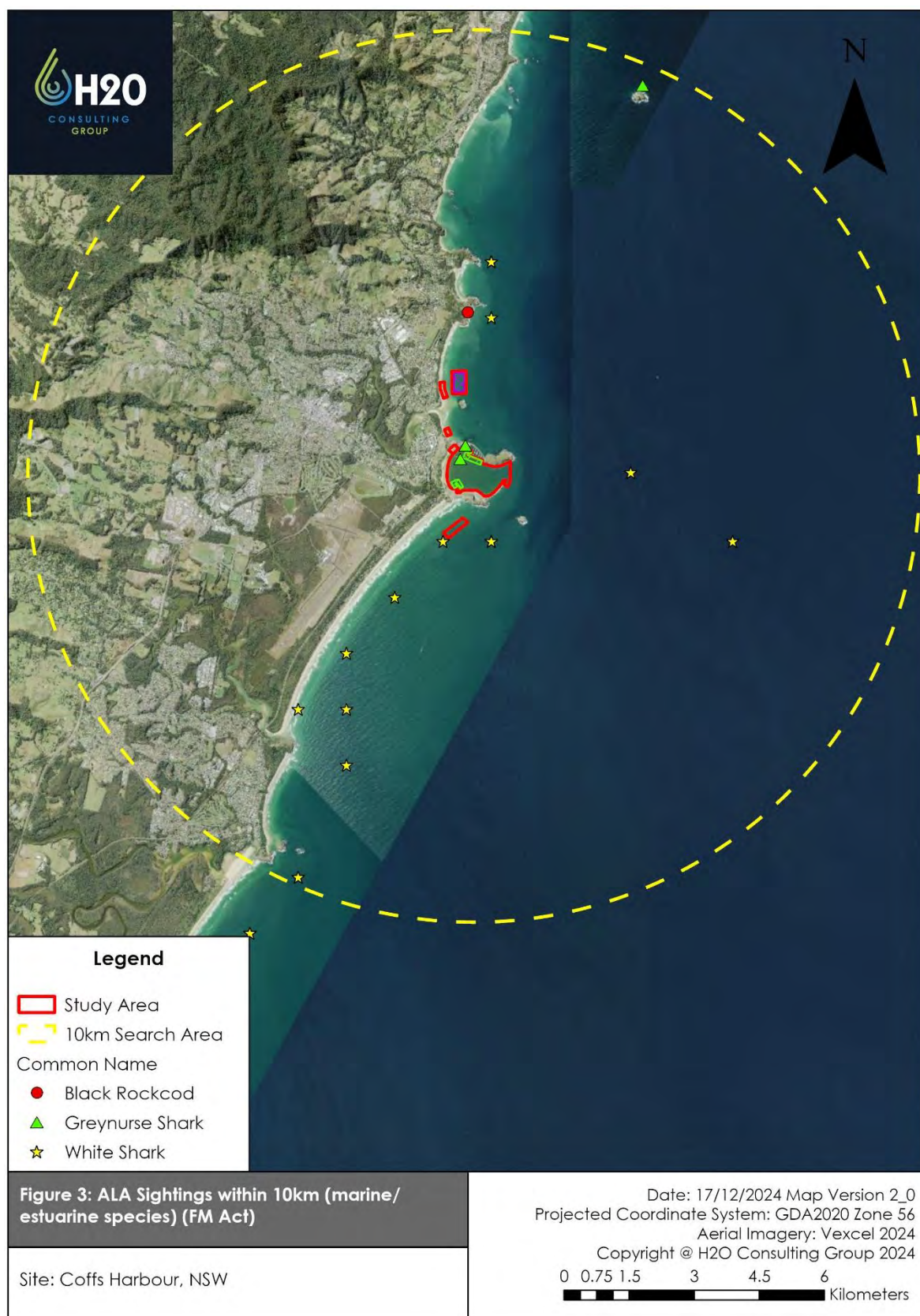


Figure 3: ALA sightings of threatened species listed under the FM Act within 10km of the Study Area

3.1.2 Existing Ecological Mapping and Aerial Imagery

Existing mapping of estuarine macrophytes conducted by NSW DPI (2024b) did not identify any seagrass, mangroves, or saltmarsh to occur within the Study Area. The nearest occurrence of estuarine macrophytes is recorded within Coffs Creek, where extensive fringing mangroves, some saltmarsh, and fringing patches of the *Zostera* sp. seagrass are mapped east of the Orlando St bridge (Appendix 3).

The Study Area on the northern side of the Coffs Harbour Marina and Muttonbird Island is within the Habitat Protection Zone (IUCN IV) of the Solitary Islands Marine Park (Appendix 3). The Solitary Islands Marine Park extends north from Coffs Harbour 75 km to Sandon River.

The entirety of the Study Area and adjacent waters are mapped as Key Fish Habitat (KFH) - Northern Rivers (Appendix 3).

Mapping conducted as part of the Resilience and Hazards SEPP (2021) identifies vegetated land behind Jetty Beach and Park beach as Littoral Rainforest Area under the SEPP, with some Littoral Rainforest Proximity Areas within the Study Area, including Placement Area B and directly adjacent to Placement Area C. Coastal Wetland Areas are mapped within Coffs Creek and other small sections southwest of the Study Area (Appendix 3). Additionally, parts of the Study Area are mapped as coastal vulnerability, coastal environment and coastal use areas under the SEPP.

No aquaculture leases are present within 10 km of the Study Area. The nearest leases are mapped to occur approximately 20 km south of the Study Area in the Bellinger River near Mylestom (NSW DPI 2023b).

Reef Areas

Existing bathymetry mapping conducted by NSW Department of Planning and Environment as part of the Seabed NSW Program indicates the presence of extensive rocky reef habitat landforms in the vicinity of the Study Area. A number of large rocky reef formations are present offshore to the east of Coffs Harbour, as well as on the northern side of the Coffs Harbour Marina and to the east of Little Muttonbird Island. These formations are comprised of peaks, scarps and rugose outcrops with the majority of reef formations in close proximity of the Study Area at depths of between -15.0 to -20.0 m. A small outcrop of rocky reef is also evident within Coffs Harbour, close to shore approximately 120 m north of the end of the Coffs Harbour Boat Ramp breakwater.

3.2 Description of Habitat and Biota

3.2.1 Dredging Areas – Coffs Harbour

Dredge Area 1

Dredge Area 1 is located at the entrance to the Coffs Harbour Marina, between the jetty and the marina breakwaters in the northern area of the Harbour. Shoreline and intertidal habitat directly adjacent to Dredge Area 1 included artificial habitat provided by the ballast rock marina breakwaters to the north and the existing Coffs Harbour Jetty to the south. Artificial habitat was observed to provide foraging value for shorebird species, with Sooty Oystercatchers (*Haematopus fuliginosus*) observed during surveys. Intertidal areas of these breakwaters supported various intertidal invertebrate species, with high intertidal zones dominated by Tube Worms (*Galeolaria caespitosa*) and lower areas dominated by dense assemblages of Cunjivoi (*Pyura stolonifera*) and motile invertebrates.

Subtidal habitat associated with Dredge Area 1 is characterised by a shallow, gradually sloping, soft sediment seabed comprised of fine marine sands with a high amount of silt. Sediment from Dredge Area 1 possessed a median particle size of 0.191 mm. Sediment infauna communities within Dredge Area 1 (S02) were found to be diverse and high in abundance, dominated by the polychaete genus *Mediomastus*, with other common taxa from multiple classes including Polychaeta, Oligochaeta and Bivalvia (Table 7). Live marine vegetation was not observed on the seabed within Dredge Area 1, with only macroalgal wrack observed. Some common marine macroalgae species were, however, observed on artificial habitat provided by subtidal areas of the ballast rock marina breakwaters, including Gulfweed (*Sargassum* sp.) and encrusting Coralline Algae (*Corallina officinalis*). Habitat within Dredge Area 1 was considered as Type 3 – Minimally sensitive KFH (Fairfull 2013).

Dredge Area 2

Dredge Area 2 is located at the entrance to the Coffs Harbour Boat Ramp harbour, adjacent to the southern shoreline of Coffs Harbour. The boat ramp is semi-protected by the recently added breakwater, with the shoreline both within the boat ramp harbour and along the adjoining shorelines comprised of artificial ballast rock armouring. Dredging plant and machinery was present at the time of survey, with recently dredged material having been placed on the top of the breakwater, attracting various shorebird and seabird species including oystercatchers (*H. fuliginosus* and *H. longirostris*), Crested Terns (*Thalasseus bergii*) and Silver Gulls (*Chroicocephalus novaehollandiae*). Intertidal habitat directly adjacent to the Dredge Area was provided by the lower ballast rock armouring and some exposed sands. Intertidal communities to the west (inside of) the boat ramp breakwater were dominated by invertebrates that predominantly comprised of small, mobile gastropod species (*Bembicium nanum*, *Tenguella marginalba*, *Austrocochlea porcata*, *Cellana tramoserica*). Communities to the east of the breakwater where habitat is more exposed were dominated by a higher proportion of sessile invertebrates (*Galeolaria caespitosa*, *P. stolonifera*, *Sypharochiton pelliserpentis*), whilst lower areas also supported various common marine macroalgae species including Sea Lettuce (*Ulva* sp.), *Sargassum* sp., *C. officinalis* and the brown macroalgae *Petalonia binghamiae*.

Subtidal habitat associated with Dredge Area 2 is characterised by a gradually sloping, shallow, unvegetated, soft sediment seabed with shoaling sands and accretion at the entrance to the boat harbour, restricting passage at low tide. Sediment in Dredge Area 2 comprised of clean marine sands, with a median particle size of 0.202 mm. A small rocky reef bommie is located in the northern corner of the Dredge Area, approximately 5-10 m in diameter and provides complex habitat, including rock overhangs. The bommie

supported stands of *Sargassum* and *C. officinalis*, whilst subtidal areas of ballast rock in areas adjacent to Dredge Area 2 also supported similar vegetation assemblages (Figure 4). Sediment infauna communities within Dredge Area 2 (S01) were found to be abundant, however, lacked diversity (Table 7). The majority of infauna identified were Bivalves, with other taxa including Polychaetes and Malacostraca. Habitat within Dredge Area 2 was classified as Type 3 – Minimally sensitive KFH, with the adjacent rocky bommie classified as Type 2 – Moderately sensitive KFH due to the presence of marine macroalgae and rocky reef habitat (Fairfull 2013).

3.2.2 Sand Placement Area

Sand Placement Area – Park Beach (Nearshore subtidal)

As the entirety of the Study Area at the Sand Placement Area falls within the Solitary Islands Marine Park, it is considered Type 1 – Highly sensitive KFH (Fairfull 2013).

Subtidal habitat within the Sand Placement Area comprised of a gently sloping and unvegetated seabed, consisting of clean marine sands with occasional shell debris. Sediment was variable throughout the Sand Placement Area, comprised of sand, shell and gravel with some organic detritus. Particle sizes ranged from 75 µm to 2.36 mm, with the median particle size from replicate samples at the southern end of the Placement Area recording as 0.6 mm and 0.191 mm, whilst the median in the northern section was 0.184 mm (Appendix 4). Sediment infauna communities within the Sand Placement Area (S03 and S04) were much less abundant than the Dredge Areas, whilst taxa richness was relatively similar to Dredge Area 2 and was higher than that at reference sites (S05 and S06) to the south of Coffs Harbour. Dominant taxa differed slightly between the northern and southern portion of the Placement Area, with the infauna community at S03 (south) dominated by decapods and amphipods (Malacostraca class) and various polychaetes, whilst the community at S04 (north) supported a similar composition but with a higher proportion of bivalves. This may be attributed to the finer sediment sizes observed in the northern section of the Placement Area.

3.2.3 Adjacent Habitats

Adjacent Intertidal Habitats (Park Beach, Jetty Beach and North Wall Beach)

Jetty Beach lays adjacent to Dredge Areas 1 and 2. The area is characterised as a natural sandy beach with a large, gently sloping beach face. Jetty Beach receives a high amount of sediment accretion, with the lower intertidal zone very shallow. Whilst the area may at times provide some limited foraging habitat for shorebird species, the area facilitates a high amount of anthropogenic activity.

The southern end of Park Beach lays adjacent to the nearshore Sand Placement Area. The area is characterised as a natural sandy beach with a large, gently sloping beach face possessing some fringing dune vegetation. Fringing vegetation included common colonising dune species, including Beach Spinifex (*Spinifex sericeus*) and Native Morning Glory (*Ipomoea pes – caprae subsp. brasiliensis*). Intertidal habitat along the southern end of Park Beach comprised of depauperate clean marine sands, with some shell and gravel, with sediment adjacent to the southern end of the Placement Area possessing a median particle size of 0.283 mm and sediment adjacent to the northern end possessing a median particle size of 0.375 mm. Infauna communities were minimal in intertidal sediment samples (I02 and I03), with an average abundance and taxa richness of 0.4 at I02 and an average abundance and taxa richness of 0.2 at I03, comprised of amphipods or polychaetes. The lack of infauna at these locations likely provides minimal foraging value for shorebird species.

Similar habitat was observed at North Wall Beach, which lies between Coffs Creek and the marina. Sediment at North Wall Beach comprised depauperate clean marine sands and shell debris, with a median particle size of 0.245 mm. While slightly higher than Park Beach, infauna abundance and richness was low (Table 7), with the community comprised of polychaetes, bivalves, amphipods and crustaceans.

Adjacent Subtidal Habitats (Southern Muttonbird Island)

Subtidal habitat associated with the southern side of Muttonbird Island within Coffs Harbour comprised of complex natural rocky reef habitat (Figure 4). Rocky reef provided complex habitat structures including bommies, gutters, crevices and caves and supported extensive assemblages of common reef species including *P. stolonifera* and various encrusting and branching sponge species. Hard substrata also supported diverse marine vegetation, dominated by *Sargassum*, *C. officinalis*, brown macroalga *Padina crassa* and *Cystophora* sp.

Table 6: Opportunistic observations of marine species during the site survey

Common Name	Scientific Name	Location
Marine birds and shorebirds		
Silver Gull	<i>Chroicocephalus novaehollandiae</i>	Intertidal sands or breakwater
Pied Oystercatcher	<i>Haematopus longirostris</i>	Intertidal sands or breakwater
Sooty Oystercatcher	<i>Haematopus fuliginosus</i>	Intertidal sands or breakwater
Eastern Osprey	<i>Pandion haliaetus</i>	Aerial
Australian Pelican	<i>Pelecanus conspicillatus</i>	Intertidal sands or breakwater
Crested Tern	<i>Thalasseus bergii</i>	Intertidal sands or breakwater
Invertebrates		
Little Blue Periwinkle	<i>Austrolittorina unifasciata</i>	Intertidal – eastern breakwater
Zebra Top Shell	<i>Austrocochlea porcata</i>	Dredge Area 2
Striped-mouth Conniwink	<i>Bembicium nanum</i>	Dredge Area 2, Intertidal – eastern breakwater
Variegated Limpet	<i>Cellana tramoserica</i>	Dredge Area 1, Dredge Area 2, Intertidal – eastern breakwater
Tube Worm	<i>Galeolaria caespitosa</i>	Dredge Area 1, Dredge Area 2, Intertidal – eastern breakwater
Purple Encrusting Sponge	<i>Haliclona</i> sp.	Dredge Area 1
Variegated Shore Crab	<i>Leptograpsus variegatus</i>	Dredge Area 1, Intertidal – eastern breakwater
Dog Whelk	<i>Narssarius burchardi</i>	Dredge Area 1, Intertidal – eastern breakwater
Black Nerita	<i>Nerita atramentosa</i>	Dredge Area 2
Limpet	<i>Patelloida mimuli</i>	Dredge Area 2
Red Bait Crab	<i>Plagusia chabrus</i>	Dredge Area 1
Cunjevoi	<i>Pyura stolonifera</i>	Dredge Area 1, Dredge Area 2 Intertidal – eastern breakwater
Sydney Rock Oysters	<i>Saccostrea glomerata</i>	Dredge Area 2
Elephant Snail	<i>Scutus antipodes</i>	Intertidal – eastern breakwater
False Limpet	<i>Siphonaria denticulata</i>	Dredge Area 2
Snakeskin Chiton	<i>Sypharochiton pelliserpentis</i>	Dredge Area 1, Intertidal – eastern breakwater
Mulberry Whelk	<i>Tenguella marginalba</i>	Dredge Area 1, Dredge Area 2, Intertidal – eastern breakwater

Turbo Shell	<i>Turbo undulatus</i>	Dredge Area 1
Marine turtles		
Green Turtle	<i>Chelonia mydas</i>	Subtidal habitat
Marine mammals		
Common Dolphin	<i>Delphinus delphis</i>	Subtidal habitat
Fish, Sharks and Rays		
Yellowfin Bream	<i>Acanthopagrus australis</i>	Subtidal habitat
Eastern Blue Grouper	<i>Achoerodus viridis</i>	Subtidal habitat
Rock Cale	<i>Aplodactylus lophodon</i>	Subtidal habitat
Narrow-lined pufferfish	<i>Arothron manilensis</i>	Subtidal habitat
Big Eye Trevally	<i>Caranx sexfasciatus</i>	Subtidal habitat
Red Morwong	<i>Cheilodactylus fuscus</i>	Subtidal habitat
Luderick	<i>Girella tricuspidate</i>	Subtidal habitat
Moses Perch	<i>Lutjanus ussellii</i>	Subtidal habitat
Diamond Fish	<i>Monodactylus argenteus</i>	Subtidal habitat
Sea Mullet	<i>Mugil cephalus</i>	Subtidal habitat
Inscribed Wrasse	<i>Notolabrus inscriptus</i>	Subtidal habitat
Spotted Wobbegong	<i>Orectolobus maculatus</i>	Subtidal habitat
Common Sydney Octopus	<i>Octopus tetricus</i>	Subtidal habitat
Australian Goatfish	<i>Upeneus australiae</i>	Subtidal habitat
Amberjack	<i>Seriola dumerili</i>	Subtidal habitat
Macroalgae		
Encrusting Coralline Algae	<i>Corallina officinalis</i>	Dredge Area 1, Dredge Area 2
Brown Alga	<i>Cystophora</i> sp.	Rocky reef South Muttonbird Island
Brown Alga	<i>Padina crassa</i>	Rocky reef South Muttonbird Island
Brown Alga	<i>Petalonia binghamiae</i>	Dredge Area 2
Gulfweed	<i>Sargassum linearifolium</i>	Dredge Area 1, Intertidal – eastern breakwater
Sea Lettuce	<i>Ulva</i> sp.	Intertidal – eastern breakwater

Table 7: Mean abundance, mean taxonomic richness and median particle size at each sample site.

Infauna Sample Site	Project Area	Mean Infauna Abundance	Mean Infauna Taxonomic Richness	Median Particle Size (mm)
S01	Dredge Area 2	55	5	0.202
S02	Dredge Area 1	76.2	14.4	0.191
S03	Sand Placement Area (south)	5.25	4.2	0.3955*
S04	Sand Placement Area (north)	9.4	5.6	0.184
S05	Reference (Gallows Beach)	5.8	3.8	0.223
S06	Reference (north Boambee Beach)	4.4	3.6	0.234
I01	Park Beach	1.4	1.2	0.245
I02	Park Beach	0.4	0.4	0.283
I03	North Wall Beach	0.2	0.2	0.375



Figure 4: Habitat map showing benthic habitats within and near to the Study Area

4 Impact Assessment

Dredging activities can have significant impacts on benthic marine organisms, particularly phototrophic macrophytes (e.g. seagrasses) and fauna of limited mobility living in seabed sediment (e.g. infauna such as worms and bivalves) (Fraser *et al.* 2017). Such disturbances may occur through mechanisms such as direct removal for those situated on/in sediments to be dredged, and excessive sedimentation and reduction in light availability as a result of increased mobilisation and suspension of sediments during dredging. Direct and indirect impacts may also occur at the site of sand placement as a result of changed water quality. Dumped sediments in Sand Placement Areas can result in a temporary reduction of water quality as sediments settle, resulting in altered physical chemistry, increased turbidity, reduced water clarity. Where sediments are placed on beaches or intertidal areas, they may become mobile and impact on adjacent habitats.

The Guidelines for Aquatic Ecology in Environmental Impact Assessment identifies that environmental disturbances to aquatic ecology can be categorised in terms of potential physical, chemical and biological effects, which allows for the nature of impacts and their likely magnitude to be assessed (Lincoln Smith 2003). More recently, research on impacts to marine fauna has had increased focus on behavioural impacts as a result of additional sources of disturbance such as underwater noise (Erbe 2012) and light (Tidau 2021). To recognise this, behavioural effects have been added as a fourth category of impacts summarised in Table 8.

Table 8: Identification of potential aquatic impacts from the project.

Impact	Likelihood	Description
Physical		
Removal or modification of Key Fish Habitat	Known	Habitat within the Dredge Areas is predominantly considered Type 3 KFH, comprising of unvegetated soft sediment. Some Type 2 KFH is present along the edges and directly adjacent to the dredge areas, comprising of both natural and artificial rocky reef habitat. The Sand Placement Area is considered Type 1 KFH, within the Solitary Islands Marine Park. Modifications of KFH in Dredge Areas is expected to be temporary and confined to unvegetated Type 3 KFH and within areas that have previously been disturbed or modified. Placement in the Sand Placement Area (Type 1 KFH) will also involve temporary modifications of habitat.
Removal or loss of marine vegetation	Possible	The proposed dredging is confined to unvegetated sediments, with no seagrasses in the vicinity of works, which are most sensitive to dredging disturbances. The Sand Placement Area includes unvegetated subtidal habitat, however, some rocky reef habitat supporting macroalgal stands are in proximity to the Sand Placement Area. Macroalgae is expected to experience short-term, temporary disturbances from increased sedimentation and turbidity, however, losses are generally considered unlikely. Some accumulation of sediment may occur on rocky reef structures at Macauley's Headland following larger subtidal deposits of sand, which may result in some localised smothering of macroalgal stands.
Removal or loss of threatened ecological community or population	None	Threatened aquatic ecological communities or populations within Coffs Harbour are confined to Coastal Saltmarsh, which does not occur in the Study Area or is mapped to occur on adjacent shorelines. Coastal Saltmarsh in the vicinity is expected to be confined to areas upstream of Orlando Street bridge.

Removal or loss of a threatened or migratory species or its habitat	Possible	A number of threatened species may at times utilise habitat within the Study Area. The Critically Endangered Marine Brown Alga <i>Nereia lophocladia</i> is known to occur on reef on the northern side of the Coffs Harbour northern breakwater. While the proposed Dredge Areas do not include known habitat of the species, dredging inside of Coffs Harbour may have potential to impact on <i>N. lophocladia</i> should it establish inside the Harbour in the future. Migratory seabirds are known to utilise Muttonbird Island and the surrounding waters, including the Wedge-tailed Shearwater which nests on the island. The presence of dredging and sand placement equipment and vehicles has potential to increase the likelihood of injury and/or mortality to already injured and exhausted seabirds that often float on the surface or wash up on shore, upon returning to the island at the end of migration.
Disturbance to a threatened aquatic species or their habitat	Possible	Known habitat for <i>N. lophocladia</i> in areas in close proximity to the Sand Placement Area may experience some minor pulse disturbances of reduced water quality following sand placement. Various threatened marine mammals, including pinnipeds and cetaceans, sharks, fish and turtles are expected to utilise habitat within or in close proximity to the Study Area at times. Dredging and sand placement works may result in some reduction in habitat quality for these species, however, considering the vast expanses of habitat these species inhabit it is expected that disturbances will deter animals to other locations in the vicinity. Threatened and migratory shorebirds may also utilise habitat associated with Muttonbird and Little Muttonbird Island for nesting and roosting, whilst the waters surrounding these islands in the Study Area likely provide important foraging grounds. Some disturbances to this foraging habitat may occur during dredging and subtidal sand placement works, predominantly as a result of decreased water quality. Placement activities may temporarily disturb foraging activities for these species, including likely modifications to foraging behaviour.
Physical disturbance to marine fauna and flora	Known	The dredging will result in some physical disturbance to marine flora and fauna, particularly epibenthic organisms (sessile invertebrates) and benthic infauna associated with soft sediments. This disturbance will include removal of infauna amongst the sediments to be removed or smothering of infauna amongst surface sediments in the Sand Placement Area. The more motile fauna such as benthic fish and decapods may either disperse away from the disturbance as an avoidance response to sudden increases in turbidity, or alternatively be attracted to the turbid plume to opportunistically feed on elutriated infauna or other dispersing prey items. Other marine species in the vicinity, such as marine mammals, turtles, fish and sharks, may be deterred from the immediate area during the operation of the dredge.
Barriers to fish passage	None	The works are not expected to result in any temporary or permanent barriers to fish passage.
Injury caused by ingestion of, or entanglement in, harmful marine debris	Possible	Materials used or rubbish generated during the works that are not contained or disposed of correctly have potential to find their way into the water and be ingested by marine fauna.
Potential for increased risk of vessel strike for marine fauna	Possible	The works are generally not expected to result in any notable or sustained increase in vessel movements in the Study Area, considering works will be conducted adjacent to the boat ramp and

		marina. However, some air breathing marine fauna, especially marine turtles are vulnerable to vessel strike. Vessel strike can result in series injuries and in many cases can be fatal for marine fauna that pose a risk to marine fauna that occupy waters at or near the surface. Additionally, if dredging works were to coincide with migratory marine birds returning to Muttonbird and Little Muttonbird Island, where injured or exhausted birds float on the water surface, dredging vessels may increase the risk of further injury or mortality outside of natural causes.
Generation of noise resulting in injury	Unlikely	The level of underwater noise expected to be generated via the dredging machinery will be well below levels considered potentially harmful to marine fauna. Given this, the potential to produce levels of underwater noise capable of injury to marine fauna is negligible. Disturbances from underwater noise are expected to be limited to behavioural avoidance of the area.
Chemical		
Changes in water quality	Likely	The maintenance dredging is expected to result in very localised and short-term elevated levels of turbidity in the vicinity (wider Study Area) of active dredging works and sand placement activities. Given the location on the open coast, coastal tidal flows in this area and nature of the material (clean marine sands) suspended sediments are expected to dissipate quickly.
Mobilisation of contaminants	Possible	Dredging works will disturb sediments from the navigation channels to the Coffs Harbour Boat Ramp and Marina, which will result in the mobilisation of sediments. Sediments in both channels are dominated by natural marine sands with some decaying organic marine flora. Potential Acid Sulfate Soils (PASS) have been identified within the Harbour, however, monitoring will be undertaken to avoid and/or prepare and implement mitigation strategies (TfNSW, In Prep).
Nutrification	Unlikely	The sediments present in the proposed Dredging Areas are primarily comprised of natural marine sands, with some decaying organic matter (TfNSW In Prep). Decaying organic matter has potential to release nutrients and reduce oxygen levels, however, unless excessive amounts of wrack are accumulating in areas to be dredged and sediment transported, nutrification is unlikely.
Biological		
Invasion or spread of non-native or invasive species	Possible	Equipment brought to the site during construction works has potential to introduce non-native or invasive species from other areas.
Introduction of disease or pathogens	Unlikely	No known diseases or pathogens have been identified in the Study Area that pose an environmental issue for marine fauna and flora that would be exacerbated by the proposed works.
Behavioural		
Generation of underwater or construction noise with potential for behaviour affect	Possible	The level of underwater noise expected to be generated via the dredging machinery has minimal potential to impact on the behaviour of marine fauna (marine mammals, turtles, fish and sharks) present inside of Coffs Harbour at the time of works. Fauna would be expected to disperse from the source of disturbance.
Generation of underwater or construction noise with potential for physiological affect	Unlikely	Vessel movements, dredge and pump operation and shoreline staging of machinery may produce some construction noise. However, it is expected to be negligible in comparison with the existing vessel and recreational boating that occur at this location and is not expected to be of a magnitude for physiological impacts to marine fauna.

Generation of artificial lighting with potential for behaviour effect	Possible	Vessel operations, shoreline staging and laydown areas may include temporary artificial lighting. Shearwater fledglings taking first flight from Muttonbird or Little Muttonbird Island may be attracted to artificial lights, causing disturbances to migration if works coincide with fledglings leaving the nest and are utilised near dusk.

4.1 Sediment and Water Quality

Dredging mobilises sediments into the water column as sediments are removed from the seabed. Increases in suspended sediments in the water column can alter the physical chemistry of the water, increase turbidity and reduce available light to the seabed, eventually settling on the seabed. No seagrasses occur within the Study Area, with vegetation confined to marine macroalgae. Dredging is expected to include the use of an ocean-going Trailing Suction Hopper Dredge (TSHD) or Split Hopper Barge (SHB) to remove material from Dredge Areas and transport material to the nearshore Placement Area A, while a Cutter Suction Dredge will be used to remove and transport sediment via a land-based pipeline. Dredging events utilising the TSHD will likely result in increased sedimentation to surrounding habitats as a result of sediment pluming during the placement of sand. Sediment plumes in Coffs Harbour and in the vicinity of Placement Area A as a result of dredging and sand placement works are expected to be short-term and regularly dissipate with the coastal ocean currents for the duration of the works.

Current and sediment dynamics along the Coffs Coast include a northward littoral drift with approximately 150,000 m³ per year of sediment transported northward around Corambirra Point, with wave focusing behind South Coff Island and the high energy of the wave breaking zone transporting 100,000 m³ per year into Coffs Harbour (RHDHV 2024 In prep). Sediment transport and dynamics at Coffs Harbour have been altered since the construction of the Harbour and breakwaters, with much of the northerly littoral transport of sediment coming from the south intercepted by harbour structures. This results in significant accretion on the southern side and inside of the Harbour, with an estimated sediment transport of 100,000 m³ per year into the main Harbour, including approximately 30,000 m³ transported along the southern shore, 10,000 m³ along the northern shore and 60,000 m³ towards the middle and onshore, per year (RHDHV 2024 In prep), that results in significant shoaling nearshore and at the entrances of the boat ramp and marina. Additionally, as northern transport is disrupted by Muttonbird Island, Park Beach experiences a sediment deficit and is estimated to recede at up to 2 m per year along the southern end and up to 0.5 m per year on the northern end (MHL 2020). With consideration of the significant sediment accretion that currently occurs inside of Coffs Harbour, pulse increases in sedimentation and turbidity associated with dredging is not expected to result in ecologically significant disturbances. Nearshore sand placement events at Park Beach may mitigate some erosive impacts of the altered transport pathways by providing large sediment loads that would otherwise bypass these areas. Sand placement in this area may assist in reducing the magnitude of long-term beach recession along Park Beach.

The sediments in the proposed Dredge Areas comprise of marine sands, however, Potential Acid Sulfate Soils (PASS) have been identified to occur within areas of the Harbour. Sediment sampling is being undertaken to determine the risk of Actual Acid Sulfate Soils (AASS) and contaminants and to inform appropriate mitigation and management measures (TfNSW, In Prep). There are some ecological risks associated with dredging of PASS and ASS if not properly managed. When ASS is exposed to oxygen, chemical reactions can result in the formation of sulfuric acid, iron and aluminium. Sulfuric acid typically possesses a pH around 4 but can be as low as 2. Exposure in the environment can reduce habitat quality and result in physiological impacts to marine life. Risks associated with ASS are from sand placement activities are expected to be minimal as sediments transported to the nearshore Sand Placement Area will

remain underwater. Any sediment dredged from an area that has been marked as PASS should not be reused for placement as part of nourishment works without proper treatment and assessment.

Unplanned spills and discharges may lead to detrimental impacts on water quality, habitats and associated flora and fauna. Unplanned spills may include hydrocarbon-based products such as diesel fuel and lubricants from water-based machinery, sand slurry from burst pipes and spills of other potential environmental contaminants required on site during the project. Accidental spills pose a significant risk to both fauna and the wider Solitary Islands Marine Park. Where possible the use of booster pumps and floating machinery should be avoided or minimised to reduce these risks, while suitable measures to mitigate residual risk of unplanned spills will be required. Discharges may include operational wastewater and ballast water from vessels during dredging activities, as well as discharge from onshore dewatering. These works will require suitable measures to avoid, minimise and mitigate the risk of unplanned spills and discharges during project works and to ensure these risks are within acceptable limits for works within the Marine Park.

Impacts from water quality on the ecological receptors relevant to this project are discussed further below within the relevant sections.

4.2 Estuarine Flora and Fauna

4.2.1 Macroalgae

Subtidal habitat within the Study Area predominantly consisted of unvegetated, clean marine sands or silts with shell debris and occasional gravel. Macroalgae was predominantly confined to artificial hard substrata in areas adjacent to the Dredge and Placement Areas, with the only macroalgae within the Dredge Area associated with the rocky reef bommie along the northern boundary of Dredge Area 2. The bommie supported low-density stands of the common marine macroalgae *Sargassum* and *C. officinalis*.

Dredging activities may have some potential to temporarily disturb adjacent assemblages due to a reduction in water quality (increased turbidity) caused by mobilisation of sediments. This is likely to include macroalgae inhabiting hard substrata directly adjacent to Dredge Areas and macroalgae inhabiting rocky reef habitat in vicinity of the nearshore Sand Placement Area. Sedimentation generated from dredging within the Harbour is expected to be directed towards the shore by current, whilst sediments placed offshore of Park Beach will likely be transported towards shore and northward, by the northward littoral drift. Disturbances are typically expected to be minor, short-term and very localised with sedimentation expected to dissipate quickly with coastal tide and current. Additionally, macroalgae are less sensitive to light requirements, typically more resilient to disturbance, and recolonise areas relatively quickly (Sze 1998).

The Critically Endangered Marine Brown Alga *Nereia lophocladia* is known to occur in the Study Area. The species occurs on hard substrate at the sand and rock interface, with habitats supporting known occurrences including dynamic areas of reef, rockpools or submerged rocky outcrops. The species has been known to occur on the northern side of Muttonbird Island, along the northern side of Coffs Harbour Marina, at Sawtell and Woolgoolga Headland (NSW DPI 2018), as well as Little Muttonbird Island, Charlesworth Bay, Diggers Camp and Minnie Water (Mamo et. al., 2021). Targeted surveys in 2015 identified the species on the northwest side of Muttonbird Island, the toe of the northern Coffs Harbour breakwater and Boambee Headland at Sawtell (Yee et. al., 2017). Targeted monitoring surveys in 2019 did not find *N. lophocladia* along the eastern side of the Coffs Harbour Boat Ramp breakwater or on the southern side of the Harbour (Kelaher and Mamo 2019), whilst further surveys in 2020 did not find the species to occur on the small reef habitat to the north of the boat ramp harbour (Kelaher 2020). Targeted

surveys in October 2023 identified the species around the bommie at the southern end of North Wall Beach to the north of the Coffs Harbour northern breakwater, however, it was not present at Little Muttonbird Island, Muttonbird Island or Macauley's Headland (H2O Consulting Group 2024a).

Sand movement following storms or coastal development has been identified to threaten the species (NSW DPI 2018), which may include increased sedimentation from dredging works; however, scouring driven by sand movement may also benefit the species by removing marine growth and providing opportunities for *Nereia* to establish (pers. comm. Nick Yee 2023). Considering the sediment transport pathways and loads, it is unlikely that suitable habitat would be present for the species inside of Coffs Harbour. An estimated 100,000 m³ of sediment is transported into Coffs Harbour annually, including approximately 30,000 m³ along the southern shore, 10,000 m³ along the northern shore and 60,000 m³ towards the middle and onshore, per year (RHDHV 2024 In prep).. It is likely that natural sediment accretion on sand-rock interfaces would smother the species in these locations in vicinity of the proposed Dredge Areas. Based on the current known distribution of *N. lophocladia* in the area, which is restricted to the sand-rock interface along reef at the southern end of North Wall Beach (on the northern side of the Coffs Harbour breakwater), maintenance dredging in Dredge Areas 1 and 2 is unlikely to result in impacts to the species. However, future dredging campaigns may have potential to impact on the species if changes in distribution occurs where it may establish inside Coffs Harbour, potentially along the southern side of Muttonbird Island, where some natural fringing rock and reef occurs.

Subtidal sand placement is expected to result in temporary pulse disturbances following sand placement, including increased sedimentation and turbidity in the vicinity. Little Muttonbird Island, approximately 195 m to the south of the proposed Sand Placement Area includes extensive fringing reef habitat, whilst seabed bathymetry also indicates extensive rocky reef formations east of the island and toward Muttonbird Island and extending east from Macauley's Headland to the north of the Study Area. Previous reef monitoring studies recorded macroalgae communities in these locations to be dominated by brown macroalgae such as Kelp (*Ecklonia radiata*) and Gulfweed (*Sargassum* sp.), and red macroalgae such as *Amphiroa anceps* and *Delisea pulchra* (H2O Consulting Group 2024a). It is possible that macroalgae in the vicinity of the Sand Placement Area and macroalgae communities inhabiting rocky reef habitat to the north of Park Beach associated with Macauley's Headland may experience some smothering depending on the volume of sediment placed, which may result in some loss of some smaller macroalgae stands. It is expected that placement of larger volumes of sand would be reflective of sediment transport during a storm event, which has previously been modelled to result in cross shore transport of between 70,000 to 300,000 m³ (MHL 2015). Previous studies have identified *N. lophocladia* to occur at Little Muttonbird Island (Mamo et. al., 2021), whilst recent monitoring surveys identified highly suitable habitat present on the north-western and south-western sides of the island (H2O Consulting Group 2024a).

Potential impacts to the *Nereia lophocladia* over the 10 year period were considered further through a 7-Part Test (Appendix 5).

4.2.2 Marine Birds, Shorebirds and Waders

Marine birds, shorebirds and waders may regularly use habitat and resources within the Study Area. This may include use of aerial and subtidal habitats for foraging or rocky intertidal and sandy shoreline areas for foraging, resting and roosting. Such species that utilise these habitats may include shearwaters, gulls, terns, cormorants and oystercatchers, which are common in coastal areas along the NSW coast. The proposed dredging is confined to subtidal areas within Coffs Harbour, however, will be in close proximity to rocky intertidal areas associated with the marina and boat ramp breakwaters and natural rocky intertidal habitat at the western extent of Muttonbird Island. Impacts on marine birds, shorebirds and waders in the

Study Area that may result from dredging and sand placement activities are expected to predominantly include short-term disturbances to habitat quality relating to reduced water quality, shifts in prey abundances, construction noise and machinery disturbance and modification of some existing shoreline/foreshore foraging and roosting habitats. These impacts are discussed in detail below in relation to marine birds and shorebirds.

A wide diversity of marine birds that forage along the NSW coastline are likely to also forage in waters within or in close proximity to the Study Area at times. At Coffs Harbour, these species are known to include various shearwater, petrel and albatross species, which spend the majority of their time in coastal areas foraging aerially over very large areas of water along the coastline and at sea (SEWPAC 2012). Marine birds that may use resources in the Study Area include several species of migratory and threatened birds, with those considered to have a moderate or higher likelihood of occurrence including the Wedge-tailed Shearwater (*Ardenna pacifica*) protected under the Japan Australia Migratory Bird Agreement (JAMBA) and the Short-tailed Shearwater (*A. tenuirostris*) protected under China Australia Migratory Bird Agreement (CAMBA), JAMBA and Republic of Korea Australia Migratory Bird Agreement (ROKAMBA). *Ardenna pacifica* are known to breed in the thousands on the upper parts of Muttonbird Island and to a lesser extent on Little Muttonbird Island. The timing of the species breeding season has been recorded to remain constant, with adult birds returning to the islands from their winter migration in August and egg laying typically beginning in late November. Most adult birds leave the islands in late March or early April, whilst fledgling chicks begin to emerge and leave the islands in late April/early May (NPWS 2009). *A. tenuirostris* typically breed in Tasmania and South Australia, with some breeding colonies also occurring in southeast NSW, however, habitat associated with Muttonbird Island is likely predominantly confined to foraging habitat along the species migratory routes. The islands have also been previously recorded to support nesting of Vulnerable Black-winged Petrels (*Pterodroma nigripennis*), which are also a migratory species, and provide foraging habitat for a number of migratory marine birds. The proposed dredging activities, specifically involving the use of dredge vessels and equipment on the water, have potential to increase the likelihood of injury and/or mortality to migratory birds in the vicinity of Muttonbird and Little Muttonbird Islands if conducted during the end of migration period. Shearwaters have naturally high mortality rates upon return from migratory journeys due to exhaustion and starvation and are often found dying or dead along beaches or floating on the surface (NSW Environment and Heritage 2023). Already incapacitated birds will likely be unable to disperse from the path of dredge vessels or equipment and may be subject to further injury or mortality that otherwise would not have occurred. Works during April/May may also have potential to injure fledglings that have had unsuccessful flights and have landed nearby. Common landing spots include Coffs Harbour Marina, Harbour Drive, Park Beach and the Deep Sea Fishing Club (NSW DPIE 2015). Additionally, *A. pacifica* use the moonlight for navigation and will typically fly in the direction of the brightest horizon, with documented disturbances from artificial land-based or vessel light sources causing birds to fly in the wrong direction, particularly as fledglings first leave (NPWS 2009). Any artificial lighting from work vessels or sites, particularly around dusk, has potential to contribute to these disturbances.

Other marine birds that may utilise foraging habitat in the Study Area include the White-bellied Sea Eagle (*Haliaeetus leucogaster*), Eastern Osprey (*Pandion cristatus*), White Throated Needletail (*Hirundapus caudacutus*) and other raptors (Robinson 2006). These marine birds and raptors typically forage over the water and rely on detecting prey aerially from above (Billerman *et. al.*, 2020, DAWE 2020). There is potential that reduced prey detection success from waters with elevated levels of turbidity may impact on some species that forage aerially (Lunt and Smee 2015). Changes to prey availability may also occur, which may be detrimental to the species where prey is deterred from dredging works, or beneficial to the species as prey are attracted to smaller biota elutriated from sediment plumes. The potential for detrimental

impacts to the water quality from the proposed dredging operations is considered to be generally minor in spatial extent considering the vast areas of coastal waters these species utilise for foraging. Any potential impacts are also likely to be very short-term, given the tidal exchange of the area and the clean marine sand substrate, allowing the substrate to settle and disperse quickly. Given the above, it is highly unlikely that any disturbance to aerial foraging for these species would be of ecological significance, thus further assessment is not required.

Threatened and migratory shorebirds and waders with a moderate or higher likelihood of occurrence in the Study Area include the Pied Oystercatcher (*Haematopus longirostris*), Sooty Oystercatcher (*H. fuliginosus*), Little Tern (*Sterna albifrons*) and Crested Tern (*Thalasseus bergii*), whilst other species such as godwits and sand plovers may utilise foraging or roosting habitat in the Study Area at times. A majority of shorebirds that frequent the locality do not breed locally nor on the Australian mainland. The Study Area provides only marginal nesting habitat for those species that do breed locally, including *H. longirostris* and *S. albifrons* which typically utilise sand or shingle above the high-water mark on beaches and estuaries, usually associated with dunes, wrack or vegetation (NSW Scientific Committee 2008). A regionally significant breeding site for *S. albifrons* is located 10 km south of Coffs Harbour at the sand spit of Bongil Bongil National Park, Sawtell, where nesting of *H. longirostris* is also occasionally observed (NSW Environment and Heritage 2022). Any potential nesting habitat within the Study Area would likely be limited to upper dunes on Park Beach or Jetty Beach, however, it is expected that birds would naturally be deterred from these locations due to the high amount of human activity. It is likely that shorebirds breeding in the direct locality would utilise sandbar and wetland habitat of Coffs Creek upstream of Orlando Street bridge. There still remains some potential that dredging and/or sand placement activities may result in disturbance to nesting shorebirds in the vicinity, however, both dredging and sand placement works are expected to be confined to subtidal habitats. Disturbance may also occur to other species utilising habitats in the rocky intertidal areas directly adjacent to Dredge Areas for foraging or roosting from construction noise or presence of workers or equipment. The placement of material in the Sand Placement Area may also attract birds to the area if material contains smaller prey items, which may encourage an increased presence in areas that are not usually preferred by these species, thereby increasing potential for interaction with work vehicles or equipment.

Considering the above, potential impacts to the Pied Oystercatcher, Sooty Oystercatcher, Wedge-tailed Shearwater, Short-tailed Shearwater, Little Tern and Crested were considered further through 5-Part Tests and Significant Impact Criteria (Appendix 5).

4.2.3 Marine Mammals

The proposed maintenance dredging will be confined to shallow subtidal areas adjacent to the Coffs Harbour Marina and Boat Ramp, whilst sand placement will occur at the subtidal, nearshore Sand Placement Area at Park Beach.

Smaller marine mammals such as Common Dolphins (*Delphinus delphis*), Bottlenose Dolphins (*Tursiops truncatus*), Dusky Dolphins (*Lagenorhynchus obscurus*) live in the Solitary Islands Marine Park throughout the year (NSW DPI n.d.) and are likely to occur on occasions as part of transient movement through the locality for opportunistic foraging, with *D. delphis* sighted during surveys. The Australian and New Zealand Fur-seals (*Arctocephalus pusillus* and *forsteri*) may also transiently use habitat in the vicinity of the Study Area for opportunistic foraging or refuge, however the NSW mid-north coast lays near the northern extent of the typical distribution of *A. pusillus*. When present, fur-seals may utilise areas of rocky shoreline associated with breakwaters, Muttonbird Island or Little Muttonbird Island to haul-out. Dredging works may disturb fur-seals using adjacent rocky shoreline associated with breakwaters inside of Coffs Harbour or the

southern shoreline of Muttonbird Island. The mobilisation of sediments from dredging and nearshore sand placement may also reduce foraging habitat value for these species, either by deterring prey or reducing success in detecting prey. Given these marine mammals forage over very large expansive areas of coastal and estuarine waters, when considered against the relatively small extent of the Study Area the potential for ecologically significant impacts on foraging habitat used by these species as a result of the proposed works is minimal and further assessment is not required.

These species, however, may experience some short-term reduction in habitat quality as a result of underwater noise during dredging works if present inside of Coffs Harbour, which will likely result in the avoidance of the area. Physiological impacts of underwater noise are typically considered to be auditory injuries, which can result in a reduction in the animal's hearing sensitivity, or an increase in hearing threshold. This may result in a temporary threshold shift (TTS) or a permanent threshold shift (PTS) to animals hearing (SA DIT 2023). Trailer Suction Hopper Dredges (TSHD) typically produce a Sound Exposure Level (SEL) of 189 dB re 1 $\mu\text{Pa}^2 \text{ m}^2 \text{ s}$ at 1 m, whilst Cutter Suction Dredge (CSD) produce between 157-186 dB re 1 $\mu\text{Pa}^2 \text{ m}^2 \text{ s}$ dependent on size (SA DIT 2023). While there are no quantitative national guidelines on acceptable exposure levels of marine mammals to underwater noise, the South Australian Government's Underwater Piling Noise Guidelines (SA DIT 2023), which are based on research by Southall et al (2007) on behavioural and physiological impacts, are the accepted guide on the levels. As functional hearing groups, dolphins are categorised as High-frequency cetaceans, whilst *A. pusillus* and *A. forsteri* are categorised as 'Other Carnivores in the water', at a lower frequency. The underwater noise exposure criteria for behavioural impacts to dolphins is a Sound Pressure Level (SPL) of 120 dB rms for dredging, whilst exposure to SEL_{24 hour} 179 dB from dredging is expected to result in TTS and exposure to SEL_{24 hour} 198 dB is expected to result in PTS (SA DIT 2023). For pinnipeds, behavioural impacts are expected at SPL 120 dB rms, with TTS expected at SEL_{24 hour} 199 dB and PTS expected at SEL_{24 hour} 219 dB. Considering the above, some behavioural impacts may possibly occur to small marine mammals within Coffs Harbour as a result of dredging and as a result affected mammals may avoid or disperse from the area. Dredging has potential for physiological impacts on dolphins in close proximity if continuous over 24 hours, however, dredging will only be conducted during daylight working hours, whilst individuals would also be expected to disperse from the disturbance before physiological impacts would occur.

It is highly unlikely that larger marine mammals such as cetaceans (whales) would enter Coffs Harbour, particularly around these shallow areas associated with Dredge Areas, however, they may transiently pass by the open coastline during migration seasons. Baleen whales are low-frequency cetaceans, with similar underwater noise criteria to toothed whales including a criteria for behavioural impacts at SPL 120 dB rms, expected TTS at SEL_{24 hour} 179 dB and expected PTS at SEL_{24 hour} 199 dB (SA DIT 2023). Thus, similarly to dolphins, baleen whales in close proximity to dredging would be expected to show behavioural avoidance of the area with potential for temporary physiological effects only if exposed to noise in close proximity for 24 hours. Given the above and considering the existing daily vessel operations within Coffs Harbour from both the marina and boat ramp, the production of temporary underwater noise as a result of works is not expected to significantly increase compared to existing conditions to such a degree that would significantly impact on marine mammals. Marine mammals in the vicinity may already avoid the general area if disturbed by the ambient underwater noise from vessels inside Coffs Harbour. The works are not considered likely to result in any significant short-term or sustained increases in vessel movements that could potentially pose an increased risk of vessel strike for any marine mammals that may transiently occur in the Study Area during dredging or sand placement operations. The movement of the dredge vessel along the ocean transport route to the Sand Placement Area holds some low risk of potential collision with a marine mammal, however, risk can be adequately managed through additional controls for marine megafauna.

4.2.4 Marine Reptiles

The Study Area may provide habitat for some marine reptiles at times. These species include the Green Turtle (*Chelonia mydas*), the Loggerhead Turtle (*Caretta caretta*) and the Hawksbill Turtle (*Eretmochelys imbricata*), which are regularly recorded within the Solitary Islands Marine Park, with *C. mydas* sighted during surveys. Turtle nesting typically occurs in more tropical waters of northern Australia, however, the marine environment around the Marine Park is an area of tropical and temperate mixing, allowing a variety of tropical and sub-tropical species to live amongst temperate species. Numerous records of Green and Loggerhead Turtle nesting events have been recorded along the Coffs Coast in the past five years, with nests as far south as the Central Coast. These have included nesting of a Green Turtle nest at Boambee Beach, immediately to the south of Coffs Harbour.

Potential habitat for marine turtles within and in vicinity of the Study Area includes sandy and rocky shorelines and subtidal rocky reef. Rocky reef habitat associated with the natural rock reef of Muttonbird Island and surrounding rocky reef outcrops, as well as rock armouring comprising the numerous breakwaters in Coffs Harbour support common marine macroalgae species including *E. radiata* and *Sargassum* sp. and various invertebrates, which provide foraging value for turtles. Green turtles are mostly herbivorous as adults feeding mainly on macroalgae and seagrasses, although may also feed on jellyfish, whilst Hawksbill Turtles are omnivorous and feed on macroalgae, seagrass, soft corals and shellfish, and Loggerhead Turtles (adults) are carnivorous and feed on jellyfish, crustaceans and sea urchins (GBRMPA 2024). It is likely that these habitats within and adjacent to the Study Area provide suitable foraging at times. Marine turtles may experience short-term disturbances to foraging habitat quality when dredging or nearshore sand placement is occurring, as a result of increased sedimentation and turbidity in the locality. As the Dredge Areas and the Sand Placement Area are exposed to ocean coastal processes, it is expected that turbidity would dissipate quickly. These changes to foraging habitats are considered to be of minimal ecological significance to foraging prospects for species of marine turtles.

Sandy shoreline habitat in and adjacent to the Study Area on Park Beach and Jetty Beach, provide marginal nesting habitat for Green and Loggerhead Turtles. Considering the high amount of human activity around Jetty Beach and the marina, it is highly unlikely that turtles would choose habitat in this area for nesting. Whilst Park Beach is also exposed to a high level of human activity, the longer and more open beach may provide potential nesting habitat for turtles in the region. As the proposed Sand Placement Area is confined to subtidal areas off Park Beach, physical onshore impacts to nests or nesting turtles from sand placement is not expected, however, the presence of dredging vessels and equipment may disturb some nesting turtles in the area. Climate change has been identified as a threat to marine turtles, with expected impacts at all life stages and across their entire ranges. Relevant to this assessment, impacts from climate change resulting in changes to water temperature and sand temperature may affect species range and habitat suitability, particularly for nesting sites. Increasing numbers of Green and Loggerhead Turtle nests are being recorded in NSW, potentially in response to climate change impacts (Commonwealth of Australia 2017). Thus, following current trends the likelihood of marine turtle nesting in or in close proximity to the Study Area over the next decade increases with time. Considering that a Green Turtle nesting event has been recorded at Boambee Beach, just south of the Study Area, and occurrences of both Green and Loggerhead Turtles are prevalent along the Coffs Coast, a 5-Part Test and Significant Impact Criteria was conducted for these species to further assess potential impacts on nesting habitat (Appendix 5).

The proposed maintenance dredging works are not expected to generate any ecologically significant levels of underwater noise that has potential for detrimental physiological or behavioural responses by marine turtles should they be present in the vicinity. Marine turtles are not considered as sensitive to underwater

noise as some fish and marine mammals, however there is anecdotal evidence that marine turtles may still experience acoustic annoyance and mild tactile detection or physical discomfort from underwater noise (Viada et al 2008), with mortality possibly occurring at 210 dB SEL_{cum} (Popper and Hawkins 2018). Trailer Suction Hopper Dredges typically produce 189 dB re 1 $\mu\text{Pa}^2 \text{m}^2 \text{s}$ at 1 m, whilst Cutter Suction Dredges produce between 157-186 dB re 1 $\mu\text{Pa}^2 \text{m}^2 \text{s}$ dependent on size (SA DIT 2023).

The works are not considered likely to result in any short-term or sustained increases in vessel movements that could potentially pose an increased risk of vessel strike for any marine turtles that may transiently occur in the Study Area during dredging operations. Dredge Areas are directly adjacent to the Coffs Harbour Marina and Coffs Harbour Boat Ramp, which facilitate a moderate amount of vessel movements daily.

4.2.5 Fish, Sharks and Rays

The proposed maintenance dredging involves both dredging works in shallow subtidal areas and sand placement in subtidal habitat nearshore to Park Beach. Given the relatively slow forward progress of dredging vessels during operations, it is expected that most fish, sharks and rays in the path of the dredge vessel and machinery would have sufficient levels of alertness and mobility to evade disturbances. Direct detrimental impacts are likely to be confined to smaller, less motile benthic or epibenthic species, which may be disturbed by dredging or by subtidal sand placement. Some short-term disturbances may occur to fish, sharks or rays in close proximity to dredging as a result of underwater noise, however, the works are not expected to result in levels of underwater noise that would cause injury or mortality to these organisms. As previously stated, TSHD typically produce 189 dB at 1 m and CSD produce between 157-186 dB dependent on size (SA DIT 2023). Interim guidelines developed for fish identify triggers for TTS at >186 dB SEL_{cum}, recoverable injury at 203 dB SEL_{cum} and mortality at 207 dB SEL_{cum}, while for sharks and rays these are TTS at >186 dB SEL_{cum}, recoverable injury at 216 dB SEL_{cum} and mortality at 219 dB SEL_{cum} (Popper and Hawkins 2018).

Impacts from the proposed maintenance dredging in Coffs Harbour are expected to be predominantly indirect on fish, sharks and rays, as a result of pulse disturbances to habitat and modifications of benthic habitat. Dredging and sand placement in subtidal areas is expected to result in the mobilisation of sediments and the creation of sediment plumes, with expected pulse increases in turbidity surrounding works areas and sedimentation of adjacent habitats. These habitat disturbances may reduce habitat quality for larger, more pelagic species of fish, sharks and rays, as well as their prey, during works as a result of reduced water quality, underwater noise and potential dispersal of prey species from the immediate area. Species disturbed by temporary decreases in habitat quality will likely move to adjacent areas for the duration of works. Given the Dredge Areas and Sand Placement Area provide direct connectivity to expansive other areas of subtidal habitat, these impacts are not expected to have ecologically significant impacts. It is also possible that the disturbed seabed immediately behind the operating dredge machinery and associated sediment plume will attract many of these species due to the expected elutriation of substantial amounts of benthic infauna prey items into the water column.

Various other threatened and/or migratory species of larger predatory fish, sharks and rays may transiently occur in the waters of the Study Area. The Critically Endangered Grey Nurse Shark (*Carcharias taurus*) occurs in the locality, with known aggregation sites in the Solitary Islands Marine Park, however, these sites are confined to the North and South Solitary Islands (NSW DPI 2016), with South Solitary Island approximately 15 km northeast of the Study Area. Whilst known aggregation sites do not occur within the Study Area, some individuals may transiently utilise rocky reef habitat throughout or adjacent to the Study Area for foraging efforts, predominantly at night. Given that dredging operations will be confined to subtidal

habitats close to shore, the marina and the boat ramp, and the species typically occupies deeper waters beyond the surf zone (NSW DPI 2016) direct impacts from maintenance dredging on *C. taurus* or their habitat are considered unlikely. The species may experience some temporary reduced foraging habitat following any sand dumping nearshore Park Beach as sand settles. In addition to the above, habitat disturbances may reduce habitat quality for larger, more pelagic species of fish, sharks and rays, as well as their prey, during works. It is also likely that some larger, transient predatory species, such as the endangered White Shark (*C. carcharias*), may utilise habitat within the harbour at times. Habitat quality for these large predators may be reduced via lower water quality, fewer prey species and temporary underwater noise. Any impacts on water quality are expected to be very minimal and localised and would not be expected to impact large pelagic species such as the White Shark.

Rocky reef habitat associated with Muttonbird Island, Little Muttonbird Island and armouring breakwaters throughout Coffs Harbour may provide suitable habitat for the Vulnerable Black Rockcod (*Epinephelus daemeli*), which utilises deeper shoreline areas along rocky drop-offs where ledges, overhangs and caves occur (NSW DPI 2012b). The small reef bommie adjacent to the Coffs Harbour Boat Ramp may also provide some habitat value for the species at times. Impacts to the species from proposed maintenance dredging is expected to be limited to indirect disturbances as a result of reduced habitat quality from turbidity and sedimentation associated with works. However, further assessment has been undertaken to assess potential impacts on this species (Appendix 5).

Whilst most fish, shark or ray species in Coffs Harbour or in the vicinity of Placement Area A will experience pulse events of indirect disturbances with each dredging and/or placement campaign, sedimentation and turbidity increases are likely to be of minimal ecological significance to these species compared to existing coastal processes. Sediment accretion within Coffs Harbour has been estimated at between 20,000 – 50,000 m³ annually (MHL 2020), with between 4,000 – 6,000 m³ accreting along the northern and southern shorelines each, per year (MHL 2020).

4.2.6 Marine Invertebrates

Infauna assemblages in the Study Area were found to vary between the Dredge Areas, the Sand Placement Area and adjacent habitats. Infauna communities in both Dredge Areas were abundant, with Dredge Area 2 possessing a diverse taxa community. Comparatively, the Sand Placement Area and reference sites to the south possessed a low to moderate abundance and diversity of infauna taxa, whilst intertidal sediments on Park and North Wall Beach were largely depauperate. Communities were typically dominated by polychaetes, amphipods and bivalves. A weak trend was observed where infauna abundance and richness typically decreased with an increase median particle size.

The removal of soft sediment from Dredge Areas 1 and 2 will result in the direct removal and/or physical disturbance of the infaunal invertebrate community inhabiting sediments within the Dredge Areas. These invertebrates are a key component of the benthic ecosystem and of marine food webs, providing a food source for fish, turtles and birds. It is expected that those infauna communities inhabiting sands to be dredged will be lost, removed or displaced.

Additionally, infauna occupying surface sediments in the Sand Placement Area may be smothered or buried during sand placement. Benthic infauna or slower-moving epibenthic fauna inhabiting surface sediments may be smothered and as a result, some fauna may perish where they cannot escape from the sediment being placed. Sand placement also has potential for longer-term impacts on the habitat for invertebrate species by changing the critical habitat requirements in regard to sediment particle size distribution (Marks 2017). Impacts will be lesser where the composition of sediments are most similar to the

existing sediment composition of the placement site. Sediment from the Dredge Areas was found to be relatively similar in particle size distribution to the northern portion of the Sand Placement Area (Appendix 4), whilst sediment is slightly finer than that in the southern portion. As placed sediment will be slightly finer rather than larger in the southern portion of the Placement Area, impacts to the composition of sediments to such an extent that it changes critical habitat requirements for infauna may be of a lesser magnitude. Infauna in intertidal areas on Park Beach may experience some short-term impacts from smothering where large volumes of sediment are redirected from the nearshore Sand Placement Area and deposited along the beach. . However, it is likely that infauna communities along Park Beach, which has been modelled as a receding shoreline, may already be quite deprived. Recent infauna monitoring at a beach with active coastal erosion on the mid NSW coast found no significant differences in infauna abundance or richness between pre and post beach nourishment works, with the highly active sands likely providing unstable habitat for these communities (H2O Consulting Group 2024b). While existing research on recovery of macroinvertebrates following nourishment works is limited, it is predicted that recovery will occur more quickly in subtidal habitats, with those more stable sediments in deeper water likely to recover quicker than shallow areas, where greater disturbance from wave energy occurs. Additionally, the active northward littoral drift along Park Beach at the Sand Placement Area and its location behind the surf zone may distribute placed sediment over a larger area, reducing magnitude of impact in the direct area. While the recovery of intertidal sediments is likely to be slower, lower intertidal areas have been previously found to recover more quickly in comparison with higher areas (Marks 2017). Typically, early stages of recovery may be detectable from weeks to months after sand placement but will depend on seeding potential for these communities, patchiness and volume of nourishment, other disturbances of sediments and the physical properties of the sediment used. Where losses do occur, the recolonisation of the seabed sediment in the newly dredged seabed and Sand Placement Areas will likely begin soon after dredging and recover to pre-dredging diversity and abundance (Dernie *et al.* 2003). Estimates of infauna recovery from previous studies as indicated this to be typically less than 12 months and as little as 1 month from dredging of navigational channels and at Placement Areas (Wilber *et al.* 2007). Thus, the extent and magnitude of any disturbance to or loss of infauna as a result of this proposed maintenance dredging is not expected to occur at any ecologically relevant scale.

Other larger soft sediment invertebrates such as larger gastropods and crustaceans, sea cucumbers, sand and tube anemones, sea pens and other cnidarians may sporadically occur in the Project Area, and slow moving and solitary species would likely be smothered by this proposal.

Invertebrates associated with hard substrata of natural rocky reef of Muttonbird Island and the numerous rock ballast breakwaters in Coffs Harbour, which included various gastropods, molluscs and other sessile invertebrate species, may also experience some short-term, temporary habitat disturbances associated with works. Impacts to these species are expected to be confined to indirect impacts associated with reduced habitat quality as a result of increased turbidity and sedimentation.

4.3 Coastal Wetlands and Littoral Rainforests

The proposed works are not expected to impact on Coastal Wetlands or Littoral Rainforest mapped under the Resilience and Hazards SEPP 2021.

4.4 Solitary Islands Marine Park

The nearshore Sand Placement Area is within a Habitat Protection Zone (IUCN IV) of Solitary Islands Marine Park. Placement of sand in this area will need to apply adequate mitigation measures to ensure that

high level protection for biological diversity, habitat and ecological function is achieved. These controls will need to include maintaining adequate buffers to nearby sensitive receptors including rocky reef habitat of Little Muttonbird Island and monitoring ecological recovery of the soft sediment communities following smothering from the dredge spoil.

4.5 Key Threatening Processes

4.5.1 Debris and Harmful Substances

Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris is considered a Key Threatening Process under both the *FM* and *EPBC Acts*. The planned or unplanned disposal of any wastes, petroleum-based products and other debris has potential to have direct and indirect impacts on marine fauna in the Study Area. For example, petroleum products destroy the insulating ability of fur-bearing mammals such as seals and the water repellence of bird feathers, while they can also have an effect on the health, fitness, condition, growth rates, and larval survival of fish and invertebrates (Clarke 2001). During dredging activities, and during mobilisation or demobilisation of dredging equipment, uncontained debris and contaminants from unplanned spills can enter the waterways. The implementation of management measures to manage wastes and minimise the likelihood of unplanned spills will be required to minimise this risk and should be included as part of the Construction Environmental Management Plan (CEMP) or equivalent document (refer to Section 5.1.1).

4.5.2 Introduction of non-indigenous fish and marine vegetation

The introduction of non-indigenous fish and marine vegetation to the coastal waters of NSW is considered a Key Threatening Process under the *FM Act*. Introduced fish and marine vegetation, or noxious (invasive or toxic) species, that may occur and be transferred between locations on dredging equipment and associated vessels can pose a risk in terms of infestation by non-native or invasive species. While areas of colonisation by the invasive green alga *C. taxifolia* have typically been restricted to mid-coast to south coast NSW estuaries (NSW DPI 2022), dredging vessels and equipment has potential to transport this species between estuaries. This species can colonise areas of soft substrate rapidly and out-compete seagrasses, particularly *Zostera* (Williams 2007, Glasby 2013), of which a small amount is present adjacent to the Study Area in Coffs Creek. Given this, consideration of measures to minimise risk of the introduction and spread of non-native and invasive species should be considered as part of the Construction Environmental Management Plan (CEMP) or equivalent document (refer to Section 5.1.1).

4.6 Assessments of Significance

4.6.1 Shorebirds and Waders

A 5-Part Test concluded that disturbances to the Pied Oystercatcher and Sooty Oystercatcher from the proposed works include short term and minor disturbances to a small area of potential foraging and very marginal and likely highly disturbed roosting habitat that may be used opportunistically. Disturbances will be limited to occasional transport of placed sands from the nearshore placement area to lower onshore areas along Park Beach, which may deter birds from foraging or attract birds to sediment during placement works. These modifications are expected to result in the maintenance of or additional potential foraging habitat for the species over the 10 year approval period. Given the absence of previous nesting records, and the high recreational use of the area, it is unlikely that the site provides suitable nesting habitat for the Pied Oystercatcher. The Sooty Oystercatcher are known to breed in offshore locations. The proposal is not

considered likely to result in a significant impact on the local population of the Pied Oystercatcher and Sooty Oystercatcher (Appendix 5).

4.6.2 Marine Birds

A 5-Part Test for Little Terns concluded that individuals that may potentially at times utilise habitat in the vicinity of Study Area are unlikely to be significantly affected by the proposed activity. The Little Tern only has a moderate likelihood of occurrence in this area, while the adjacent sandy shoreline areas associated with Jetty Beach and Park Beach, and waters within and adjacent to the Study Area only provide marginal habitat for the species. Disturbances to the species are expected to be confined to temporary reductions in foraging habitat quality. Additionally, a Significant Impact Criteria for migratory marine birds concluded potential impacts to migratory marine birds from the proposed maintenance dredging and sand placement at Coffs Harbour are confined to areas of marginal habitat inside of the Study Area, including temporary disturbances to subtidal foraging habitat quality. It is not expected that these impacts will affect important migratory marine bird habitat associated with Muttonbird or Little Muttonbird Island, whilst it is also not expected that works will seriously disrupt the life cycle of migratory marine bird species (Appendix 5).

4.6.3 Marine Turtles

A 5-Part Test and Significant Impact Criteria concluded that Marine Turtles that may potentially utilise habitat in the vicinity of the proposal are unlikely to be significantly affected by the proposed activity. Habitat use in the vicinity of the Study Area is likely to be very occasional and limited to opportunistic foraging as part of transient movements, with any nesting considered unlikely within or adjacent to the Study Area. Disturbances from the proposed works are limited to temporary reductions in habitat quality associated with the operation of the dredge and during sand placement, due to increased turbidity and sedimentation and disturbances from underwater noise (Appendix 5).

4.6.4 Marine Brown Alga

A 7-Part Test concluded that based on the current known distribution of *N. lophocladia*, the proposed dredging and sand placement activities are not considered to have a significant impact on the species such that it would result in the extinction of the local population. The known, consistently observed population on reef north of Coffs Harbour northern breakwater is not within the Dredge Areas and protected from dredging by the northern breakwater and Muttonbird Island. The population that has previously been recorded on Little Muttonbird Island may experience some minor, short-term sedimentation where extensive pluming occurs from subtidal placement, however, is over 160 m from the Sand Placement Area and in the opposite direction of the natural current flow. Further 7-Part tests may be required over the 10 year approval period should dredging be required within 50 m of natural subtidal rocky reef on the southern side of Muttonbird Island, where *N. lophocladia* may have potential to occur (Appendix 5).

4.6.5 Black Rockcod

A 7-Part Test and Significant Impact Criteria concluded that the viability of the Black Rockcod population that may utilise habitat in the vicinity of the proposal is unlikely to be significantly affected by the proposed activity. Potential Black Rockcod habitat inside the Study Area is marginal habitat only and is not expected to be significant to the local population. Impacts from the proposal are restricted to some potential disturbances during construction works that may have some localised and short-term influence on habitat quality if they are present in the Study Area at this time.

5 Recommendations and Conclusions

5.1 Recommendations

This section details how the project proposal would, in the first instance, avoid ecological impacts on the marine environment, then apply mitigation measures where avoidance is not possible.

5.1.1 Management Measures

Before works Commence

The following recommendation should be implemented to avoid, minimise and mitigate impacts to marine flora, fauna, infauna and their habitats before works commence for each dredging campaign:

- The Benthic Assessment Procedure (BAP) has been prepared that details the requirements and processes to be implemented into the CEMP for the duration of the 10 year approval, detailed in Appendix 6. The BAP identifies requirements and procedures to be adhered to, including the completion of a Marine Habitat Survey prior to each dredging campaign, reporting and further assessment requirements, consultation requirements, triggers for Species Impacts Statements and management plans and any permits and offsetting. A Marine Habitat Survey is to be conducted prior to each dredging campaign to identify potential to impact on any threatened species under the FM Act and to update the distribution of ecologically significant habitats e.g., reef structures, macroalgae stands and benthic communities. These distribution maps of ecologically sensitive habitats are to be prepared for incorporation into the project CEMP or equivalent that identify habitat boundaries and required buffers. Note: A Marine Habitat Survey will not be required for areas considered as part of this initial assessment within 12 months of survey.
- Dredge and Sand Placement design for the campaign must maintain a minimum 100 m buffer from areas of known or previously known occurrences of *N. lophocladia*. Where dredging or sand placement must occur within 100 m of known or previously known occurrences, a management plan must be prepared (Figure 5).
- Dredge and Sand Placement design for the campaign must also maintain a 50 m buffer from areas of natural subtidal rocky reef (Figure 5). If dredging is required within 50 m of natural subtidal rocky reef, a targeted search for *N. lophocladia* should be conducted along the sand-rock interface within 24 months of the dredging campaign and must be conducted during the visible macroscopic life stage of the species, typically observed between the end of July and start of December (NSW DPI 2018). Details are identified in the BAP (Appendix 6), note that this excludes the rocky bommie within Dredge Area 2.
- Dredge Area 2 must avoid the small rocky reef bommie located north of the Coffs Harbour Boat Ramp breakwater toe, along the Dredge Area northern boundary. This includes habitat within a 10 m buffer of the bommie.
- A pre-works inspection of fauna habitat associated with shoreline and intertidal areas must be conducted by an ecologist within 4 weeks prior to commencement of works, especially for threatened shorebirds and/or nesting turtles, and where required fauna clearance works must be undertaken before any works in these areas commence. Inspections are to include breakwaters adjacent to Dredge Areas and when onshore Placement Areas will be utilised, Jetty Beach and the

southern end of Park Beach. Should nesting fauna be found, further consultation and the preparation of an appropriate management plan will need to be negotiated with DPIE and/or NPWS.

- If works are to occur within October to March (inclusive breeding season of Green, Loggerhead and Hawksbill Turtles) the local NPWS office should be contacted prior to works to ensure no nesting turtles have been recorded on Jetty or Park Beach. If nesting turtles are recorded on these beaches during works, a risk assessment should be conducted and a management plan prepared if necessary.
- Timing of works should avoid important migration periods of Shearwaters, which nest on Muttonbird and Little Muttonbird Island, when birds are most vulnerable to external impacts. These periods include:
 - o April – early May: fledglings begin first migratory flight from Muttonbird and Little Muttonbird Island.
 - o August: adults return to Muttonbird and Little Muttonbird Island at the end of their migration.

If works are unavoidable within these time periods, a Migratory Marine Bird Management Plan will need to be prepared to mitigate risks to vulnerable birds.

- A monitoring program to measure ecological recovery of soft sediment communities within the subtidal Placement Area is recommended and pre-dredging data obtained within six months of commencing dredging works. This data should include:
 - o Measurement of infauna assemblages, diversity and abundance using replicated sampling to account for spatial variability (Min n = 4).
 - o Measurement of key sediment characteristics TOC and PSD.
 - o Sampling of a minimum of two impact (within Placement Area) and two appropriate control sites.
- A Section 199 permit must be current and associated notification issued for each campaign.
- A Section 205 permit must be current and associated notification issued for each campaign, where identified as a requirement within the Marine Habitat Survey or requested by NSW DPI Fisheries.
- Where any works involve sand placement or transport of sand to Placement Areas A, which lay within the Solitary Islands Marine Park, a permit will be required under the *Marine Estate Management Act 2014* and *Marine Estate Management (Management Rules) Regulation 1999* prior to the commencement of the activity.
- All vessels and the site compound are to have on hand appropriate spill kits and bins for disposal of all rubbish and debris. This should include adequate hydrocarbon booms.

During works

The following recommendation should be implemented to avoid, minimise and mitigate impacts to marine flora, fauna, infauna and their habitats during works:

- For dredging and sand placement works a 50 m buffer zone should be maintained to any Type 2 KFH and 50 – 100 m for Type 1 KFH as per the Guidelines (Fairfull 2013) for waters outside the Marine Park, where possible. For works within the Marine Park (where all KFH is considered Type 1 KFH), works should maintain a minimum 100 m buffer to natural rocky reef habitats. Dredging may occur in close proximity to Type 2 macroalgae associated with breakwaters, which cannot be

avoided. The proposed Placement Area A currently maintains an ~150 m buffer from rocky reef of Little Muttonbird Island. This buffer should be upheld for subtidal placement works over the 10 year period.

- No mooring or beaching of vessels within any marine vegetation.
- No dredge pipes are to be placed over natural rocky intertidal or subtidal formations.
- The NSW NPWS Guidelines for approach distance to Seals (Figure 6) must be adhered to at all times. Should this not be possible the project ecologist and NPWS must be notified immediately.
- If any marine or shorebirds or turtles are found to be nesting, or Fur-seals resting within 100 m of the Dredge and Placement Areas during works, the works should cease immediately and the local NPWS office notified.
- If injured or exhausted seabirds are encountered during works, they should be covered with a towel and put in a box (with air flow). The contractor should contact WIRES or NPWS.
- To manage potential impacts of vessel strike and underwater noise on marine fauna inside of Coffs Harbour, the following is recommended during works:
 - o The entire harbour is to be considered an observation zone for marine mammals and turtles.
 - o The observation zone should be monitored for marine mammals and turtles for a period of no less than 30 mins before start-up of dredge.
 - o A shut down zone for marine mammals and turtles should be implemented for an area that extends 100 m from the Dredge Areas and Placement Area. Incursions of marine mammals and/or turtles into this zone during dredging operations triggers a temporary shut down of operations.
- Works vessels should travel at no greater than 8 knots of speed within 500 m of the proposal footprint during construction works to minimise potential for interaction and/or vessel strike on marine fauna.
- All hydrocarbons must be appropriately managed across the Study Area at all times, including:
 - o The storing of hydrocarbon-based products on any on water sites within the Study Area should be avoided and must be stored in a suitable bunded area within the site laydown area.
 - o Hydrocarbons are to be stored in a bunded area with adequate spill kits available. All staff are to be made aware of the location of the spill kit and trained in its use.
 - o Hydrocarbon booms should be placed around all stationary machinery on the water and be on hand for deployment around vessels.
 - o All machinery must be routinely checked for leaks, with an emergency spill kit to be kept on site at all times. Where practical, floating containment booms should be in place to control any unplanned spills of hydrocarbons around machinery operating on or over water.
- Visual and turbidity monitoring of dredge pluming should be undertaken as part of standard water quality monitoring during dredging works at both the dredge and placement sites.
- All equipment to be brought to the Study Area must be thoroughly cleaned and free of substrate to avoid introduction of species such as *C. taxifolia*. Equipment should be also thoroughly cleaned following the completion of the project to prevent spread of potential invasive species to other areas.
- If *C. taxifolia* is found within the Study Area, it should be avoided and not disturbed to minimise further spread to other areas of the Study Area. If dredging vessels or equipment are found to have caught *C. taxifolia* during works, they should be thoroughly cleaned with fresh water, with all biota safely disposed of on land.

- Environmental controls should be inspected weekly by a TfNSW Environmental Scientist or an independent environmental consultant.

Following completion of the works

The following recommendation should be implemented to avoid, minimise and mitigate impacts to marine flora, fauna, infauna and their habitats following completion of the works:

- All materials, machinery and rubbish must be removed from site.
- An inspection of the site by TfNSW Environment Officer or Project Manager must be undertaken.
- Any notification requirements of the Section 199 or 205 permits must be filled and submitted.
- A post dredging survey of ecological recovery of soft sediment communities within the subtidal Placement Areas and control sites is recommended to be implemented within 6 months of completion of the dredging works. The survey should follow the monitoring protocols adopted for pre-dredging survey.

No dredging of additional areas is to occur without further consideration of aquatic ecological impacts. For future dredging works scheduled to occur greater than 12 months following completion of the site surveys done as part of this AEA, mapping of sensitive habitats will need to be updated for inclusion into an updated version of the CEMP. This should include updates to habitat maps and any associated dredge pipe routes and required buffers.



Figure 5: Indicative known *Nereia lophocladia* habitat at Coffs Harbour. Figure shows 50 m and 100 m buffer zones from *N. lophocladia* and natural rocky reef (in the Study Area).

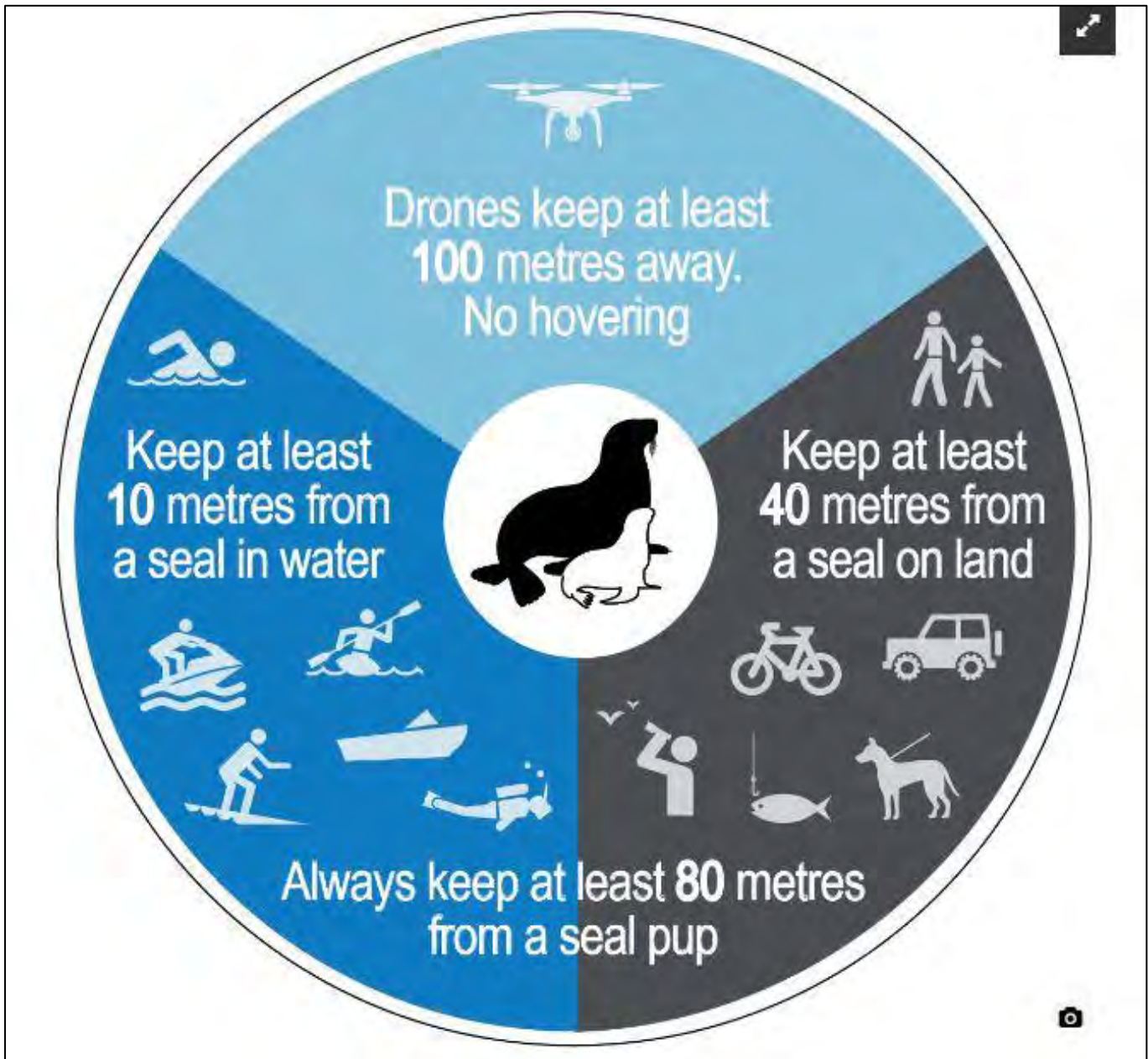


Figure 6: NSW NPWS Guidelines for approach distances to fur-seals (Source: NPWS).

5.1.2 Permits and Consultation

A permit under Section 199 of the FM Act will be required to be current for each dredging campaign as these works will require dredging of water land. These permits can be issued for periods of up to 5 years on the discretion of NSW DPI Fisheries.

The current proposed dredging is not expected to impact on any marine vegetation and a Section 205 Permit should not be required. However, the requirement for a Permit under Section 205 of the FM Act for future campaigns will be assessed as part of the Marine Habitat Survey prior to each dredging campaign.

However, NSW DPI Fisheries will make the final determination regarding permit requirements during the s.199 of the FM Act consultation process for dredging projects following each Marine Habitat Survey.

Where any works involve sand placement or transport of sand to the Sand Placement Area, which lays within the Solitary Islands Marine Park, a permit will be required under the *Marine Estate Management Act 2014* and *Marine Estate Management (Management Rules) Regulation 1999* prior to the commencement of the activity.

5.1.3 Offsetting

NSW DPI enforces a 'no net loss' habitat policy as a permit condition or condition of consent. This may require proponents to conduct habitat rehabilitation and/or provide environmental compensation. In circumstances where marine vegetation is likely to be negatively impacted to a degree that cannot be avoided or mitigated, environmental compensation will be required and calculated at the rate of 2:1 habitat offset requirement (Fairfull 2013).

Where Type 1 or 2 KFH with marine vegetation is directly impacted during future campaigns offset requirements will be determined as part of the Marine Habitat Survey. For indirect impacts monitoring may be required to determine if and the amount of offset that is required. Once an area has been offset, it will be exempt from further offset for the duration of the 10 year approval.

5.2 Conclusions

Direct impacts from the maintenance dredging program at Coffs Harbour will include the removal of up to 96,000 m³ of seabed material per campaign and the placement of this sediment to subtidal areas nearshore to Park Beach. Direct ecological impacts from the proposed dredging are expected to be the removal of and/or physical disturbance to invertebrate infauna and/or slower moving sessile epibenthic invertebrates, which will either be removed as a result of dredging or buried as a result of sand placement. These losses are not considered to be ecologically detrimental to the wider invertebrate community or ecological function within Coffs Harbour or the adjacent shoreline habitats, including the Marine Park. The affected infauna communities within both the Dredge Areas and the Sand Placement Area are expected to recover within several months. This will result in the direct modification of Type 3 KFH during dredging, whilst placement nearshore at Park Beach will involve direct modification of Type 1 KFH, as this location is within the Marine Park. No marine vegetation was observed within either Dredge Area or the Sand Placement Area, with the exception of the rock bommie in Dredge Area 2 which is to be avoided, thus direct removal of marine vegetation is not expected, and offsetting is not considered to be required for works with 12 months of this assessment.

The project at times may result in some indirect impacts to adjacent habitats as a result of reduced water quality and increased sedimentation. Habitats with sensitive receptors such as reef assemblages are most vulnerable to such disturbances. Although these impacts are expected to be minimal given the coarse nature of the dredge material being expected to settle quickly, the naturally high sediment loads along the Coffs Coast and the exposure of the project to coastal currents, adequate buffers to sensitive receptors and areas of elevated biological or ecological value will need to be adopted to mitigate these risks. This includes suitable buffers to the reef on the northern side of the Coffs Harbour northern breakwater and Little Muttonbird Island, where the Critically Endangered *N. lophocladia* has previously been known to occur. All

adjacent habitats on the northern side of the northern breakwater are also considered Type 1 – Highly sensitive KFH as they are within the Marine Park.

Based on the current and previously known distribution of *N. lophocladia*, the proposed works are not expected to impact on the species to any ecological significance. Known distribution is outside of the Dredge and Placement areas. Where necessary works must occur within close proximity of suitable natural habitat for the species, it has been recommended that targeted surveys are conducted prior to works to mitigate potential impacts where changes in distribution may occur. Given that no seagrasses occur within the Study Area and are unlikely to establish in this area over the next decade, and Coffs Harbour is outside of the natural range of Cauliflower Soft Coral, a Benthic Assessment Procedure, which has been recommended for other similar dredging works along the NSW coast, is not considered necessary for this proposal. The recommended mitigation and monitoring requirements for the identified sensitive benthic species, *N. lophocladia*, is considered sufficient to avoid and mitigate impacts from this proposal.

Various threatened and migratory marine species may occur in the area at times; however, most are likely to be transient visitors or only enter area in search or pursuit of prey items, which they forage across very large expanses of the coastal environment for. Thus, the habitat within the Study Area has minimal ecological significance for the majority of these species. Exceptions requiring further consideration included migratory marine birds, shorebirds and marine turtles which at times utilise habitat within Coffs Harbour and the Solitary Islands Marine Park. These species may experience impacts to nesting, foraging, refuge or roosting habitat due to dredging or sand placement works in subtidal areas or along the shoreline. Further assessment has identified the proposed works are unlikely to have a significant impact on the species or local populations. However, careful management and consideration of the timing of works over the 10 year period will be required to mitigate potential impacts to these species.

To manage the potential risks that this project may pose to marine and estuarine habitat, flora and fauna, a series of recommendations has been provided in Section 5.1. This includes some recommendations for measures to avoid potential impacts at both the planning and implementation stages, while a series of additional recommendations to minimise and mitigate remaining potential impacts have also been provided and should be adopted into the CEMP for the proposed activities. With adoption of these recommendations, the project is considered unlikely to have a significant impact on any State- and/or Commonwealth-listed threatened aquatic biodiversity. Given that the proposed action is for a period of 10 years, a detailed procedure (BAP) to guide ongoing assessment for future dredging campaigns and capture habitat and ecological changes has been provided in Appendix 6.

References

- ALA (2024). Atlas of Living Australia Spatial Portal. <https://spatial.ala.org.au/>, Accessed November 2024
- Billerman, S. M., Keeney, B. K., Rodewald, P. G. and Schulenberg T. S. (Editors) (2020). Birds of the World. Cornell Laboratory of Ornithology, Ithaca, NY, USA. <https://birdsoftheworld.org/bow/home>
- Birdlife Australia (Birddata). (2024). Data Portal. Accessed online April 2024 (https://birddata.birdlife.org.au/explore#map=-22.5083100_136.0786120_4)
- Cardno Lawson Treloar (Cardno). (2008). Brisbane Water Estuary Processes Study. Prepared for Gosford City Council and Department of Environment and Climate Change.
- Clarke, R. B. (2001). *Marine Pollution*. Fifth Edition. Oxford University press, Oxford UK.
- Commonwealth of Australia, (2017). Recovery Plan for Marine Turtles in Australia 2017-2027'. Prepared by the Department of the Environment and Energy, Commonwealth of Australia.
- DAWE (2020). Species Profile and Threats Database, Department of Agriculture, Water and the Environment (DAWE). Available Online <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- DCCEEW (2024). Protected Matters Search Tool. <https://pmst.awe.gov.au/>, Accessed November 2024.
- Department of Environment (2013). Matters of National Environmental Significance: Significant impact guidelines 1, Environment Protection and Biodiversity Conservation Act 1999. Australian Government
- Dernie, K.M., Kaiser, M.J. and Warwick, R.M. (2003). Recovery rates of benthic communities following physical disturbance. *Journal of Animal Ecology*, 72 pp:1043–1056.
- Erbe, C. (2012). Effects of Underwater Noise on Marine Mammals. *Advances in Experimental Medicine and Biology*. January 2012 DOI: 10.1007/978-1-4419-7311-5_3.
- Fairfull, S. (2013), *Policy and guidelines for fish habitat conservation and management*. NSW Department of Primary Industries, Fisheries, Woolongbar, NSW.
- Fisheries Scientific Committee (FSC), (2021), 'Cauliflower Soft Coral *Dendronephthya australis* – Final Determination
- Ford, J., Fowler, A., and Suthers, I. (2006). 'Prediction of larval fish settlement 'hotspots' in relation to a current shear index, zooplankton biomass, and chlorophyll a distribution in Brisbane Water.' Prepared for Gosford City Council
- Gladstone, W. (2006). 'Spatial and temporal variation in the biodiversity of macroinvertebrates in Brisbane Water estuary and its relationship to environmental variation', University of Newcastle, Final report of the Brisbane Water estuary biodiversity study.
- Gladstone, W. and Shokri, M. R. (2007). 'Spatial and habitat-related patterns in the biodiversity of Brisbane Water estuary: a tool for sustainable estuary management', University of Newcastle, Draft Final Report.
- Harasti, D., Martin-Smith, K., Gladstone, W. (2014). Ontogenetic and sex-based differences in habitat preferences and site fidelity of White's seahorse *Hippocampus whitei*. *Journal of Fish Biology*, 85 (5), 1413-1428

- H2O Consulting Group. (2024a). Marine Ecological Monitoring Report – Coffs Harbour Sand Transfer System. *Prepared for Transport for NSW.*
- H2O Consulting Group (2024b). Monitoring Report – Post Nourishment, Stockton Beach Nourishment. *Prepared for NSW Public Works.*
- Kelaher, B. and Mamo, L. (2019). Targeted surveys for the critically endangered marine brown alga *Nereia lophocladia* on the Coffs Harbour Eastern Breakwater and adjacent shores. Report prepared by Southern Cross University for the Department of Industry, Crown Lands and Water.
- Kelaher, B. (2020). Targeted survey for the critically endangered marine brown alga *Nereia lophocladia* on patch reefs inside Coffs Harbour. Report prepared by Southern Cross University for the Department of Industry, Crown Lands and Water.
- Kirkman, H. and Kuo, J. (2012). Seagrasses of south-east Australia— An Introduction. *Estuary Plants and whats happening to them in south-east Australia*. Sanity, G., Hosking, J., Carr, G. and Adam. P. (Eds). Published by Sanity and Associates Pty Ltd, Potts Point, NSW.
- Lincoln Smith, M (2003). Aquatic Ecology in Environmental Impact Assessment. EIA Guideline Series May 2003. Prepared on behalf of Department of Planning.
- Lunt, J. and Smee, D.L. (2015). Turbidity interferes with foraging success of visual but not chemosensory predators. *Peer J*, 3, e1212
- Mamo, L. T., Wood, G., Wheeler, D., Kelaher, B. P. and Coleman, M. A. (2021). Conservation genomics of a critically endangered brown seaweed, *Journal of Phycology*, Vol 57, 1345-1355, DOI: 10.1111/jpy.13177
- MHL (2020). Coffs Harbour Boat Ramp Redevelopment Sediment Transport Modelling. Draft Report V2 Prepared by Manly Hydraulics Laboratory (MHL) for Transport for NSW: Maritime Infrastructure Delivery Office.
- National Parks and Wildlife Service (NPWS). (2009). Muttonbird Island Nature Reserve Plan of Management. National Parks and Wildlife Service, part of the Department of Environment and Climate Change NSW
- NSW DPI (2012). Endangered populations in NSW, *Posidonia australis* in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie, Fisheries Ecosystems Unit, Port Stephens Fisheries Institute, NSW.
- NSW DPI (2013). Grey Nurse Shark (*Carcharias taurus*). Factsheet. Prepared by The Fisheries Ecosystem Unit, Port Stephens Fisheries Institute, NSW DPI, February 2013.
- NSW DPI (2015). White Shark (*Carcharodon carcharias*). Primefact 6, Third Edition. Prepared by The Aquatic Ecosystems Unit, Port Stephens Fisheries Institute, NSW DPI, June 2015.
- NSW DPI (2015). Black Rockcod – (*Epinephelus daemeli*). Primefact 189 (2nd Ed), NSW DPI Fisheries. NSW Department of Primary Industries, Threatened Species Unit, NSW.
- NSW DPI (2019). White's Seahorse – (*Hippocampus whitei*). Primefact 1702, NSW DPI Fisheries. NSW Department of Primary Industries, Threatened Species Unit, NSW.
- NSW DPI (2021). Cauliflower Soft Coral – *Dendronephthya australis*. Primefact INT21/391176, First edition, DPI Fisheries – Threatened Species Unit.

- NSW DPI (2022c). *Caulerpa taxifolia*. NSW Department of Primary Industries. Accessed Online September 2022. <https://www.dpi.nsw.gov.au/fishing/aquatic-biosecurity/pests-diseases/marine-pests/seaweed/caulerpa-taxifolia>
- NSW DPI (2024a). Threatened Species Lists. NSW Department of Primary Industries. <https://www.dpi.nsw.gov.au/fishing/species-protection/what-current>, Accessed April 2024.
- NSW DPI (2024b). Fisheries Spatial Data Portal. NSW DPI website. Link: Fisheries Spatial Data Portal (nsw.gov.au). Accessed April 2024.
- NSW DPI (2015). Wedge-tailed shearwater migration underway, Media release 15 April 2015. Accessed online November 2024, <https://www.environment.nsw.gov.au/media/OEHmedia15051501.htm>
- NSW Environment and Heritage (2022). 'Big season for little terns at Sawtell', media release 23 February 2022, <https://www.environment.nsw.gov.au/news/big-season-for-little-terns-at-sawtell> accessed November 2024
- NSW Environment and Heritage (2023). Shearwaters. <https://www2.environment.nsw.gov.au/topics/animals-and-plants/native-animals/native-animal-facts/birds/shearwaters> Accessed November 2024
- NSW Environment and Heritage (2024). Bionet Atlas. <https://atlas.bionet.nsw.gov.au/>, Accessed November 2024.
- Royal HaskoningDHV (RHDHV), (2024 In Prep). Draft Conceptual Model – Coffs Harbour Dredging. Communicated via email, Dan Messiter 26 November 2024
- Robinson, M., 2006. Birds of the Brisbane Water Estuary. Prepared for Bio-Analysis Pty Ltd, 2006.
- SEWPAC (2012). Species group report card – seabirds. Supporting the marine bioregional plan for the Temperate East Marine Region. Prepared by the Department of Sustainability, Environment, Water, Population and Communities
- South Australia Department for Infrastructure and Transport (SA DIT), (2023). Underwater Piling and Dredging Noise Guidelines EHTM Attachment 7E, Government of South Australia.
- TfNSW (In Prep). Ettalong Dredging Works – Project REF. Prepared for Transport for New South Wales (TfNSW) by Hydrosphere Consulting XXX 2023.
- Viada, S., Hammer, R. M., Racca, R. and Hannay, D. (2008). Review of potential impacts to sea turtles from underwater explosive removal of offshore structures, *Environmental Impact Assessment Review*, 284 (4-5), pp 267-285
- Wilber, D. H., Clarke, D. G., & Rees, S. I. (2007). Responses of benthic macroinvertebrates to thin-layer disposal of dredged material in Mississippi Sound, USA. *Marine Pollution Bulletin*, 54(1), 42-52. <https://doi.org/https://doi.org/10.1016/j.marpolbul.2006.08.042>
- Yee, N. R., Finley, L., Roberts, A., Kelaher, B., and Millar, A. J. K. (2017). Re-discovery of the critically endangered marine brown alga, *Nereia lophocladia* (Order Sporochneales) at Coffs Harbour, NSW, Australia, *Marine Biodiversity*, DOI 10.1007/s12526-017-0796-y

Plates



Plate 1: Intertidal habitat at Dredge Area 1, showing a) facing the entrance of the marina and b) facing Jetty Beach.



Plate 2: Shoreline and intertidal habitat adjacent to Dredge Area 2, showing a) the entrance to the boat ramp harbour and b) the breakwater armoured along the southern shoreline of Coffs Harbour.

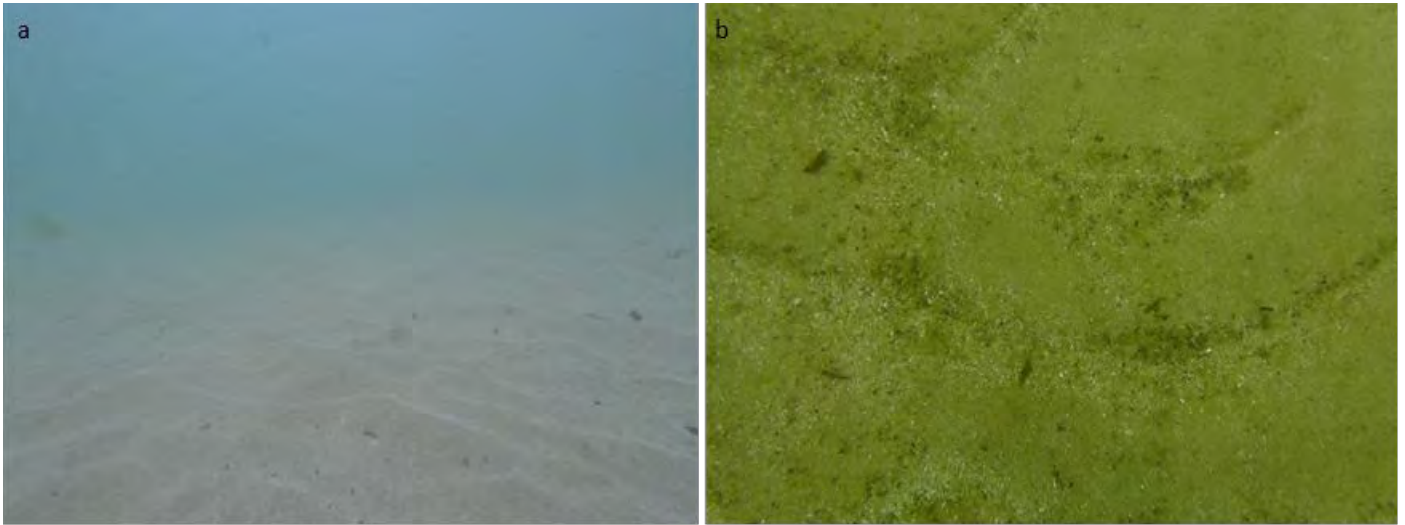


Plate 3: Typical sediment within the Dredge Areas, showing a) clean marine sands and b) marine sands with fine silts.



Plate 4: Adjacent shoreline and intertidal habitat at Park Beach, showing a) looking north towards Macauley's Headland and b) looking south at Little Muttonbird Island and Muttonbird Island.

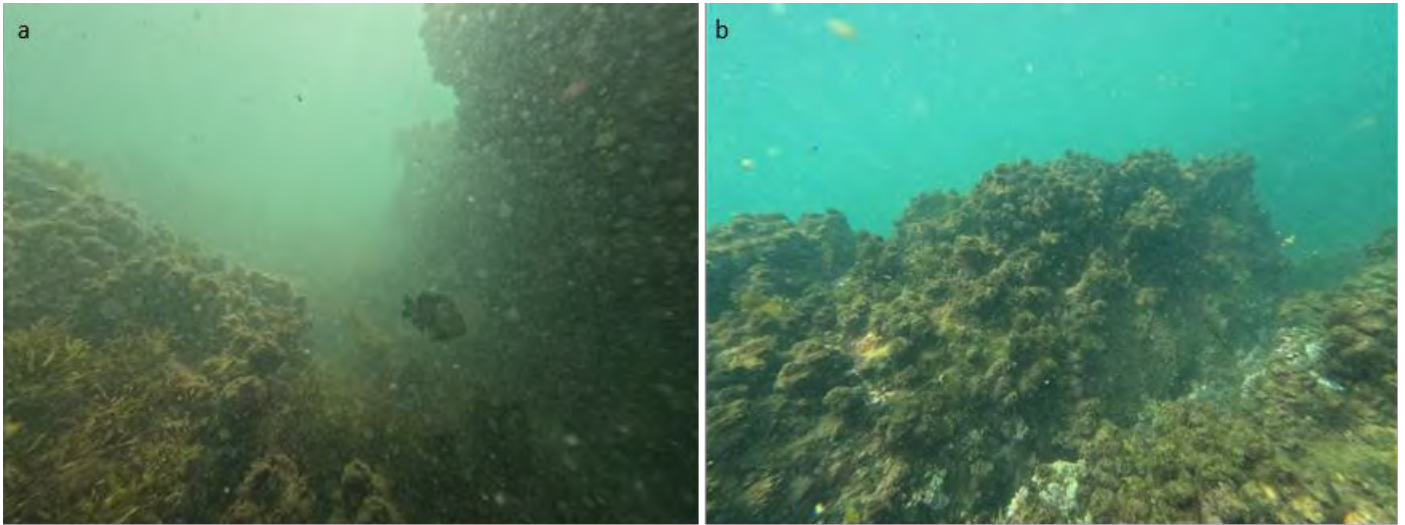
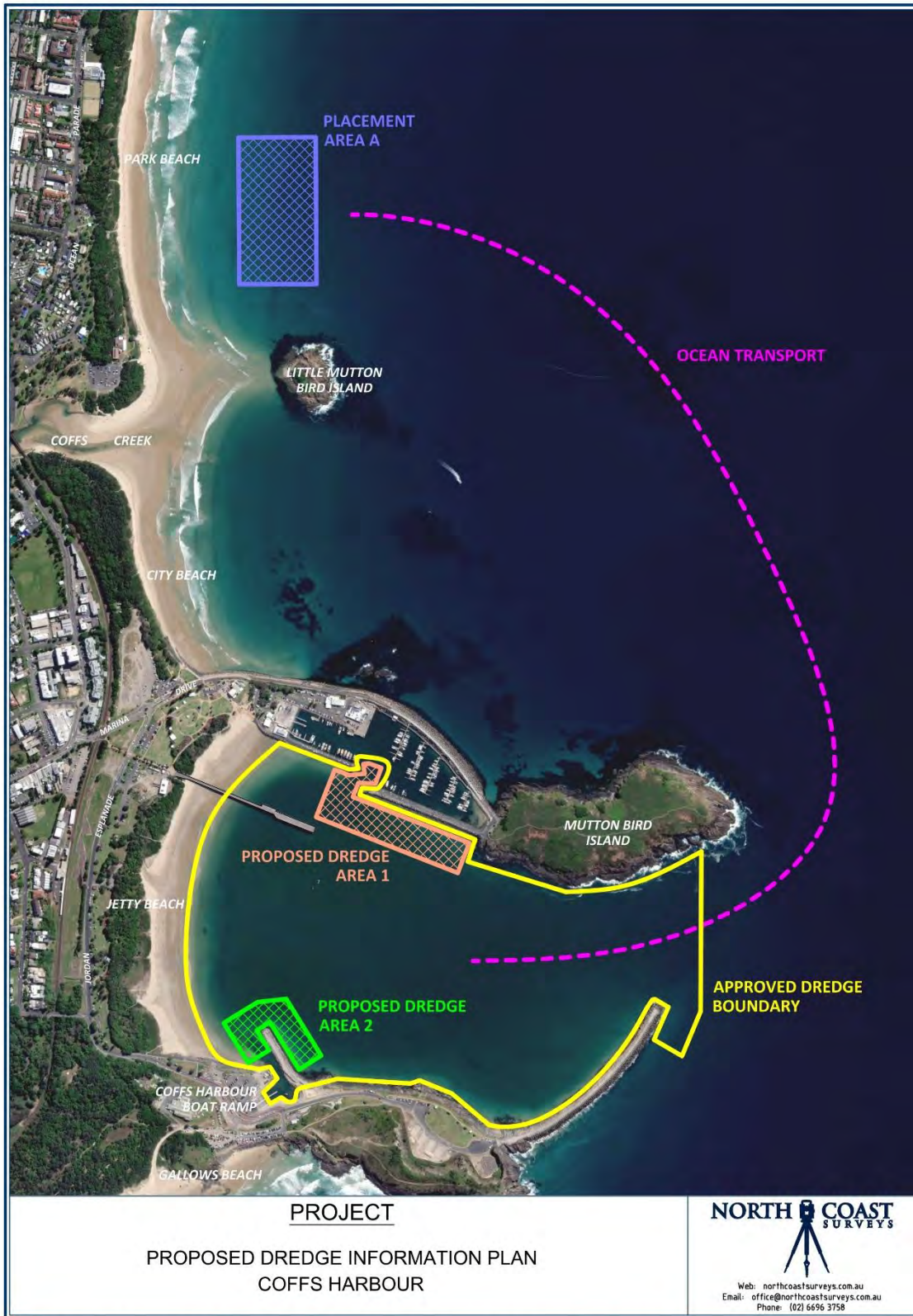
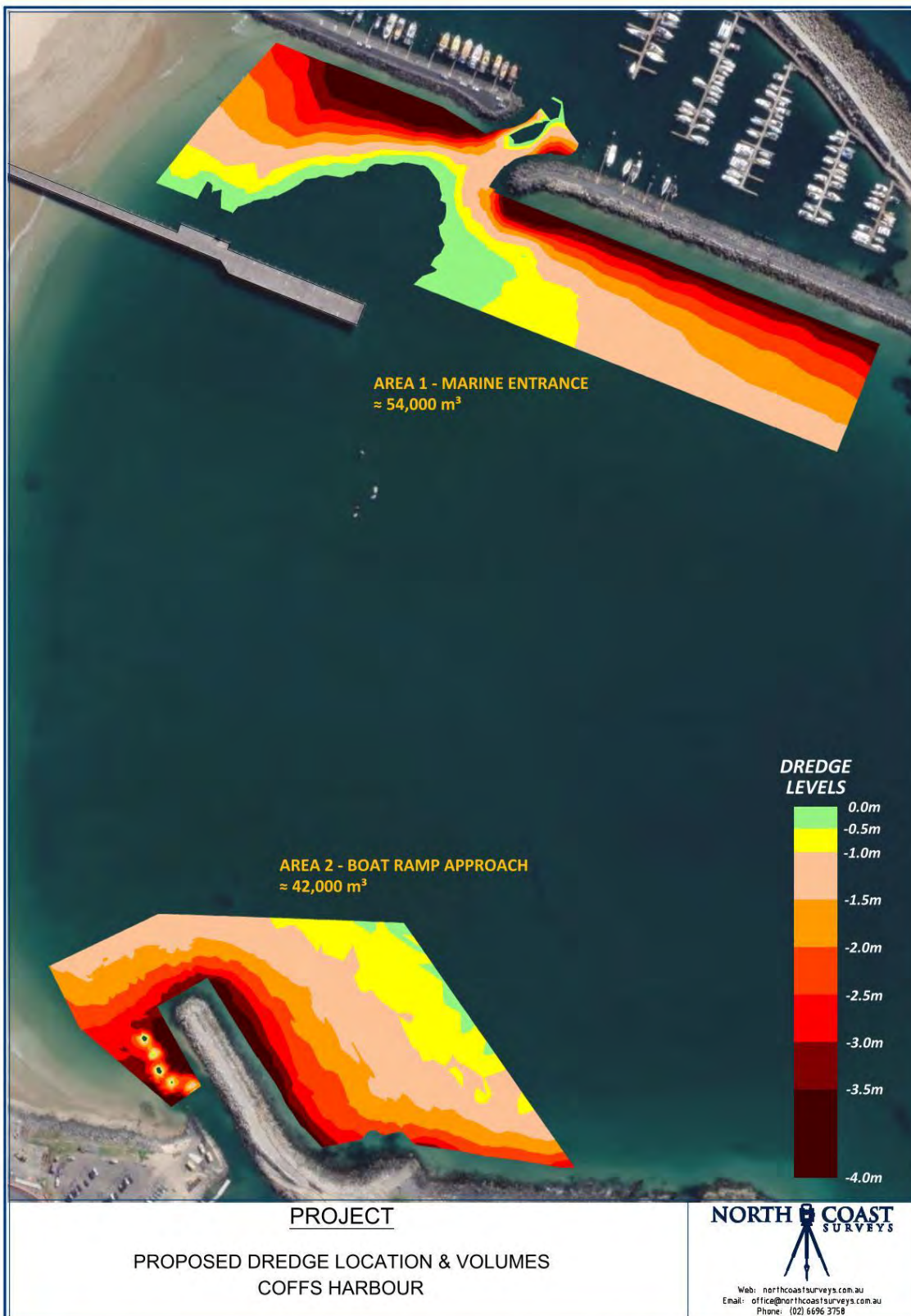


Plate 5: Adjacent subtidal habitat along the southern side of Muttonbird Island, showing a) complex reef structure with marine vegetation and b) reef bommie with *P. stolonifera*.

Appendix 1 – Proposed Project Plans



COFFS HARBOUR PROPOSED DREDGE INFORMATION PLAN R1DWG WARNING: THIS FILE MUST BE USED REFERRING TO THE TRANSMITTAL AND ALL NOTES AND DISCLAIMERS ON THE HARDCOPY PLOTTED: 9/24/2024 12:35 PM



COFFS HARBOUR PROPOSED DREDGE DESIGN CAD.DWG

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Appendix 2 – Threatened Species Searches

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Public Report of all Valid Records of Threatened (listed on BC Act 2016) ,Commonwealth listed ,CAMBA listed ,JAMBA listed or ROKAMBA listed Entities in selected area [North: -30.25 West: 153.09 East: 153.19 South: -30.35] recorded since 10 Sep 2004 until 10 Sep 2024 returned a total of 14,592 records of 68 species.

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Kingdom	Class	Family	Species Code	Scientific Name	Common Name	NSW status	Comm. status	Records	Info
Animalia	Aves	Apodidae	0335	<i>Apus pacificus</i>	Fork-tailed Swift	P	C,J,K	1	
Animalia	Aves	Apodidae	0334	<i>Hirundapus caudacutus</i>	White-throated Needletail	V,P	V,C,J,K	8	
Animalia	Aves	Diomedidae	0091	<i>Thalassarche cauta</i>	Shy Albatross	E1,P	E	1	
Animalia	Aves	Procellariidae	0069	<i>Ardenna pacifica</i>	Wedge-tailed Shearwater	P	J	13133	
Animalia	Aves	Procellariidae	0071	<i>Ardenna tenuirostris</i>	Short-tailed Shearwater	P	C,J,K	50	
Animalia	Aves	Procellariidae	0937	<i>Macronectes halli</i>	Northern Giant-Petrel	V,P	V	1	
Animalia	Aves	Sulidae	0105	<i>Sula dactylatra</i>	Masked Booby	V,P	J,K	1	
Animalia	Aves	Ciconiidae	0183	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E1,P		2	
Animalia	Aves	Accipitridae	0226	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V,P		5	
									
									

Animalia	Aves	Accipitridae	8739	<i>Pandion cristatus</i>	Eastern Osprey	V,P,3		22	
Animalia	Aves	Burhinidae	0174	<i>Burhinus grallarius</i>	Bush Stone-curlew	E1,P		2	
Animalia	Aves	Haematopodidae	0131	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V,P		8	
Animalia	Aves	Haematopodidae	0130	<i>Haematopus longirostris</i>	Pied Oystercatcher	E1,P		8	
Animalia	Aves	Scolopacidae	0149	<i>Numenius madagascariensis</i>	Eastern Curlew	P	CE,C,J,K	1	
Animalia	Aves	Laridae	0953	<i>Sterna hirundo</i>	Common Tern	P	C,J,K	2	
Animalia	Aves	Laridae	0117	<i>Sternula albifrons</i>	Little Tern	E1,P	C,J,K	4	
Animalia	Aves	Laridae	0115	<i>Thalasseus bergii</i>	Crested Tern	P	J	5	
Animalia	Mammalia	Otariidae	1543	<i>Arctocephalus forsteri</i>	New Zealand Fur-seal	V,P		3	
Animalia	Mammalia	Otariidae	1882	<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal	V,P		1	
Animalia	Mammalia	Balaenidae	1561	<i>Eubalaena australis</i>	Southern Right Whale	E1,P	E	3	
Animalia	Mammalia	Physeteridae	1578	<i>Physeter macrocephalus</i>	Sperm Whale	V,P		1	
Animalia	Reptilia	Cheloniidae	2004	<i>Caretta caretta</i>	Loggerhead Turtle	E1,P	E	4	
Animalia	Reptilia	Cheloniidae	2007	<i>Chelonia mydas</i>	Green Turtle	V,P	V	87	
Animalia	Reptilia	Cheloniidae	2008	<i>Eretmochelys imbricata</i>	Hawksbill Turtle	P	V	7	



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 10-Sep-2024

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	7
Listed Threatened Species:	109
Listed Migratory Species:	65

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <https://www.dcceew.gov.au/parks-heritage/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	16
Commonwealth Heritage Places:	None
Listed Marine Species:	99
Whales and Other Cetaceans:	28
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	10
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	12
Key Ecological Features (Marine):	None
Biologically Important Areas:	5
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area

[\[Resource Information \]](#)

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name

Buffer Status

Commonwealth Marine Areas (EPBC Act)

In buffer area only

Listed Threatened Ecological Communities

[\[Resource Information \]](#)

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name

Threatened Category

Presence Text

Buffer Status

[Coastal Swamp Oak \(Casuarina glauca\) Forest of New South Wales and South East Queensland ecological community](#)

Endangered

Community likely to occur within area

In feature area

[Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland](#)

Endangered

Community likely to occur within area

In feature area

[Dunn's white gum \(Eucalyptus dunnii\) moist forest in north-east New South Wales and south-east Queensland](#)

Endangered

Community may occur within area

In buffer area only

[Littoral Rainforest and Coastal Vine Thickets of Eastern Australia](#)

Critically Endangered

Community likely to occur within area

In buffer area only

[Lowland Rainforest of Subtropical Australia](#)

Critically Endangered

Community likely to occur within area

In buffer area only

[Subtropical and Temperate Coastal Saltmarsh](#)

Vulnerable

Community likely to occur within area

In buffer area only

[Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions](#)

Endangered

Community likely to occur within area

In feature area

Listed Threatened Species

[\[Resource Information \]](#)

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Breeding known to occur within area	In feature area
Atrichornis rufescens Rufous Scrub-bird [655]	Endangered	Species or species habitat may occur within area	In buffer area only
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat known to occur within area	In feature area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Critically Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Erythrorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Endangered	Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In feature area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat known to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area	In feature area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area	In buffer area only
FISH			
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In feature area
Seriolella brama Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area	In feature area
FROG			
Assa darlingtoni Pouched Frog [1965]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Vulnerable	Species or species habitat known to occur within area	In feature area
Phyllorhina sphagnicola Sphagnum Frog [59709]	Vulnerable	Species or species habitat may occur within area	In buffer area only
INSECT			

Scientific Name	Threatened Category	Presence Text	Buffer Status
<u>Argynnis hyperbius inconstans</u> Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area	In feature area
<u>Phyllodes imperialis smithersi</u> Pink Underwing Moth [86084]	Endangered	Species or species habitat known to occur within area	In buffer area only
MAMMAL			
<u>Balaenoptera borealis</u> Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
<u>Balaenoptera musculus</u> Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
<u>Balaenoptera physalus</u> Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
<u>Chalinolobus dwyeri</u> Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat likely to occur within area	In feature area
<u>Dasyurus maculatus maculatus (SE mainland population)</u> Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
<u>Eubalaena australis</u> Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In feature area
<u>Notamacropus parma</u> Parma Wallaby [89289]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<u>Petauroides volans</u> Greater Glider (southern and central) [254]	Endangered	Species or species habitat known to occur within area	In feature area
<u>Petaurus australis australis</u> Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<u>Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</u>			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
<u>Potorous tridactylus tridactylus</u>			
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat known to occur within area	In feature area
<u>Pseudomys novaehollandiae</u>			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area	In feature area
<u>Pteropus poliocephalus</u>			
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
PLANT			
<u>Acronychia littoralis</u>			
Scented Acronychia [8582]	Endangered	Species or species habitat known to occur within area	In feature area
<u>Allocasuarina thalassoscopica</u>			
[21927]	Endangered	Species or species habitat known to occur within area	In feature area
<u>Arthraxon hispidus</u>			
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat known to occur within area	In feature area
<u>Bertya sp. Clouds Creek (M.Fatemi 4)</u>			
[84675]	Endangered	Species or species habitat may occur within area	In buffer area only
<u>Boronia umbellata</u>			
Orara Boronia [56301]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<u>Coleus nitidus listed as Plectranthus nitidus</u>			
Nightcap Plectranthus, Silver Plectranthus [91380]	Endangered	Species or species habitat likely to occur within area	In buffer area only
<u>Corynocarpus rupestris subsp. rupestris</u>			
Glenugie Karaka [19303]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area	In feature area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area	In feature area
Endiandra hayesii Rusty Rose Walnut, Velvet Laurel [13866]	Vulnerable	Species or species habitat known to occur within area	In feature area
Fontainea sp. Coffs Harbour (A.S.Benwell 341, NSW1102027) [91784]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Haloragis exalata subsp. velutina Tall Velvet Sea-berry [16839]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Hicksbeachia pinnatifolia Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Leichhardtia longiloba listed as Marsdenia longiloba Clear Milkvine [91911]	Vulnerable	Species or species habitat known to occur within area	In feature area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat known to occur within area	In feature area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat known to occur within area	In feature area
Owenia cepiodora Onionwood, Bog Onion, Onion Cedar [11344]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Parsonsia dorrigoensis Milky Silkpod [64684]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area	In feature area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat known to occur within area	In feature area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Samadera sp. Moonee Creek (J.King s.n. Nov. 1949) [86885]	Endangered	Species or species habitat known to occur within area	In feature area
Sarcochilus fitzgeraldii Ravine Orchid [19131]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Syzygium hodgekinsoniae Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat may occur within area	In feature area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area	In feature area
Vincetoxicum woollsii listed as Tylophora woollsii [40080]	Endangered	Species or species habitat known to occur within area	In feature area
Zieria prostrata Headland Zieria [56782]	Endangered	Species or species habitat known to occur within area	In buffer area only
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In feature area
Coeranoscincus reticulatus Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area	In feature area
Saltuarius moritzi New England Leaf-tailed Gecko, Moritz's Leaf-tailed Gecko [89490]	Endangered	Species or species habitat known to occur within area	In feature area

SHARK

Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Congregation or aggregation known to occur within area	In feature area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Migration route known to occur within area	In feature area
Galeorhinus galeus School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardeenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardeenna grisea Sooty Shearwater [82651]	Vulnerable	Breeding known to occur within area	In feature area
Ardeenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In feature area
Ardeenna tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area	In feature area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Sternula albifrons Little Tern [82849]		Breeding likely to occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophrys Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Marine Species			
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Migration route known to occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dugong dugon Dugong [28]		Species or species habitat may occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In feature area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area	In feature area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area	In buffer area only
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands

[\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status

Communications, Information Technology and the Arts - Australian Postal Corporation

Commonwealth Land - Australian Postal Commission [11377]	NSW	In buffer area only

Communications, Information Technology and the Arts - Telstra Corporation Limited

Commonwealth Land - Australian Telecommunications Commission [11384]	NSW	In buffer area only

Commonwealth Land - Australian Telecommunications Commission [11354]	NSW	In buffer area only

Commonwealth Land - Australian Telecommunications Commission [11374]	NSW	In buffer area only

Commonwealth Land - Australian Telecommunications Corporation [11373]	NSW	In buffer area only

Commonwealth Land - Telstra Corporation Limited [11385]	NSW	In buffer area only

Commonwealth Land - Telstra Corporation Limited [11379]	NSW	In buffer area only

Commonwealth Land - Telstra Corporation Limited [11381]	NSW	In buffer area only

Commonwealth Land - Telstra Corporation Limited [11378]	NSW	In buffer area only

Commonwealth Land - Telstra Corporation Limited [11382]	NSW	In buffer area only

Commonwealth Land - Telstra Corporation Limited [11380]	NSW	In buffer area only

Defence

Defence - Training Depot [10075]	NSW	In buffer area only

Defence - Training Depot [10074]	NSW	In buffer area only

Unknown

Commonwealth Land - [11375]	NSW	In buffer area only

Commonwealth Land - [11376]	NSW	In buffer area only

Commonwealth Land - [11383]	NSW	In buffer area only

Listed Marine Species

[\[Resource Information \]](#)

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Breeding known to occur within area	In feature area
Ardenna pacifica as Puffinus pacificus Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In feature area
Ardenna tenuirostris as Puffinus tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Breeding likely to occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea antipodensis gibsoni as Diomedea gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In feature area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area overfly marine area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area overfly marine area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area overfly marine area	In buffer area only
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area	In feature area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Pterodroma nigripennis Black-winged Petrel [1038]		Breeding known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Stercorarius antarcticus as Catharacta skua Brown Skua [85039]		Species or species habitat may occur within area	In buffer area only
Sterna striata White-fronted Tern [799]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Breeding likely to occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Fish			
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area	In feature area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area	In feature area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area	In feature area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area	In feature area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area	In feature area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area	In feature area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In buffer area only
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area	In feature area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area	In feature area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In feature area
Hippocampus kelloggi Kellogg's Seahorse, Great Seahorse [66723]		Species or species habitat may occur within area	In feature area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area	In feature area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area	In feature area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In feature area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area	In buffer area only
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area	In feature area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area	In feature area
Microphis manadensis Manado Pipefish, Manado River Pipefish [66258]		Species or species habitat may occur within area	In feature area
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area	In feature area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area	In feature area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In feature area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
Mammal			
Dugong dugon Dugong [28]		Species or species habitat may occur within area	In feature area
Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area	In feature area
Hydrophis platura as Pelamis platurus Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area	In feature area

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In feature area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In feature area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area	In buffer area only
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area	In buffer area only
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area	In buffer area only
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area	In buffer area only
Kogia sima Dwarf Sperm Whale [85043]		Species or species habitat may occur within area	In buffer area only
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area	In buffer area only
Mesoplodon grayi Gray's Beaked Whale, Scamperdown Whale [75]		Species or species habitat may occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area	In buffer area only
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area	In buffer area only
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In feature area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area	In buffer area only
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area	In buffer area only
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area	In buffer area only
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area	In buffer area only

Australian Marine Parks		[Resource Information]
Park Name	Zone & IUCN Categories	Buffer Status
Solitary Islands	Special Purpose Zone (Trawl) (IUCN VI)	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Bongil Bongil	National Park	NSW	In buffer area only
Bruxner Park	Flora Reserve	NSW	In buffer area only
Coffs Coast	Regional Park	NSW	In buffer area only
Kororo	Nature Reserve	NSW	In buffer area only
Moonee Beach	Nature Reserve	NSW	In buffer area only
Muttonbird Island	Nature Reserve	NSW	In feature area
Solitary Islands	Marine Park	NSW	In feature area
Split Solitary Island	Nature Reserve	NSW	In buffer area only
Ulidarra	National Park	NSW	In buffer area only
Yuraarla	Flora Reserve	NSW	In buffer area only

Regional Forest Agreements	[Resource Information]
Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.	

RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

EPBC Act Referrals					[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status	
Controlled action					
Clarence Valley and Coffs Harbour Regional Water Supply Project	2005/2191	Controlled Action	Post-Approval	In feature area	
Pacific Highway Upgrade - Coffs Harbour Bypass, NSW	2017/8005	Controlled Action	Post-Approval	In buffer area only	

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
25km upgrade of the Pacific Highway	2007/3910	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Land clearing for horticulture (blueberries), South Moonee, NSW	2013/7023	Not Controlled Action	Completed	In buffer area only
Rehabilitation and Re-sculpting of Coffs Creek Flying Fox Camp and Adjacent Rese	2007/3771	Not Controlled Action	Completed	In buffer area only
Safe management of vegetation within Obstacle Limitation Surfaces, Coffs Harbour Regional Aerodrome,	2016/7794	Not Controlled Action	Completed	In buffer area only
Sawtell Catholic Care of the Aged, NSW	2020/8738	Not Controlled Action	Completed	In buffer area only
Undertake vegetation removal as per CASA safety requirements	2011/6007	Not Controlled Action	Completed	In buffer area only
Vegetation removal over sewer infrastructure easement	2013/6725	Not Controlled Action	Completed	In buffer area only

Referral decision

Breeding program for Grey Nurse Sharks	2007/3245	Referral Decision	Completed	In feature area
World Rally Championship 'Super Special Stage'	2013/6731	Referral Decision	Completed	In feature area

Biologically Important Areas [\[Resource Information \]](#)

Scientific Name	Behaviour	Presence	Buffer Status
Dolphins			
Tursiops aduncus			
Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Breeding	Likely to occur	In feature area
Seabirds			
Ardenna carneipes			
Flesh-footed Shearwater [82404]	Foraging	Known to occur	In buffer area only
Procellaria parkinsoni			
Black Petrel [1048]	Foraging	Likely to occur	In buffer area only
Sharks			
Carcharias taurus			
Grey Nurse Shark [64469]	Foraging	Known to occur	In feature area

Scientific Name	Behaviour	Presence	Buffer Status
Whales			
Megaptera novaeangliae			
Humpback Whale [38]	Migration (north and south)	Known to occur	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact us](#) page.

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Department of Climate Change, Energy, the Environment and Water

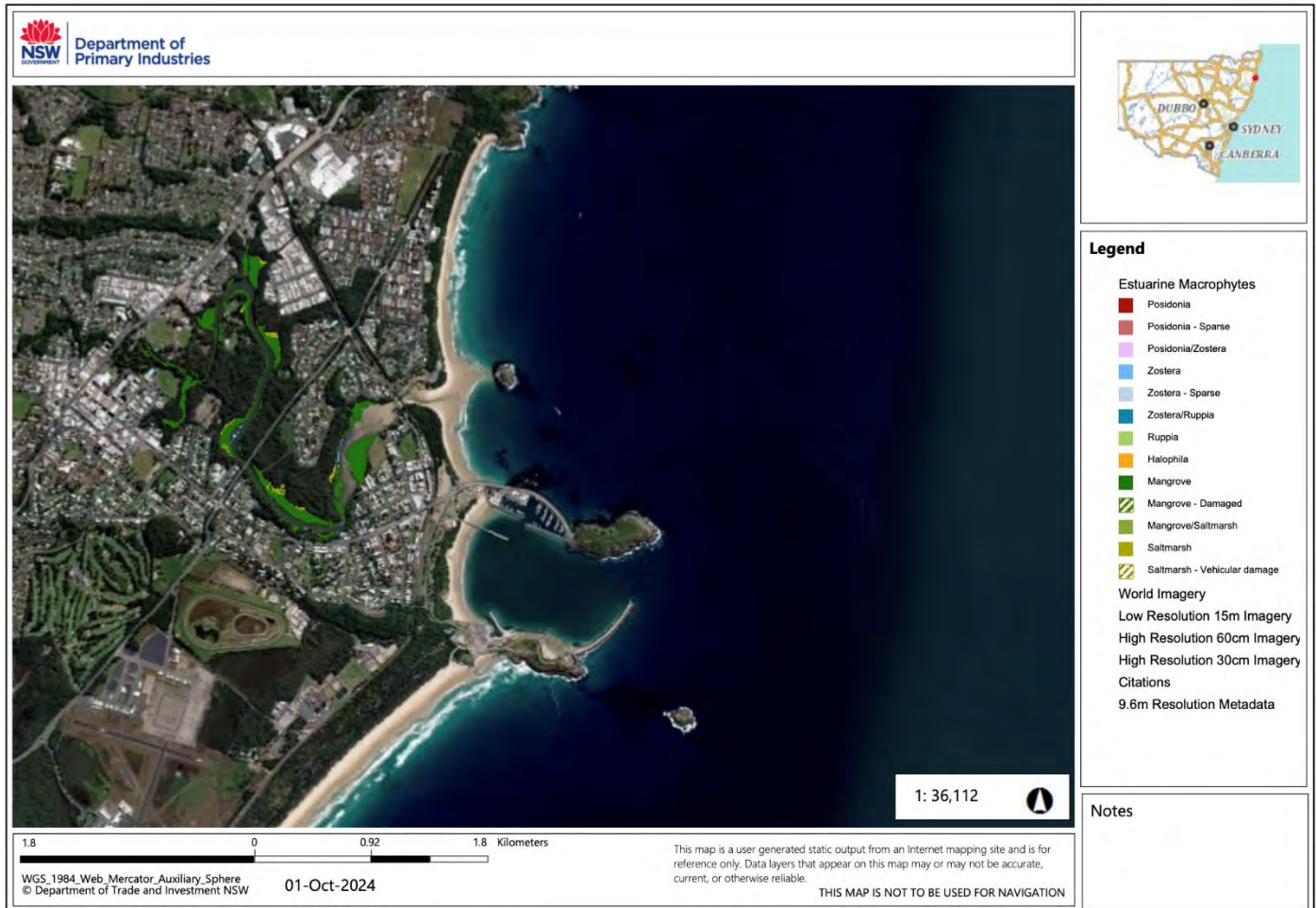
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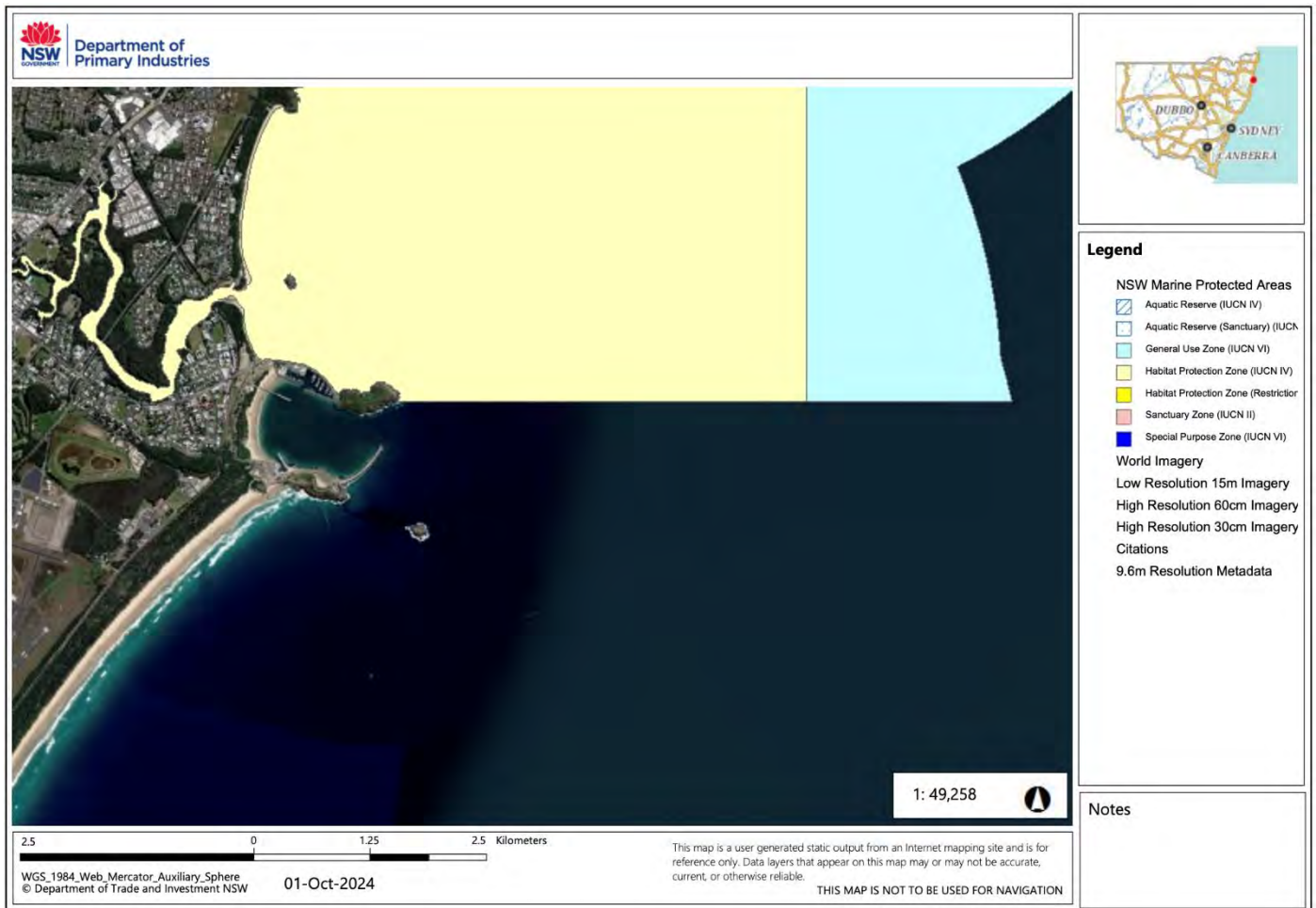
+61 2 6274 1111

Appendix 3 – Existing Ecological Mapping

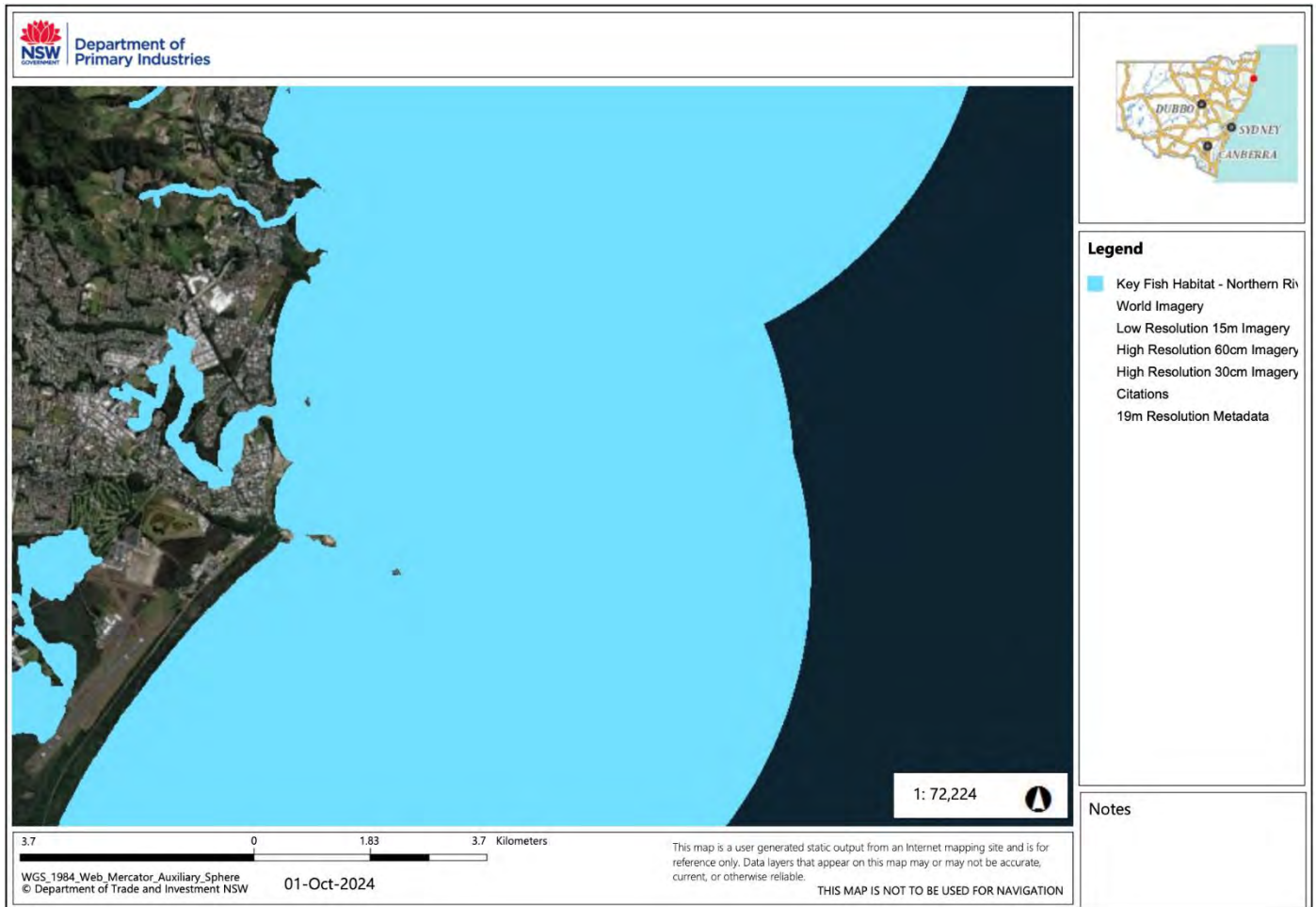
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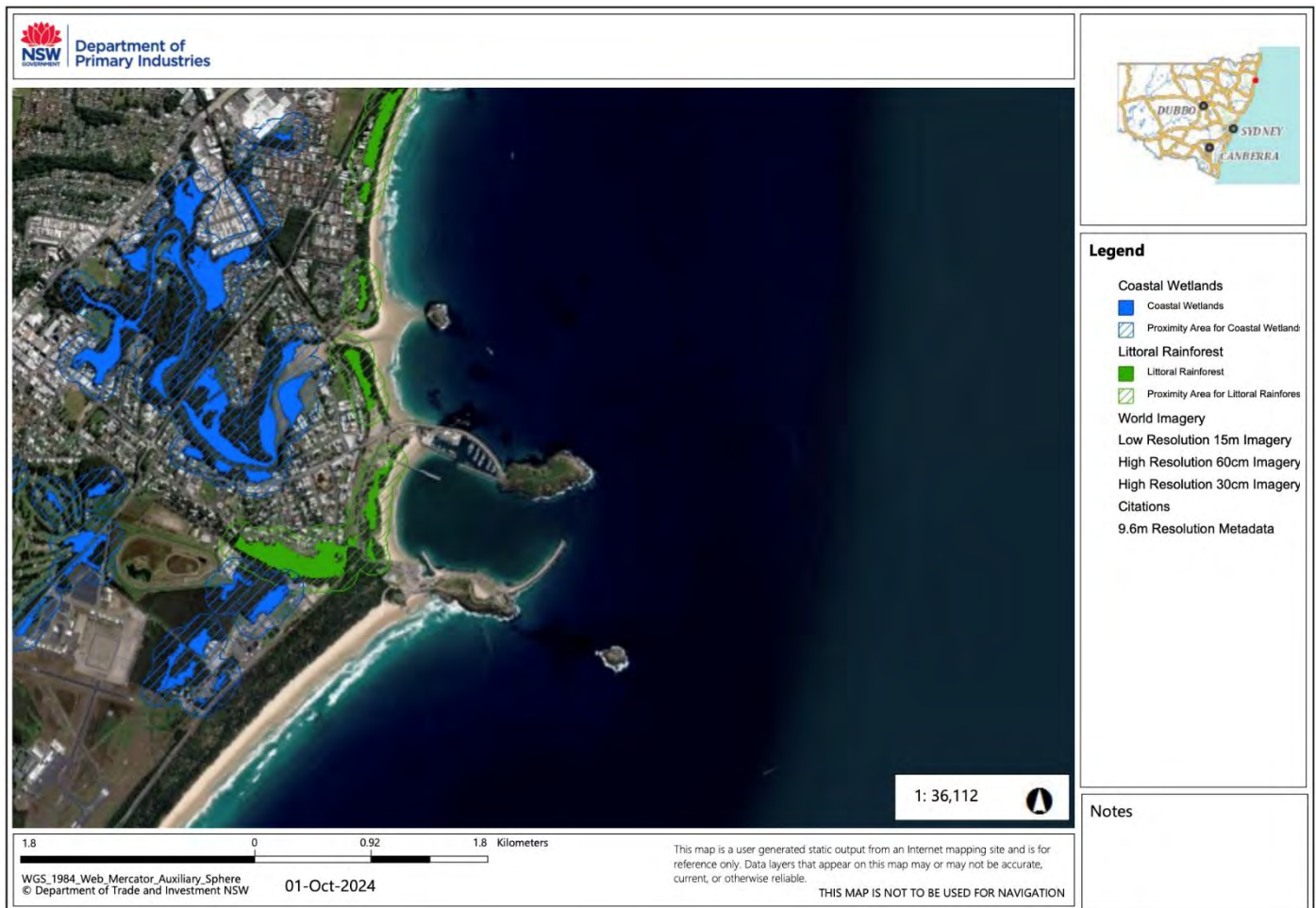
NSW Marine Protected Areas



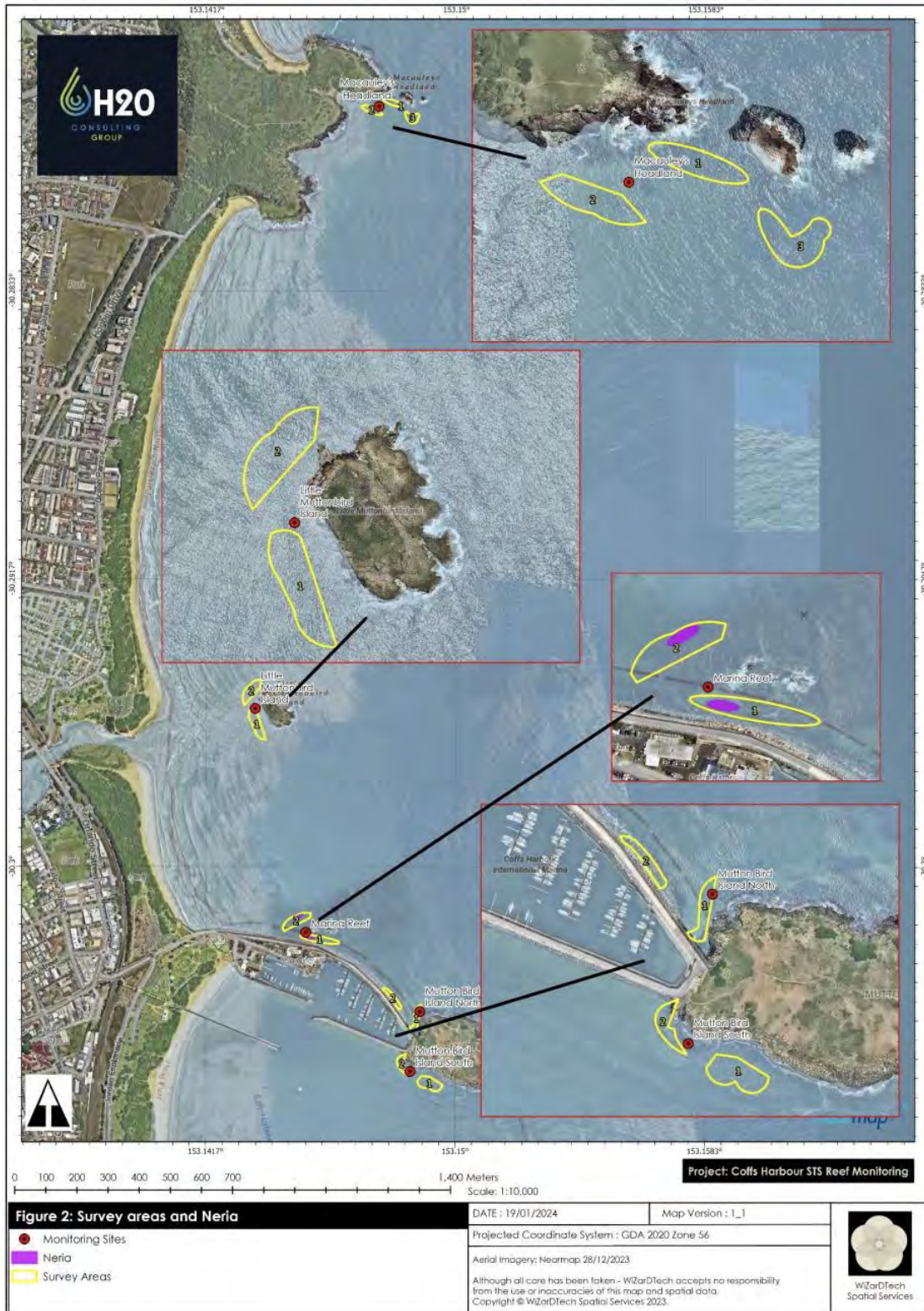
NSW Key Fish Habitat



Resilience and Hazards SEPP – Coastal Wetlands and Littoral Rainforests



Marine Brown Alga Mapping Coffs Harbour 2023 (H2O Consulting Group 2024a)



Appendix 4 – Particle Size Distribution Data

			S01	S02	S03 R1	S03 R2	S04	S05	S06	I01	I02	I03
EA150: Particle Sizing	Unit	LOR										
+75µm	%	1	99	97	99	98	98	99	99	99	99	99
+150µm	%	1	76	66	97	67	64	90	94	91	96	96
+300µm	%	1	2	8	77	5	2	8	15	26	44	56
+425µm	%	1	<1	2	65	1	<1	1	2	9	24	46
+600µm	%	1	<1	<1	50	<1	<1	<1	<1	3	10	37
+1180µm	%	1	<1	<1	14	<1	<1	<1	<1	<1	1	20
+2.36mm	%	1	<1	<1	2	<1	<1	<1	<1	<1	<1	7
+4.75mm	%	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3
+9.5mm	%	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
+19.0mm	%	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
+37.5mm	%	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
+75.0mm	%	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size												
Fines (<75 µm)	%	1	1	3	1	2	2	1	1	1	1	1
Sand (>75 µm)	%	1	99	97	93	98	98	99	99	99	98	88
Gravel (>2mm)	%	1	<1	<1	6	<1	<1	<1	<1	<1	1	11
Cobbles (>6cm)	%	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Median Particle Size (mm)			0.202	0.191	0.6	0.191	0.184	0.223	0.234	0.245	0.283	0.375

Appendix 5– Assessments of Significance

Threatened Shore Birds

Review of Species

Name /Species		Status BC Act	Status EPBC Act
Sooty Oystercatcher (<i>Haematopus fuliginosus</i>)		Vulnerable	-
Pied Oystercatcher (<i>H. longirostris</i>) –		Endangered	-
Species	Distribution	Habitat and Prey	Breeding
<i>H. fuliginosus</i>	Found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Small numbers of the species are evenly distributed along the NSW coast.	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries, where they forage on intertidal invertebrates such as limpets and mussels.	Breeds in spring and summer amongst pebbles and shells on rocky shores or cliffs located almost exclusively on offshore islands, but occasionally on isolated promontories.
<i>H. longirostris</i>	Distributed around the entire Australian coastline, although common in coastal Tasmania and parts of Victoria. In NSW the species is thinly scattered along the entire coast.	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide for molluscs, worms, crabs and small fish.	Nests between August and January, mostly on coastal or estuarine beaches, although occasionally they use saltmarsh or grassy areas.

Sources: DPIE (2020)

5-Part Test – BC Act

Threatened Shore Birds (*H. fuliginosus* and *H. longirostris*) – BC Act

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The impact assessment considerations to shore and wading birds in Section 4 has identified that dredging and the deposit of sand spoil from dredging to the nearshore Placement Area at Park Beach, have potential to impact indirectly on potential habitat for the Pied Oystercatcher and Sooty Oystercatcher. Impacts in Table 5 include: the disturbance of shoreline and aquatic habitat; possible disturbance to threatened species and their habitat; and possible noise impacts on foraging and roosting habitat. The Pied Oystercatcher will utilise sandy habitat at the entrance to estuaries for foraging, typical to that adjacent to Dredge Areas and onshore adjacent to the Sand Placement Area. While the Sooty Oystercatcher is more likely to utilise areas of rocky habitat.

Sooty Oystercatchers are known to forage amongst intertidal habitat at low tide adjacent to the proposal footprint. Breeding is unlikely to occur in the Study Area. Construction works will likely result in disturbance to a very small amount of habitat this species uses in the locality. These disturbances may include modification of beach habitat from nearshore sand placement where sediment is transported onshore, while increased noise during construction may reduce the availability and quality of foraging habitat at low tide adjacent to dredge areas or sand placement area. These disturbances are unlikely to have any adverse effects on the lifecycle of any individuals that may use this location at times. It is likely that individuals will still forage at low tide when works are not being undertaken and will use nearby areas with similar habitat when works are occurring. Given this, it is unlikely that the proposed action has potential to adversely affect the life cycle of the species such that local populations are likely to be placed at risk of extinction.

The Pied Oystercatcher typically uses sandy habitats, which may include those associated with Jetty Beach or Park Beach adjacent to the project area. As above, sand placement activities may modify foraging habitat the species uses on Park Beach where it is transported to the shoreline, whilst construction noise and presence of the dredge may reduce quality of foraging habitat. The habitat adjacent to the Study Area is only marginal and not considered to be of importance to the life cycle of the local population of this species. Occasional breeding of the species has been observed to the south at Bongil National Park, however, the marginal potential breeding habitat available in the Study Area is close to high amounts of human activity and is not expected to be naturally chosen as suitable habitat by nesting individuals.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not Applicable

(c) in relation to the habitat of a threatened species or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

- I. The shoreline and intertidal habitat that may be modified as a result of maintenance dredging campaigns over the 10 year approval period is limited to the to Park Beach, associated with the potential transport of placed dredged materials from the nearshore Placement Area to the lower shoreline of Park Beach. These modifications will not result in any net habitat loss and may provide additional or maintain existing foraging habitat for these species. Indirect impacts may include some positive sand accretion along Park Beach as sand released in the subtidal placement area may be transported onshore. Foraging habitat may be modified temporarily whilst sands settle but would be expected to return to normal conditions in a matter of weeks following placement.
- II. No habitat is expected to become fragmented or isolated as a result of the proposal.
- III. Potential modifications to the existing intertidal habitat on Park Beach will result in minimal change, with expected stable or net increase in habitat over the longer term. Additionally, sandy intertidal habitat on Park Beach represents only a small area of beaches in the locality that may be used by the species. Consequently, there is minimal potential to impact the long-term survival of any Sooty Oystercatchers and Pied Oystercatchers that use this habitat. Rocky intertidal is not expected to be modified as a result of the proposed maintenance dredging campaigns. Furthermore, habitat in the Study Area is not recognised to be of significance to the long-term survival of either species in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

No

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process

NSW KTPs with potential to be exacerbated by the proposed development do not have potential to impact on these shore birds

Conclusion	Disturbances to the Pied Oystercatcher and Sooty Oystercatcher from the proposed works include short term and minor disturbances to a small area of potential foraging and very marginal and likely highly disturbed roosting habitat that may be used opportunistically. Disturbances will be limited to occasional transport of placed sands from the nearshore placement area to lower onshore areas along Park Beach, which may deter birds from foraging and roosting or attract birds to sediment during placement works. These modifications are expected to result in the maintenance of or additional potential foraging habitat for the species over the 10 year approval period. Given the absence of previous nesting records, and the high recreational use of the area, it is unlikely that the site provides suitable nesting habitat for the Pied Oystercatcher. The Sooty Oystercatcher are known to breed in offshore locations. The proposal is not considered likely to result in a significant impact on the local population of the Pied Oystercatcher and Sooty Oystercatcher.

Migratory and Marine Birds

Review of Species

Name /Species		Status BC Act	Status EPBC Act
Wedge-tailed Shearwater (<i>Ardenna pacifica</i>)		-	Migratory
Short-tailed Shearwater (<i>A. tenuirostris</i>)		-	Migratory
Crested Tern (<i>Thalasseus bergii</i>)		-	Migratory
Little Tern (<i>Sterna albigfrons</i>)		Endangered	Migratory
Species	Distribution	Habitat and Prey	Breeding
<i>A. pacifica</i>	Widespread across the Indian and Pacific Ocean, spending non-breeding season in the tropics.	Found in association with tropical and subtropical waters, and offshore waters over the continental slope of eastern Victoria and southern NSW, mostly associated with sea-surface temperatures of 13.9–24.4 °C.	Breeds and nests on offshore islands including Muttonbird Island, Little Muttonbird Island and other offshore Islands in the adjacent SIMP.
<i>A. tenuirostris</i>	Migrates from wintering grounds in the northern hemisphere to the southern hemisphere to breed during summer.	Very common in NSW coastal waters during migration periods. Feeds on krill, small fish and other small marine creatures. Food is caught mostly at the surface of the water but sometimes birds are seen diving for food.	Breeds and nests mainly on small islands in Bass Strait and Tasmania. May breed and nest on offshore islands in the adjacent SIMP between August and May.
<i>T. bergii</i>	Found along the entire Australian coastline. Many populations are more or less resident around breeding areas. Australian birds disperse several hundred kilometres around colony.	Most common on tropical and subtropical coasts and oceanic islands. Nests on offshore islands, low-lying coral, sandy or rocky islets, coastal spits, lagoons, and recently on artificial islets in salt pans and sewage works. Forages in shallow waters of lagoons and barrier reefs, in estuaries, along beaches, and well out to sea. Rests on buoys or on rocks and sandbars, often with other terns and gulls.	Breeds in colonies on small offshore islands.
<i>S. albigfrons</i>	Migrates from eastern Asia, and is found on the north, east and south-east Australian coasts. In NSW, they arrive from September to November, occurring mainly north of Sydney with most departing by May.	Almost exclusively coastal, preferring sheltered environments; however, may occur several kilometres from the sea in harbours, inlets and rivers. Feeds on small fish, crustaceans, insects, worms and molluscs, typically by diving while aerially foraging.	Nests in small, scattered colonies in low dunes or on sandy beaches (especially sand spits along the NSW coast), just above high tide mark near estuary mouths or adjacent to coastal lakes and islands. Identified nesting site occurs to the south of Study Area at Sawtell. Breeds in spring and summer.

Sources: DAW (2020). DPIE (2020), Billerman et al (2020) and NPWS (2004)

5 Part Test: Marine Birds

Threatened Marine Birds (*S. albigfrons*) – BC Act

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The impact assessment considerations to migratory and marine birds in Section 4 has identified that dredging and the deposit of sand spoil from dredging to the nearshore sand placement area at Park Beach, have potential to impact indirectly on potential habitat for Little Tern. Impacts in Table 5 include: the disturbance of shoreline and aquatic habitat; possible disturbance to threatened species and their habitat; and possible noise impacts on foraging and roosting habitat.

The Little Tern typically uses sandy habitats that on rare occasions has included Jetty Beach to roost, whilst the species utilises sheltered sandy habitats (such as beaches or spits), typically near the mouth of estuaries to nest. The habitat in and adjacent to the Study Area is considered only marginal for the species and not considered to be of importance to the life cycle of the local population of this species. Habitat directly adjacent to works on Jetty Beach and Park Beach are in locations with a high amount of human activity that would not provide suitable nesting habitat for the species, which are easily disturbed. Breeding pairs in the locality would be expected to utilise known breeding sites, which are monitored by the City of Coffs Harbour and the NPWS at Hearn Lake Beach and Sawtell.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not Applicable

(c) in relation to the habitat of a threatened species or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

- i) The shoreline habitat that may be modified as a result of maintenance dredging campaigns over the 10 year approval period is limited to Park Beach, associated with the potential transport of placed dredged materials from the nearshore Placement Area to the lower shoreline of Park Beach. These modifications will not result in any net habitat loss and may provide additional or maintain existing roosting habitat that may be opportunistically used by this species. Indirect impacts may include some temporary reduced foraging habitat quality as a result of reduced water quality during dredging and as sand is released in the subtidal placement area.
- ii) No habitat is expected to become fragmented or isolated as a result of the proposal.
- iii) Marine bird habitat that may be impacted represents only a very small amount of that available and is considered marginal roosting/resting and foraging habitat for these species within the locality. These areas of habitat within and adjacent to the Study Area are not recognised to be of significance to the long-term survival of these species in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

No

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process

KTPs with potential to be exacerbated by the proposed development do not have potential to impact on Little Terns.

Conclusion

The Little Terns that may potentially at times utilise habitat in the vicinity of Study Area are unlikely to be significantly affected by the proposed activity. The Little Tern only has a moderate likelihood of occurrence in this area, while the adjacent sandy shoreline areas associated with Jetty Beach and Park Beach, and waters within and adjacent to the Study Area only provide marginal habitat for the species. Disturbances to the species are expected to be confined to temporary modification of roosting habitat that may be used opportunistically and a temporary reduction in foraging habitat quality.

Significant Impact Criteria: Migratory Marine Birds

Migratory Marine Birds (<i>A. pacifica</i> , <i>A. tenuirostris</i> , <i>T. bergii</i> and <i>S. albifrons</i>) (EPBC Act)	Likelihood of Impact
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	
1. 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	
Muttonbird Island and Little Muttonbird Island support a breeding colony of Wedge-tailed Shearwaters and is an area of important habitat for the species. The proposed dredging and sand placement works are restricted to subtidal habitats associated with sediments at the entrances to the Coffs Harbour marina and boat ramp harbour and subtidal habitat nearshore to Park Beach. The proposed actions are not expected to substantially modify, destroy or isolate Muttonbird or Little Muttonbird Island, with neither Island within proposed works areas. Other migratory marine birds (Short-tailed Shearwater, Crested Tern and Little Tern) may also occasionally use the islands for roosting, although likely rare. Subtidal and surface habitat of waters seaward of Muttonbird and Little Muttonbird Island likely provide significant foraging habitat for Wedge-tailed Shearwaters during breeding season. Foraging habitat in the dredge areas and nearshore placement area are very close to shore, high in boat traffic and shallow, and likely only provide very marginal foraging habitat for marine birds. Disturbances to subtidal foraging habitat as a result of reduced water quality or noise during dredging and subtidal sand placement are expected to be typically short-term, confined to a small area of this habitat in relation to the extensive area where these species may forage. Sandy shoreline at adjacent habitats at Jetty Beach and Park Beach provide only very marginal roosting and nesting habitat for marine birds such as the Little Tern. Shoreline habitat in these locations is not considered to be important habitat for these species; <i>A. pacifica</i>, <i>A. tenuirostris</i> and <i>T. bergii</i> are known to breed on offshore islands, whilst only very occasional sightings of the Little Tern have occurred on Jetty Beach and it is not considered a breeding site (NPWS 2004). The roosting and resting habitat associated with the Coffs Harbour breakwaters adjacent to the dredge areas only provides marginal habitat for marine birds. Impacts on this habitat will be confined to physical disturbances from the presence of dredge vessels or infrastructure and noise disturbances. The proposed works are not expected to substantially modify, destroy or isolate any important habitat for migratory species.	Unlikely
2. 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	
No known invasive species harmful to migratory marine birds are likely to be released or have their populations enhanced in an area of important habitat as a result of this proposal. Construction works will be confined to areas in the Study Area and outside important migratory marine bird habitat associated with nearby Muttonbird Island.	Unlikely
3. seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	

Muttonbird Island and Little Muttonbird Island are areas of important habitat for Wedge-tailed Shearwaters as individuals may return to islands upon return from migration or breed on the islands, with Muttonbird Island supporting a known breeding colony. The proposed works are confined to shallow subtidal areas and do not include any modifications to Muttonbird or Little Muttonbird Island. The proposed dredging campaigns are not expected to seriously disrupt breeding, feeding, migration or resting behaviour of Wedge-tailed Shearwaters on Muttonbird Island, however, depending on the timing of works, there is some marginal potential to exacerbate existing conditions. This may include a very marginal increased risk of collision (resulting in further injury or mortality) of birds with dredge vessels, either from already injured or exhausted birds on the water's surface or from fledglings taking first flight that are attracted to Coffs Harbour lights and fly inland, landing onshore or in shallow waters. Each year shearwaters are known to die or become injured at sea due during their migration naturally, which may come into contact with commercial and recreational vessels in the Harbour, whilst impacts to fledglings success already occur in the locality. Thus, the proposed actions are not expected to cause these impacts to the lifecycle of Wedge-tailed Shearwaters, whilst avoidance of works during critical time periods during end of migration and start of fledgling flights can also reduce potential for exacerbated impacts. The habitat in the Study Area is not considered of importance to the lifecycles of the populations of other migratory marine bird species that occur in the locality. Breeding and nesting of these migratory marine birds is not expected to occur in the Study Area, limited to offshore islands or known breeding sites nearby. Impacts with potential to disrupt the lifecycle of these species will be confined to short-term disturbances in habitat quality in the Study Area, which may include a minor portion of subtidal foraging habitat that nesting Wedge-tailed Shearwaters may use associated with nearby Muttonbird Island.	Unlikely
Conclusion Potential impacts to migratory marine birds from the proposed maintenance dredging and sand placement at Coffs Harbour are confined to areas of marginal habitat inside of the Study Area, including modification of marginal sandy roosting habitat and temporary disturbances to subtidal foraging habitat quality. It is not expected that these impacts will affect important migratory marine bird habitat associated with Muttonbird or Little Muttonbird Island, whilst it is also not expected that works will seriously disrupt the life cycle of migratory marine bird species.	

Marine Turtles

Species Review

Name /Species		Status BC Act	Status EPBC Act
Green Turtle (<i>Chelonia mydas</i>)		Vulnerable	Vulnerable, Migratory
Hawksbill Turtle (<i>Eretmochelys imbricata</i>)		-	Vulnerable, Migratory
Loggerhead Turtle (<i>Caretta caretta</i>)		Endangered	Endangered, Migratory
Species	Distribution	Habitat and Prey	Breeding
<i>C. mydas</i>	Widely distributed throughout tropical and sub-tropical waters and will occur at times in temperate waters. In coastal waters of NSW it is generally seen on the north and central coasts. Can migrate more than 2600 km between feeding and nesting grounds.	Hatchlings spend their pelagic phase drifting in ocean current until reaching 30-40cm size, when they will settle in shallow benthic foraging habitats such as tropical tidal and sub-tidal coral and rocky reef habitat or inshore seagrass beds. Adults eat mainly seagrass and algae, although they will occasionally eat other items including mangroves, fish-egg cases, and sponges. Young turtles tend to be more carnivorous than adults. During their pelagic stage they feed on plankton.	Breeding and nesting can occur all year round in some areas of the tropics. Typically nest on isolated beaches or offshore coral cays in tropical regions. Some nesting occurs on beaches in northern NSW between November and May.
<i>E. imbricata</i>	Found in tropical, subtropical and temperate waters in all the oceans of the world. Occasionally found in northern NSW waters. Migrates up to 2400 km between foraging areas and nesting beaches.	Hatchlings spend their pelagic phase drifting in ocean currents until reaching 30-40cm size, when they will settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat. Less frequently utilise seagrass habitats of coastal waters. Adults feed on sponges and algae.	Breeding animals move from their feeding grounds to areas near nesting beaches for mating. Nesting occurs in the northern Great Barrier Reef and the Torres Strait between January and April.
<i>C. caretta</i>	In Australia, it occurs in areas of coral and rocky reefs, seagrass beds and muddy bays throughout eastern, northern and western Australia, including temperate waters of NSW where it is seen as far south as Jervis Bay	Small Loggerhead Turtles live at or near the surface of the ocean and move with the ocean currents. As they grow, they remain typically ocean-dwellers, foraging in deeper water for fish, jellyfish and bottom-dwelling animals, before recruiting to their chosen inshore or neritic feeding area at approximately 70cm or more in size. In their juvenile stage they feed on algae, pelagic crustaceans, molluscs, flotsam and anthropogenic debris. As they grow they become more carnivorous, feeding primarily on benthic invertebrates and smaller amounts of jellyfish, starfish, corals, crabs and fish.	Nests on open, sandy beaches in tropical areas. Low density and sporadic nesting also occurs southwards into northern NSW. Breeds from November to March with nesting possible through to May.

Sources: DPIE (2020) and DAWE (2020).

5-Part Test – BC Act

Threatened Marine Turtles– BC Act

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Marine turtles may forage in subtidal habitats within and adjacent to the Study Area. Areas of reef associated with breakwaters and offshore reefs are likely to provide some marginal foraging habitat for marine turtles, should they enter the harbour. The foraging grounds that marine turtles utilise in the locality are likely to be widely spread along the coastline and throughout the adjacent SIMP.

Nesting by marine turtles are typically confined to more tropical habitats along the northern coastlines of Australia, however, increasing numbers of Green and Loggerhead Turtle nests are being recorded in NSW. Jetty Beach and Park Beach are within the more southern extent within which some sporadic nesting may occur, however rare nesting events in these areas are typically confined to more isolated beaches, such as the nearby Boambee Beach where a Green Turtle nesting event was recorded in 2018. There is some indication that marine turtles are nesting in areas further south in response to climate change, which may result in increased numbers of nesting marine turtles along the mid north coast of NSW in the next 10 years. Direct impacts from the proposed works are considered unlikely, with indirect impacts expected to be confined to a deterrence from the area or disturbance to foraging habitat for nesting turtles and hatchlings. Shoreline fauna checks will be required prior to the start of works to ensure nests or individuals are avoided if works occur during the nesting season to conduct a risk assessment. The proposal has minimal potential to affect the life cycle of any marine turtles in the locality.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not Applicable

(c) in relation to the habitat of a threatened species or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

- i) Habitat to be removed includes unvegetated soft sediments in shallow subtidal areas within Coffs Harbour, whilst habitat to be modified includes unvegetated subtidal marine. Subtidal habitats to be modified and removed would only be used transiently as part of movements to other habitats. Indirect impacts may include some temporary reduced foraging habitat quality as a result of reduced water quality during dredging and as sand is released in the subtidal placement area. Other disturbances will be restricted to some potential short-term and localised impacts on habitat quality as a result of reduced water quality, vessel movements associated with dredging and underwater noise.
- ii) No habitat is expected to become fragmented or isolated as a result of the proposal.
- iii) Reef habitats within the Study Area are considered only marginal for foraging by marine turtles. Marine vegetation that provide foraging value in these locations are not expected to be removed as a result of works, with disturbances limited to temporary habitat reduction as a result of increased turbidity and underwater noise. Reef habitat and pelagic areas inside and adjacent to the Study Area provide only very marginal foraging habitat for marine turtles due to high potential for human and artificial disturbances, so successful turtle nesting on Jetty Beach is unlikely. Given this, habitat within and adjacent to the Study Area is considered to be of minimal importance to the long-term survival of marine turtles that may utilise resources in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

No

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process

NSW KTPs with potential to be exacerbated by the proposed development do not have potential to impact on marine turtles.

Conclusion	Marine turtles that may potentially utilise habitat in the vicinity of the proposal are unlikely to be significantly affected by the proposed activity. Habitat use in the vicinity of the Study Area is likely to be very occasional and limited to opportunistic foraging as part of transient movements, with any nesting considered unlikely on the adjacent Jetty Beach or Park. Disturbances from the proposed works are limited to temporary reductions in habitat quality associated with the operation of the dredge and during sand placement, due to increased turbidity and sedimentation and disturbances from underwater noise.

Significant Impact Criteria: Threatened and Migratory Marine Turtles

Significant Impact Criteria: Migratory Marine Birds (EPBC Act)		Likelihood of Impact
An action is likely to have a significant impact on a threatened or migratory species if there is a real chance or possibility that it will:		
1. lead to a long-term decrease in the size of a population.		
The action is not expected to lead to any long-term decrease in the size of a population of marine turtles as:		Unlikely
- The foraging grounds that marine turtles utilise in the locality are likely to be widely spread along the coastline and throughout the adjacent SIMP. The Study Area only provides very marginal potential foraging grounds, which are not of a size of ecological relevance to the areas that marine turtles forage across in northern NSW waters. - Nesting by marine turtles in northern NSW is sporadic and of low density, while Jetty Beach and Park Beach are unlikely to be suitable due to the highly modified environment and high levels of potential human disturbance. Nesting has not been recorded previously at these locations.		
2. reduce the area of occupancy of the species		
The proposal will be limited to some short-term disturbances that may reduce habitat quality in the Study Area and potentially some adjacent areas at times (e.g. underwater noise, dredging vessel movements and water quality). Disturbances with potential to impact occupancy will likely be very short-term and limited to dredging or sand placement works that may impact on habitat quality. These short-term disturbances are not expected to impact the area of occupancy of marine turtles at any ecologically significant scales.		Unlikely
3. fragment an existing population into two or more populations		
The proposal is not expected to result in any habitat that marine turtles may use to become fragmented or isolated from other areas of habitat.		Unlikely
4. adversely affect habitat critical to the survival of a species		
The habitat is not considered to be critical to the survival of marine turtles.		Unlikely
5. disrupt the breeding cycle of a population of an endangered species or seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.		
The habitat is not considered to be critical to the life cycles (including breeding and nesting) of marine turtles.		Unlikely
6. modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline or an area of important habitat for a migratory species		
Reef habitats within the Study Area are considered only marginal for foraging by marine turtles and will not be directly removed or modified by the proposed works. The proposed maintenance dredging over the 10 year approval period will be confined to shallow, unvegetated soft sediments that do not provide foraging value for marine turtles. Other indirect modifications to reef habitat from sediment accretion are expected to be minimal. Short-term disturbances from construction and associated underwater noise, vessel movements and reduced water quality may impact on habitat quality over very short-periods. However, given the very low density of marine turtles and likely rare use of habitats within the harbour, these indirect impacts on habitat quality have minimal potential to result in any species decline for marine turtles.		Unlikely
7. result in invasive species that are harmful to a critically endangered, endangered or migratory species becoming established in the critically endangered, endangered or migratory species' habitat		
No known invasive species harmful to the endangered and/or migratory marine turtles are likely to be released or have their populations enhanced as a result of this proposal.		Unlikely

8. introduce disease that may cause the species to decline, or	
The proposed action is unlikely to result in the introduction of disease that may cause a decline of marine turtles.	Unlikely
9. interfere with the recovery of the species.	
The proposed action is unlikely to substantially interfere with the recovery of marine turtles.	Unlikely
Conclusion	
The proposal is unlikely to result in a significant impact on marine turtles. Impacts will be confined to short disturbances that may reduce habitat quality during dredging or sand placement, such as generation of underwater noise, dredging vessel movements or reduced water quality. This habitat represents only a very small area the species forages across and is not critical to their lifecycle, while nesting is unlikely to occur on nearby Jetty Beach or Park Beach.	

Marine Brown Alga

Species Review

Name /Species		Status FM Act	
Marine Brown Alga (<i>Nereia lophocladia</i>)		Critically Endangered	
Species	Distribution	Habitat	Reproduction
<i>N. lophocladia</i>	<i>N. lophocladia</i> was originally identified in Port Phillip Heads, SA in the late 1800s. The species now only occurs in NSW and has been sporadically recorded from Sawtell to Woolgoolga Headland. A small population of the species is known to occur on reef on the northern side of Coffs Harbour northern breakwater/ Muttonbird Island.	<i>N. lophocladia</i> occurs on hard substrate on the seabed at the sand/rock interface. It has been recorded at depths between 3-12 m and grows to between 10-15 cm.	The species has seasonal alternating life history stages, including a microscopic and macroscopic stage (macroscopic stage typically from July to December). Gametophytes consist of microscopic, branched creeping filaments, are dioecious and can survive indefinitely. Dispersal capabilities are believed to be limited.

7-Part Test – FM Act

Marine Brown Alga – FM Act
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
<i>Nereia lophocladia</i> possesses seasonal alternating life history stages, including a microscopic and macroscopic stage, influenced by environmental factors. Gametophytes can survive indefinitely (are free living), and if suitable environmental conditions prevail individual gametophytes may be able to survive for several years. Sediment movement and excessive sedimentation poses a threat to the species, as gametophytes or sporophytes may be smothered or buried. The presence of the northern breakwater has altered the sand scouring patterns on both sides of the marina, with evidence of large volumes of sediment accumulation transported during storm activity (Fisheries Scientific Committee 2008). The species has consistently been identified to occur on reef on the northern side of the Coffs Harbour northern breakwater adjacent to the northern side of Muttonbird Island. As this population is on the northern side of the northern breakwater, it will not be physically impacted by dredging activities within Coffs Harbour. Additionally, this population is ~950 m to the south of the southern extent of the subtidal placement area off Park Beach. Sedimentation of this habitat as a result of sand placement in Placement Area A is considered to be highly unlikely, considering the ample distance between habitats and considering the northward littoral drift dynamics of the location. Based on the current known distribution of the species, restricted to the more sheltered sand-rock interface on the northern side of Coffs Harbour northern breakwater, dredging and sand placement activities are not expected to have an adverse effect on the life cycle of the species such that the local population is likely to be placed at risk of extinction. The species has not been recently identified to occur within Coffs Harbour from targeted surveys, including in areas adjacent to the proposed dredge areas. However, the species has been previously identified to occur at Little Muttonbird Island, which is in proximity to Placement Area A. The most northern extent of the reef associated with Little Muttonbird Island that may provide suitable habitat for the species is approximately 160-170 m to the south of the placement area. There may be some potential that subtidal sand placement in this area may result in a pulse disturbance to habitat along the northern side of Little Muttonbird Island as a result of increased turbidity, however, significant sedimentation would not be expected at this location considering the current and sediment dynamics of the coastline, as modelled by RHDHV (2024 In Prep). If the species were to occur at this site, sand placement activities may result in some temporary disturbances, however, it is not likely that these disturbances would result in an adverse effect on the life cycle of the population.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.
Not applicable

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable

(d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

- i. Habitat to be removed as part of maintenance dredging during the 10 year approval will include soft sediments at the entrances to the Coffs Harbour Marina and Boat Ramp harbour. The proposed dredge areas focus on sediments in proximity to the boat ramp breakwater and the marina breakwater, with a maximum removal of 96,000 m³ of sediment in any 12 month period. Some short-term indirect impacts may occur to rocky reef habitat adjacent to dredge areas, associated with the southern side of Muttonbird Island, as a result of sediment pluming during works, whilst some minor and temporary reductions in habitat quality may also occur on the northern side of Little Muttonbird Island from subtidal sand placement.
- ii. No habitat is expected to become fragmented or isolated as a result of the proposal.
- iii. The soft sediment to be removed from dredge areas provides minimal to no habitat value for *N. lophocladia*, which requires hard substrate at the sand-rock interface. The species has not been previously recorded to occur within Coffs Harbour, with important habitat in the locality confined to reef on the northern side of the Coffs Harbour northern breakwater and northern Muttonbird Island. Sand at the interface of natural subtidal rocky reef habitat associated with the southern side of Muttonbird Island may provide potential habitat for future establishment of the species if environmental and sediment conditions are suitable, however, this location would not currently be considered as important habitat. Updated targeted surveys will need to be conducted over the 10 year approval period where works will occur within 50 m of the sand-rock interface to confirm the presence of important habitats, which may require further 7-part tests.

The northern side of Little Muttonbird Island may experience some short-term, indirect impacts from increased turbidity or sedimentation associated with subtidal sand placement at times. The species has been recorded at Little Muttonbird Island (Mamo et. al., 2021), however, was not observed in most recent targeted surveys in 2023 (H2O Consulting Group 2024a). The sand-rock interface at Little Muttonbird Island may at times provide important habitat for a small population of the species. With consideration of the current and sediment dynamics along the coastline in this location (RHDHV 2024 In Prep), it is expected that sediments placed in the subtidal placement area will be transported onshore, cross shore or northward. Sedimentation from placement at Little Muttonbird Island is expected to be confined to short-term pluming, whilst it will likely be minor with over 160 m distance from the reef.

(e) Whether the proposed development or activity is likely to have an adverse effect on any critical habitat (either directly or indirectly)

This question is not applicable, as no critical habitat has been listed for *N. lophocladia*.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Not applicable

(g) Whether the proposed development constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

KTPs with potential to be exacerbated by the proposed development do not have potential to impact on *N. lophocladia*.

Conclusion	Based on the current known distribution of <i>N. lophocladia</i>, the proposed dredging and sand placement activities are not considered to have a significant impact on the species such that it would result in the extinction of the local population. The known, consistently observed population on reef north of Coffs Harbour is not within the dredge areas and protected from dredging by the northern breakwater and Muttonbird Island. The population that has previously been recorded on Little Muttonbird Island may experience some minor, short-term sedimentation where extensive pluming occurs from subtidal placement, however, is over 160 m from the placement area and in the opposite direction of the natural current flow. Further 7-part tests may be required over the 10 year approval period where dredging is required within 50 m of the natural subtidal rocky reef on the southern side of Muttonbird Island, where <i>N. lophocladia</i> may have potential to occur.

Black Rockcod

Species Review

Name /Species		Status FM Act	Status EPBC Act
Black Rockcod (<i>Epinephelus daemeli</i>)		Vulnerable	Vulnerable
Species	Distribution	Habitat and Prey	Breeding
<i>E. daemeli</i>	Black Rockcod is now mostly found from southern Queensland to eastern Victoria, with the NSW coastline forming its main range. Adults are territorial and often occupy a particular cave for life.	Adult Black Rockcod are usually found in caves, gutters and beneath bommies on rocky reefs, from nearshore environments to depths of at least 50m. Small juveniles are often found in coastal rock pools, and larger juveniles around rocky shores in estuaries. Black Rockcod are opportunistic carnivores, eating mainly other fish and crustaceans.	The Black Rockcod is a protogynous hermaphrodite, first developing as a sexually mature female and then changing into a male later in life at a length of approximately 100–110cm.

Source: DPI (2015a).

7-Part Test – FM Act

Threatened Black Rockcod –FM Act
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
The Black Rockcod is known to be common on coastal reefs along the northern NSW coast and adjacent SIMP. Juveniles are also known to occur amongst rocks and cracks along the edges of break walls inside estuaries and harbours. Adults will typically frequent caves and overhangs on coastal reefs. The reef bommie in the Study Area provides potential Black Rockcod habitat, while juveniles could use cracks and crevices associated with adjacent breakwaters. Subtidal rocky reef associated with the southern side of Muttonbird Island in the Study Area also provides potential habitat for both juveniles and adults. Inspection of these areas during the survey did not find any Black Rockcod, and their use of these areas, if any, is unlikely to be permanent in nature. Furthermore, any use would only be by a very small part of the local population. High numbers of individuals have been identified at the outer Solitary Islands to the north of the Study Area, with the islands expected to be strongholds for larger individuals (Harasti & Malcolm 2013). Given this, the proposal is unlikely to have an adverse effect on the life cycle of the Black Rockcod such that a viable local population of the species is likely to be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.
Not applicable
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction
Not applicable

(d) in relation to the habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality	
i)	Rocky reef habitat will not be removed or directly modified as a result of the proposal. Modifications will be limited to indirect disturbances as a result of temporary reductions in water quality (increased sedimentation and turbidity) associated with dredging and sand placement activities. Other indirect disturbances may include underwater noise where the dredge operates in close proximity to subtidal rocky habitat.
ii)	No habitat is expected to become fragmented or isolated as a result of the proposal.
iii)	The habitat represents only a very small area of marginal Black Rockcod habitat. Use, if any, would only be by a very small part of the local population of Black Rockcod, while the habitat is unlikely to be significant to the long-term survival of the species in the locality.
(e) Whether the proposed development or activity is likely to have an adverse effect on any critical habitat (either directly or indirectly)	
This question is not applicable, as no critical habitat has been listed for Black Rockcod	
(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	
A Black Rockcod Recovery Plan has been prepared by the NSW DPI Fisheries (DPI, 2012). The objectives or actions of the recovery plan are: - Determine the distribution and abundance of Black Rockcod in NSW. - Initiate and support research into the biology and ecology of Black Rockcod. - Initiate and support research into the impacts of high and moderate risks to Black Rockcod. - Identify important areas of Black Rockcod habitat and implement appropriate actions to recover Black Rockcod. - Improve the collection of data on interactions between Black Rockcod and fishers. - Increase community awareness and support for Black Rockcod issues and recovery actions. - Ensure that management authorities carry out appropriate planning and impact assessment and make management decisions which minimise impacts on Black Rockcod habitats. - Mitigate the impacts of water pollution on Black Rockcod. Works during construction should be designed, implemented and managed to minimise potential for impacts on Black Rockcod. Impacts of disturbance to habitat and habitat quality from underwater noise and reduced water quality will require further consideration should Black Rockcod be found to be present at the subject site during construction works or if they are identified in surveys prior to construction works. A marine habitat survey has been recommended to be undertaken prior to works to include inspection of potential habitat, which will support a number of actions above.	
(g) Whether the proposed development constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	
KTPs with potential to be exacerbated by the proposed development do not have potential to impact on Black Rockcod.	
Conclusion	The viability of the Black Rockcod population that utilise habitat in the vicinity of the proposal is unlikely to be significantly affected by the proposed activity. Potential Black Rockcod habitat inside the Study Area is marginal habitat only and is not expected to be significant to the local population. Impacts from the proposal are restricted to some potential disturbances during construction works that may have some localised and short-term influence on habitat quality if they are present in the Study Area at this time.

Significant Impact Criteria: Black Rockcod

Significant Impact Criteria: Black Rockcod (EPBC Act)	Likelihood of Impact
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
1. lead to a long-term decrease in the size of an important population of a species	

The proposed action is limited to disturbances of marginal habitat associated with the rock bommie and artificial rocky habitat associated with breakwaters that Black Rockcod may occasionally use. Given the species was not found during the site survey and it has a high level of site fidelity, it is unlikely to occur in this area, however some new juveniles may recruit to these areas in the future. Disturbances are expected to be confined to indirect impacts from reduced water quality and underwater noise. Inspection of these areas during the survey did not find any individual Black Rockcod and their use, if any, of these areas is unlikely to be permanent in nature. Furthermore, any use by Black Rockcod would only be by a very small part of the local population. Given this, the proposal is unlikely to lead to a long-term decrease in the size of an important population of Black Rockcod in the locality.	Unlikely
2. reduce the area of occupancy of an important population	
The proposal is not expected to reduce any area of occupancy important to the Black Rockcod population in the locality. Survey of the site as part of this assessment did not find any Black Rockcod in the Study Area. This indicates it is unlikely that Black Rockcod permanently occupy these areas, and that any permanent occupancy or core habitat would be impacted.	Unlikely
3. fragment an existing important population into two or more populations	
The proposal is not expected to result in any habitat that Black Rockcod may use to become fragmented or isolated from other areas of habitat.	Unlikely
4. adversely affect habitat critical to the survival of a species	
The Study Area includes only a very small amount of marginal habitat that may be used by Black Rockcod at times. This habitat is unlikely to be critical to the survival of the species in the locality, while any disturbances will be minimal and short-term.	Unlikely
5. disrupt the breeding cycle of an important population	
The types of habitat in the Study Area and adjacent areas are not identified to be of importance for spawning by the population.	Unlikely
6. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	
Modification of potential habitat will be limited to indirect disturbances and not be expected to impact to an ecologically significant degree that would have potential to result in a likely decline of Black Rockcod.	Unlikely
7. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable, endangered, or critically endangered habitat or habitat for migratory species'	
No known invasive species harmful to Black Rockcod are likely to be released or have their populations enhanced as a result of this proposal.	Unlikely
8. introduce disease that may cause the species to decline, or	
The proposed action is unlikely to result in the introduction of disease that may cause a decline in the local Black Rockcod population.	Unlikely
9. interfere substantially with the recovery of the species.	
The proposed action is unlikely to substantially interfere with the recovery of Black Rockcod.	Unlikely
Conclusion	
Habitat in the Study Area is not considered significant habitat for Black Rockcod or likely to be utilised by a significant part of the local population. Any impacts on Black Rockcod will be dependent on their occurrence at the time of construction works and, if the species is present, will typically be confined to short-term disturbances to habitat quality during periods of reduced water quality or generation of underwater noise.	

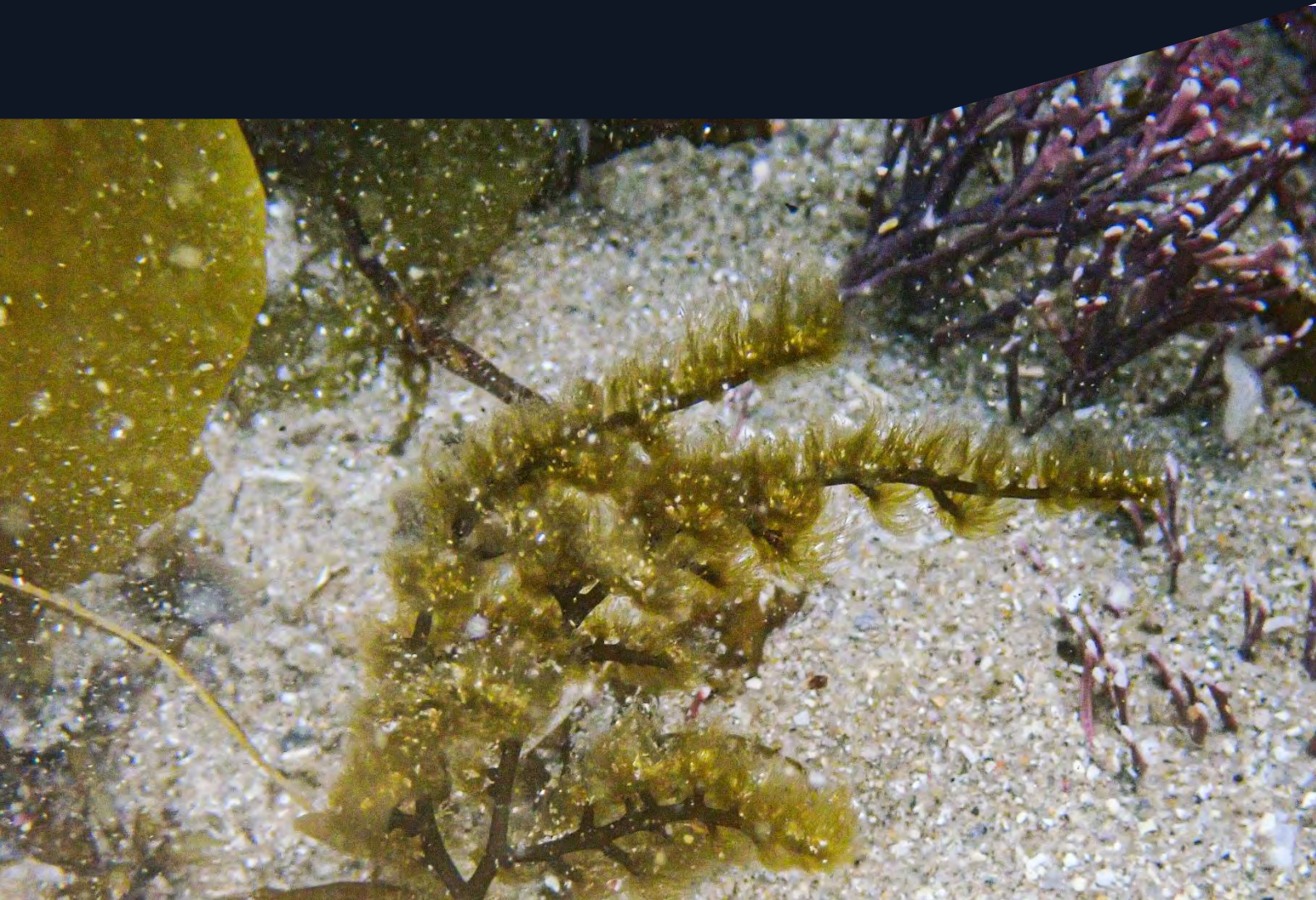
Appendix 6 – Benthic Assessment Procedure

Benthic Assessment Procedure- Supplement Document to the AEA

Coffs Harbour Ongoing Maintenance Dredging

Prepared For: Transport for NSW

Report Date: 18 December 2024



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Cover Photo: *Nereia lophocladia* growing amongst marine sands

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1 Introduction

1.1 Background

The Benthic Assessment Procedure (BAP) has been prepared as a supplementary plan to the Aquatic Ecology Assessment (AEA), which has considered impacts on aquatic ecology of the 10-year approval for maintenance dredging works by TfNSW at Coffs Harbour.

The AEA has undertaken a full assessment of aquatic biodiversity and Key Fish Habitat (KFH). However, impacts on some items of biodiversity are unable to be reliably assessed beyond 12 months, whilst the distribution of the Critically Endangered Marine Brown Alga (*Nereia lophocladia*) that is known to occur in the locality, may change in the project area over time periods greater than 12 months. Furthermore, the current placement location may also require modification for future dredging campaigns to accommodate changes in coastal processes and conditions. Given this, a BAP is a recommended requirement of the AEA to ensure biodiversity values at a significant level of risk from the proposal are adequately managed through the 10-year approval.

1.2 Purpose and Objectives

The purpose of the BAP is to:

- Identify items of aquatic biodiversity, which will require more regular consideration and assessment prior to each dredge campaign.
- Identify additional survey requirements (dredge footprint and placement locations) to provide adequate assessment and management of benthic biodiversity for each dredging campaign.
- Identify additional reporting, assessment and approval requirements to be applied at the campaign level, such as monitoring or offsets.

The objective of the BAP is to provide a process that ensures the precautionary principles to avoid, minimise and mitigate impacts on benthic biodiversity of the 10 year approval can be implemented in a manner that allows for:

- Campaign specific consideration of impacts and application of management actions to avoid significant impacts and/or maximise opportunity to reduce impacts on benthic habitat.
- Allow TfNSW to respond quickly in ensuring adequate maintenance and safe navigation of channels that provide locally significant maritime infrastructure.
- Opportunity to monitor and document changes in benthic communities through the 10 year approval.

2 Legislative Context and Related Documents

2.1 Legislative Context

Table 1: Legislation relevant to this document

Name	Legislation Definition
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Identifies and protects Commonwealth listed marine items of biodiversity as Matters of National Environmental Significance (MNES).
<i>Fisheries Management Act 1994</i> (FM Act)	State listing of species that are protected under the legal framework of the act as significant species, ecological communities and populations.
<i>Fisheries Management (General) Regulation 2010</i>	Concerns fisheries management and conservation including protection of aquatic habitats and threatened species.
<i>The Environmental Planning and Assessment Act 1979</i> (EP&A Act)	Section 5A of the EP&A Act lists factors which must be taken into account to determine whether there is likely to be a significant effect on threatened species, populations, and ecological communities or their habitats. Also termed the '7- Part Test', this consideration assists with the assessment of applications.

2.2 Related Documents

This BAP has been prepared in consideration of the Policy and Guidelines for Fish Habitat Conservation and Management (Fairfull 2013).

This document should be read in conjunction with the Coffs Harbour Maintenance Dredging Works - Aquatic Ecology Assessment, prepared by H2O Consulting Group (2024a).

3 Sensitive Benthic Receptors

A number of species that inhabit benthic environments are sensitive to or may provide habitat to species that are sensitive to direct and indirect impacts from dredging. Species such as seagrasses and macroalgae can be sensitive to disturbance, whilst they also provide important habitat for wide diversity of aquatic species, including threatened species. Threatened species that utilise benthic habitats can be particularly sensitive, especially when they have limited dispersal mechanisms or possess a small home range. The sensitive receptors with potential for impact from the project have been identified below, to be considered in each MHS. Other sensitive or threatened species not identified here, but observed within the Study Area during surveys should also be considered.

3.1 Marine Vegetation

Macroalgae stands within Coffs Harbour are predominantly confined to natural rocky reef habitat, including the southern side of Muttonbird Island, occasional rocky reef along the southern shoreline and the rocky bommie north of the boat ramp breakwater. In the wider area, rocky reefs associated with Muttonbird Island and Little Muttonbird Island and extensive reef formations to the east of the Harbour, also provide habitat for macroalgal stands. Macroalgae along the breakwaters adjacent to the Dredge Areas were typically restricted to lower intertidal assemblages.

Macroalgae stands present within Coffs Harbour are dominated by Gulfweed (*Sargassum* sp.), brown alga (*Cystophora* sp., *Padina crassa* and *Petalonia binghamiae*) and encrusting coralline algae (*Corallina officinalis*). These species are predominantly restricted to the natural rocky reef habitat and rocky bommie within the Harbour, with low-density assemblages along some lower intertidal zones of artificial breakwater ballast rocks.

The Critically Endangered Marine Brown Alga (*Nereia lophocladia*) is known to occur in the locality and has been recorded on the northern side of Muttonbird Island, along the Coffs Harbour northern breakwater, around the drying rocks and bommie at the southern end of North Wall and around Little Muttonbird Island. Most recent targeted surveys for the species identified it to occur at the sand-rock interface at the bommie at the southern end of North Wall Beach in 2023 (H2O Consulting Group 2024b) (refer to Figure AX-1). The Coffs Harbour coastline from Sawtell to Woolgoolga supports the only known populations of the species, which is found on hard substrate at the sand and rocky reef interface. The species typically prefers habitats in dynamic areas of reefs, rockpools, or submerged rocky outcrops. The movement of sand following storms of coastal development threatens the species (NSW DPI 2018), although scouring by sand movement may provide opportunities for *N. lophocladia* establishment by removing existing marine growth.

Macroalgae stands are considered Type 2 KFH (Fairfull 2013), while Gulfweed is increasingly found to be utilised as habitat by threatened Syngnathid species, where it grows within recruitment proximity to known populations. Habitat supporting *N. lophocladia* or, where applicable, any known or expected threatened species habitat is considered Type 1 KFH (Fairfull 2013).

3.2 Benthic Species

3.2.1 Cauliflower Soft Coral

The Cauliflower Soft Coral (*Dendronephthya australis*) is an endangered benthic species that can grow amongst soft sediments dominated habitats, often in the lower reaches of open estuaries. The species has

not been previously recorded in Coffs Harbour (ALA 2024). However, the species is increasingly being sighted and may have potential to establish in the vicinity of works in the next decade, with a recent sighting of the species at South West Rocks in 2021 (ALA 2024).

There remains some potential that populations of the species may establish in the locality where suitable habitat and required environmental conditions occur in the future. Any known or expected threatened species habitat is considered Type 1 KFH (Fairfull 2013).

3.3 Marine Fish

3.3.1 Black Rockcod

Rocky reef habitat in the Study Area associated with Muttonbird Island, the rocky bommie to the north of the boat ramp breakwater and artificial rocky habitat associated with Coffs Harbour breakwaters may at times provide suitable habitat for the Vulnerable Black Rockcod (*Epinephelus daemeli*). The species utilise deeper shoreline areas along rock drop-offs where ledges, overhangs and caves occur and typically move to deeper waters as they increase in size. There is potential that juveniles may occasionally utilise habitat associated with the bommie and artificial breakwaters directly adjacent Dredge Areas at times, whilst natural rocky reef along the southern side of Muttonbird Island may also provide potential habitat for juveniles and adults.

Marine rocky reef habitat is considered Type 2 KFH, whilst known or expected threatened species habitat is considered Type 1 KFH (Fairfull 2013).

4 Requirements

4.1 Marine Habitat Survey

A Marine Habitat Survey (MHS) must be undertaken for each dredging campaign. It shall include assessment of all KFH within the dredge footprint (including any batters) and placement locations and any Type 1 and 2 KFH within 50m of both the dredge footprint and placement locations.

A new MHS will be required for all campaigns that occur beyond 12 months of the Aquatic Ecology Assessment.

The objectives of each MHS are:

- Determine if there is potential for direct or indirect impacts on any threatened species, populations or communities identified in Section 3 of the project BAP. Additional threatened species, populations or communities would be assessed if identified during surveys.
- Determine and quantify if there is potential for direct or indirect impacts on Type 1 or Type 2 KFH.

Where there is potential for direct or indirect impacts on any threatened species, dredge design should be reviewed. If all potential direct and indirect impacts can not be avoided a 7-Part Test under s5A of the EP&A Act (items listed under the FM Act) must be undertaken and where relevant the Significant Impact Criteria (items listed under the EPBC Act) will be required for each item.

4.1.1 Survey Requirements

The MHS site survey must be undertaken within 12 months of the commencement of each dredging campaign and must include habitat within and adjacent to the Dredge Areas and Placement Areas to be utilised during each campaign.

The site survey must include:

- Aerial imagery collected by drone (within 3 months of seabed survey) flown at 100m (during time of good water clarity) to facilitate identification of potential Type 1 and 2 KFH habitat in the Study Area.
- A seabed survey (with the exception of clear waters in less than 2m depth at LAT or that occur within the surf zone) using a towed camera or ROV for subtidal areas. This to include field verification points. Surveys must ensure:
 - o Drone imagery is collected within 3 months of the site survey to identify areas with potential Type 1 or 2 KFH.
 - o In areas identified from drone imagery as potential Type 1 or 2 KFH, that a minimum of 80% of the seabed within the Study Area is evenly and visually inspected based on camera field of view, water visibility and distance between transects/observations, with distances between field verification points being no greater than 30m.
 - o In other areas, that a minimum of 40% of the seabed within the Study Area is evenly and visually inspected based on camera field of view, water visibility and distance between transects/observations, with distances between field verification points being no greater than 50m.
- In-water snorkel inspection of rocky bommie in Dredge Area 2 and areas of natural or artificial rocky habitat directly adjacent (within 5 m of Dredge Areas) for Black Rockcod.

- A site walk over at low tide for intertidal areas with potential Type 1 and 2 KFH habitat, if identified - see Figure AX-2.
- Identification of KFH habitat attributes for Type 1 and 2 KFH to include habitat type and species composition and density for marine vegetation.

4.1.1.1 Conditional Additional Survey Requirements

Where dredging is required within 50 m of natural subtidal rocky reef, a targeted search for *N. lophocladia* must be conducted along the sand-rock interface (refer to Figure AX-1). Note that this excludes the rocky bommie at Dredge Area 2. This survey must include:

- In-water diver survey of the sand-rock interface that occurs within 50 m of the proposed Dredge Area boundary by a marine scientist with previous experience identifying the species.
- Be conducted during the visible macroscopic life stage of *N. lophocladia*, which is typically between the end of July and start of December.
- Be conducted within 24 months of the associated dredging campaign.

Further surveys may be required if the species is identified to occur.

4.1.2 Reporting requirements

The MHS report must be prepared based on the survey undertaken within 12 months of the commencement of each dredging campaign. The report should be provided to TfNSW at least 2 months prior to dredging commencement to allow for preparation of permits, SIS, management plans or offsets.

The report must include:

- Brief Background.
- Clear description of the proposed dredging works (area, volume depth, batter etc) and placement areas supported by a map prepared with GIS software, including description of the dredging and sand placement methodology to be used and duration/timing of the works.
- Survey methodology and environmental conditions.
- Description of species identified and Type 1 and 2 KFH supported by mapping using GIS software.
- Identification of potential direct and indirect impacts with specific reference to:
 - o Threatened species, populations or communities identified in the project BAP; and
 - o Estuarine vegetation that provides Type 1 or Type 2 KFH.
- Quantification of any areas of Type 1 or 2 KFH to be directly impacted.
- Recommendations to avoid, minimise and mitigate potential impacts.
- Identification of the requirement for:
 - o Section 205 Permit application.
 - o Preparation of a Species Impact Statement (SIS).
 - o Species management plans and further monitoring.
 - o Offsets and a Marine Biodiversity Offsetting Strategy (MBOS) is required.
- If required, any 7-Part Test or Significant Impact Criteria as an Appendix with summaries of the findings provided in the report body.

4.1.3 Consultation requirements

The MHS report shall be provided to DPI fisheries a minimum of 30 days prior to the commencement of dredging. Should a Section 205 Permit or SIS be required this report should be provided at least 60 days prior to the commencement of dredging as additional consultation may be required.

4.2 Species Impact Statement

A SIS is a statement referred to in Subdivision 2 of Division 6 of the FM Act and includes an environmental impact statement, prepared under the Environmental Planning and Assessment Act 1979, that contains a SIS.

A SIS is required if a MHS determines that the project will have a significant impact via the 7-Part Test based on a finding of significance under s5A of the EP&A Act or if the proposal involves critical habitat declared under the FM Act, at any time during the project. There are a number of requirements that the proponent must adhere to under the FM Act regarding the preparation of a SIS, detailed below, including the request of SIS requirements from the Secretary (s221L) and the obtaining of concurrence of the Fisheries Agency Head before any works commence (s221ZZ).

4.2.1 Survey Requirements

The survey must determine the type, location, size and condition of the habitat (including critical habitat) of the species or population and details of the distribution and condition of similar habitats in the region.

The survey must ensure an estimate of the local and regional abundance of the species or population can be made. This must account of adequate consideration and measure of temporal variability of the species or population, with consideration of its life history.

4.2.2 Reporting requirements

The SIS must be signed by the principal author of the statement and by the sponsor.

The SIS must include details of the qualifications and experience in threatened species conservation of the person preparing the statement and of any other person who has conducted research or investigations relied on in preparing the statement. The content of the SIS must be in accordance with s221K of the FM Act and include anything additional as required by the Secretary.

The SIS must include:

- A full description of the action proposed, including its nature, extent, location, timing and layout and, to the fullest extent reasonably practicable.
- A general description of the species or population in the area are likely to be affected by the action.
- Details of the species or populations local, regional and State-wide conservation status, the key threatening processes generally affecting it, its habitat requirements and any recovery plan or threat abatement plan that applies.
- An estimate of the local and regional abundance of the species or population.

- A full description of the type, location, size and condition of the habitat (including critical habitat) of the species or population and details of the distribution and condition of similar habitats in the region.
- A full assessment of the likely effect of the action on the species or population, including, if possible, the quantitative effect of local populations in the cumulative effect in the region.
- A description of any feasible alternatives to the action that are likely to be of lesser effect and the reasons justifying the carrying out of the action in the manner proposed, having regard to the biophysical, economic and social considerations and the principles of ecologically sustainable development.
- A full description and justification of the measures proposed to mitigate any adverse effect of the action on the species or population, including a compilation (in a single section of the statement) of those measures.
- A list of any approvals that must be obtained under any other Act or law before the action may be lawfully carried out, including details of the conditions of any existing approvals that are relevant to the species or population.

Further details of the requirements can be found s221K of the FM Act.

4.2.3 Consultation requirements

The Secretary (of NSW DPI) must be consulted prior to preparation of the SIS for any further requirements in regard to the form and content of the SIS.

Additionally, under s221ZZ (3) of the FM Act, the determining authority is not to carry out the activity, or grant an approval to carry out the activity, if the activity is likely to significantly affect threatened species, populations or ecological communities, unless the determining authority has obtained the concurrence of the Fisheries Agency Head.

4.3 Management Plans

Management Plans may be recommended as part of the MHS, requested as a condition/requirement of a Section 205 Permit or identified as a mitigation measure of the SIS. Management plans may be required where there is potential for impacts on a threatened species or protected species to minimise and mitigate impacts or quantify the indirect impacts.

The management plan outline in detail further site inspections, surveys, auditing, reporting and monitoring requirements. It will include the following sections:

- Background
- Project requirements
- Identification of Impacts
- Management of Impacts
- Required Documentation

If required, the management plan is to be submitted to DPI Fisheries before commencement of the dredging works.

4.4 Offsetting

Where Type 1 or 2 KFH is directly impacted offset requirements will be determined as part of the MHS.

For indirect impacts monitoring will be required to determine if and the amount of offset that is required. Any monitoring requirements would be outlined within the species management plan.

Once an area has been offset, it will be exempt from further offset for the duration of the 10 year approval. Areas offset should be mapped as a spatial layer and revised in subsequent Marine Habitat Surveys if further offsetting is required.



Figure AX-1: Indicative known *Nereia lophocladia* habitat at Coffs Harbour and natural rocky reef within the Study Area. Figure shows 50 m and 100 m buffer zones.

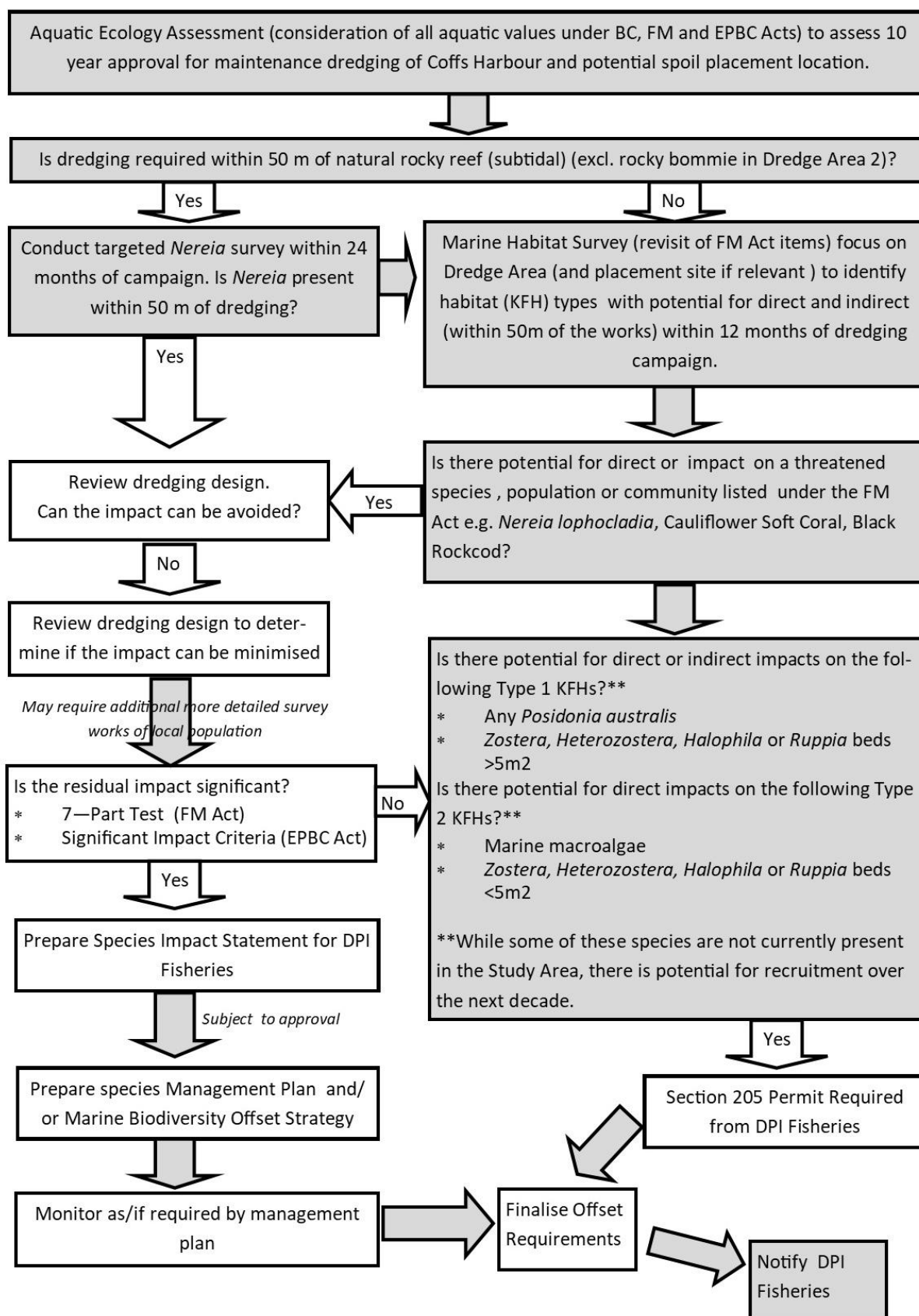


Figure AX-2: Flow chart outlining the expected approval pathway and requirements

References

- Fairfull, S. (2013), *Policy and guidelines for fish habitat conservation and management*. NSW Department of Primary Industries, Fisheries, Woolongbar, NSW.
- H2O Consulting Group (2024a). Aquatic Ecology Assessment – Coffs Harbour Maintenance Dredging Works. *Prepared for Blue Sky Planning and Environment on behalf of Transport for NSW*.
- H2O Consulting Group. (2024b). Marine Ecological Monitoring Report – Coffs Harbour Sand Transfer System. *Prepared for Transport for NSW*.
- Kelagher, B. and Mamo, L. (2019). Targeted surveys for the critically endangered marine brown alga *Nereia lophocladia* on the Coffs Harbour Eastern Breakwater and adjacent shores. Report prepared by Southern Cross University for the Department of Industry, Crown Lands and Water.
- Kelagher, B. (2020). Targeted survey for the critically endangered marine brown alga *Nereia lophocladia* on patch reefs inside Coffs Harbour. Report prepared by Southern Cross University for the Department of Industry, Crown Lands and Water.
- Mamo, L. T., Wood, G., Wheeler, D., Kelagher, B. P. and Coleman, M. A. (2021). Conservation genomics of a critically endangered brown seaweed, *Journal of Phycology*, Vol 57, 1345-1355, DOI: 10.1111/jpy.13177
- NSW DPI (2021). Cauliflower Soft Coral – *Dendronephthya australis*. Primefact INT21/391176, First edition, DPI Fisheries – Threatened Species Unit.
- NSW DPI (2023). Review of the Black Rockcod Recovery Plan. INT22/14376, DPI Fisheries – Threatened Species Unit.
- NSW DPI. (2024), *Fisheries NSW Spatial Data Portal*.
https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries_Data_Portal
- Yee, N. R., Finley, L., Roberts, A., Kelagher, B., and Millar, A. J. K. (2017). Re-discovery of the critically endangered marine brown alga, *Nereia lophocladia* (Order Sporochneales) at Coffs Harbour, NSW, Australia, *Marine Biodiversity*, DOI 10.1007/s12526-017-0796-y

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Appendix D

Sediment and Water Quality Characteristics Assessment

Coffs Harbour Dredging

Sediment and Water Quality Characteristics Desktop Assessment



December 2024

Disclaimer:

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Acknowledgement of Country:

Transport for NSW, Blue Sky Planning and Hydrosphere Consulting acknowledge the Traditional Custodians of the land discussed in this document and pay tribute and respect to the Elders past, present and emerging.

Front cover image: Looking towards Dredge Area 2, Coffs Harbour, June 2024.

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24-027
COFFS HARBOUR DREDGING SEDIMENT AND WATER QUALITY

REV	DESCRIPTION	AUTHORS	REVIEW	APPROVAL	DATE
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1	Incorporation of TfNSW feedback	K. Hartshorne, M. Howland	M. Howland	M. Howland	18 Dec 2024

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1. INTRODUCTION

This document reviews existing information to provide an interim assessment of sediment characteristics, potential for contamination and water quality to inform the environmental assessment of proposed dredging within Coffs Harbour and placement offshore of Park Beach. Key locations within the study area are shown in Figure 1. A Review of Environmental Factors (REF) incorporating this assessment is currently being prepared for the works by Blue Sky Planning on behalf of Transport for NSW (TfNSW).



Figure 1: Site location

1.1 Proposed Dredging Works

Sand accretion is affecting navigability and vessel safety at two key areas within Coffs Harbour. The proposed works are to undertake maintenance dredging over a ten-year period (2025-2035). There are two proposed dredging locations for the upcoming campaign identified in Figure 2 and Figure 3. Dredge Area 1 is located at the entrance to Coffs Harbour marina and along the southern margin of the marina breakwater with a target channel bed elevation of -4.5m relative to the lowest astronomical tide (LAT). Dredge Area 2 is located both sides of the extended breakwater at Coffs Harbour boat ramp with a target channel bed elevation of -2.5m LAT. These locations may be subject to change for later campaigns. Three options for placement of dredged materials have been identified for the proposal in the project REF:

Option 1: Dredging of the harbour and placement of the dredged sand at the northern end of Jetty Beach.

Dredging in the harbour for this option would be undertaken using a small cutter-suction dredge and a pipeline to place the material directly on to the northern end of Jetty Beach from the dredge as an emergency maintenance measure. In this case, the maximum volume of sand to be removed would be 3,000m³. This is not the preferred option and will not be further considered in this assessment.

Option 2: Dredging of the harbour and placement of the dredged sand on Park Beach via overland pipeline.

This option would involve dredging the harbour and using a land-based pipeline to pump dredged sand from the northern end of Jetty Beach to the southern end of Park Beach. The sand would be deposited onshore immediately north of the Surf Club.

Although this option may be considered in the future it is not currently the preferred option and would not be progressed until further environmental investigations are complete and separate approvals are sought. This option has not been further considered in this assessment.

Option 3: Dredging of the harbour and placement of sand in a nearshore location off Park Beach.

This option would involve dredging the harbour utilising either a cutter-suction dredge in combination with a transfer barge, or an ocean-going trailing suction hopper dredge to dredge and transport sediment past Muttonbird Island to a nearshore area north of Little Muttonbird Island. The sand would be deposited by bottom dumping approximately 100m offshore at placement Area A (Figure 2).

Sand would be placed at least 200m north of the Surf Club.

Preferred option

The dredging and placement activities considered in this assessment relate to Option 3 which is the preferred option identified in the project REF. A full description of the proposed activities is provided in the proposal REF.

An initial dredging campaign will be undertaken to remove approximately 96,000m³ of sand from the harbour. After the initial campaign, it is expected that volumes removed would be lower, with areas expected to be dredged every one to three years, depending upon the rate of infilling. Hydrographic surveys will be undertaken annually to determine the infilling rates and locations to guide the dredging schedule. A survey undertaken in August 2024 indicates that 54,000m³ and 42,000m³ for dredge Area 1 and Area 2 respectively would need to be removed to achieve the nominated bed elevations (Figure 3).

1.2 Site Setting

Jetty Beach, Coffs Harbour and Park Beach are within the Coffs Harbour City Council LGA (Figure 1). The harbour is protected from the south by a land bridge from Corambirra Point and the eastern breakwater that extends approximately 400 m north-east off this point. The land bridge between the mainland and Corambirra Point was reclaimed between 1915 and 1927 and the eastern breakwater was first completed in 1946. From the east and north, the harbour, particularly the inner harbour and marina, are protected by Muttonbird Island and the northern breakwater joining Muttonbird Island with the mainland (Figure 1). The northern breakwater was completed in 1924. Although the site harbour is well protected, ocean swells still propagate into the harbour and infilling of the harbour embayment with marine sands occurs on a continuous basis. The inner harbour, housing the marina, is situated along the northern edge of the harbour and is further protected by the marina breakwater. Apart from the marina, the inner harbour also was the site of a boatyard slipway. Historical imagery indicates that the boatyard and marina dates back to the 1970s, with the slipway being operational until 2014. The inner harbour hosts the commercial fishing fleet, the fish coop and a refuelling facility. The entrance channel linking the inner and outer harbours is subject to siltation and is identified as dredge Area 1.

Jetty Beach forms the western foreshore of the harbour and has a substantial vegetated frontal dune along the majority of the beach. This foredune gives way to a paved urban area and beach steps which facilitate public access at the very northern end of Jetty Beach. The sediment placement area for Option 1 is immediately downslope of this location.

Behind the foredune there is a large area of open grass parkland, various walking tracks and paths as well as a community building. A small ephemeral creek flows from this small catchment out onto the mid-point of Jetty Beach. The other notable feature is the Coffs Harbour Jetty, which extends approximately eastwards from Jetty Beach. This jetty is now primarily used for recreational purposes and occasional temporary mooring for non-commercial boats. There are a small number of courtesy mooring buoys located between dredge Area 1 and the jetty.

The Coffs Harbour boat ramp is located on the southside of the bay, which was upgraded in 2022. This site has traditionally been challenging for vessels using the ramp due persistent sand shoals, surging water levels (seiching), the narrow approach channel and breaking waves. The breakwater to the east of the boat ramp was extended in 2021 in an attempt to address some of these issues. Sediments continue to accrete within and adjacent to the boat ramp channel giving rise to the need for dredging at Area 2.

Park Beach is an easterly facing ocean beach located to the north of the entrance to Coffs Creek, which coincidentally also corresponds to Little Muttonbird Island located just offshore of this point. Park Beach, approximately 1.1 km north from the harbour has a history of coastal erosion and has been identified in the Coffs Harbour Coastal Zone Management Plan as a preferred target for beach nourishment.

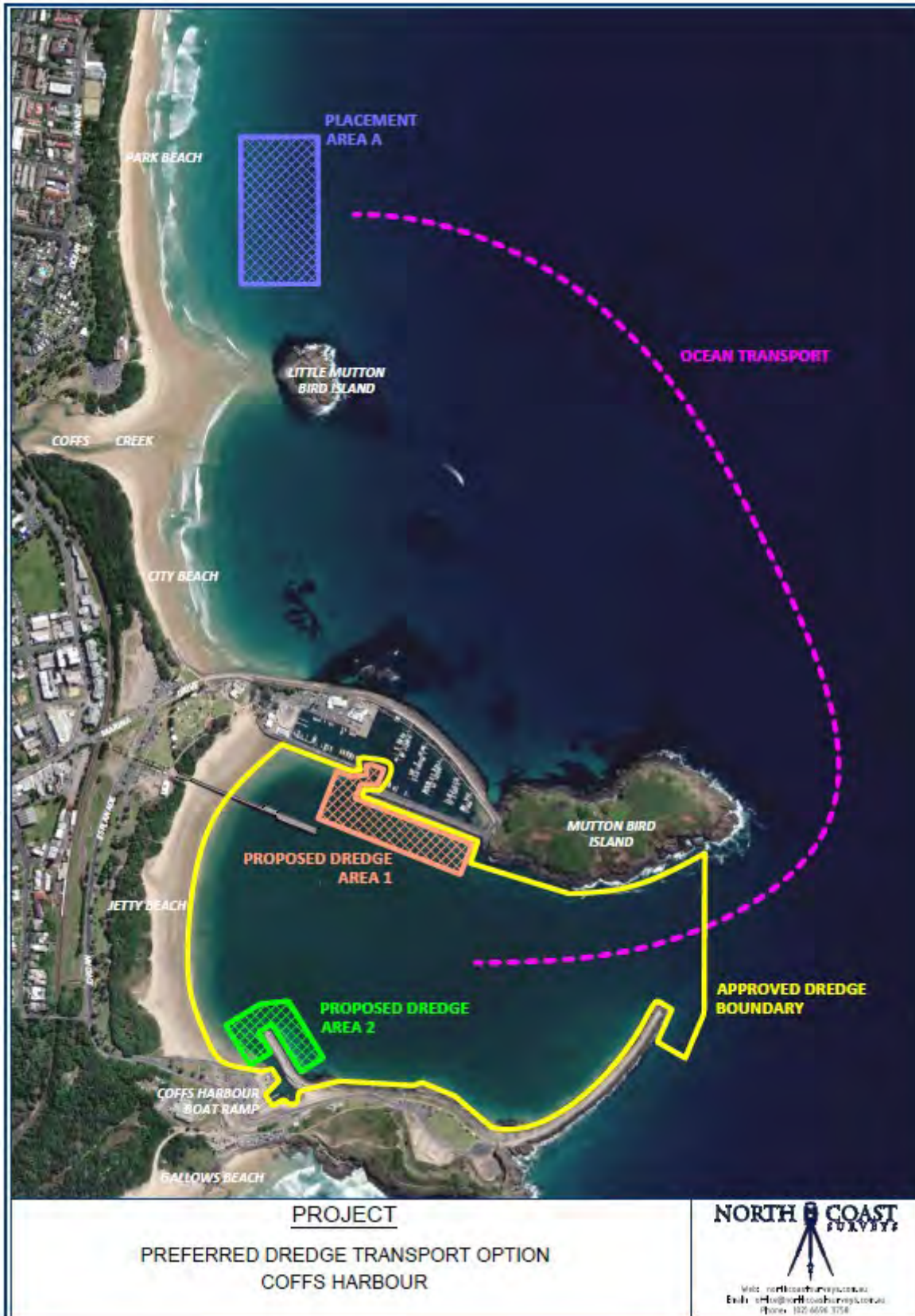


Figure 2: Proposed dredging and placement locations

Source: TfNSW (2024)

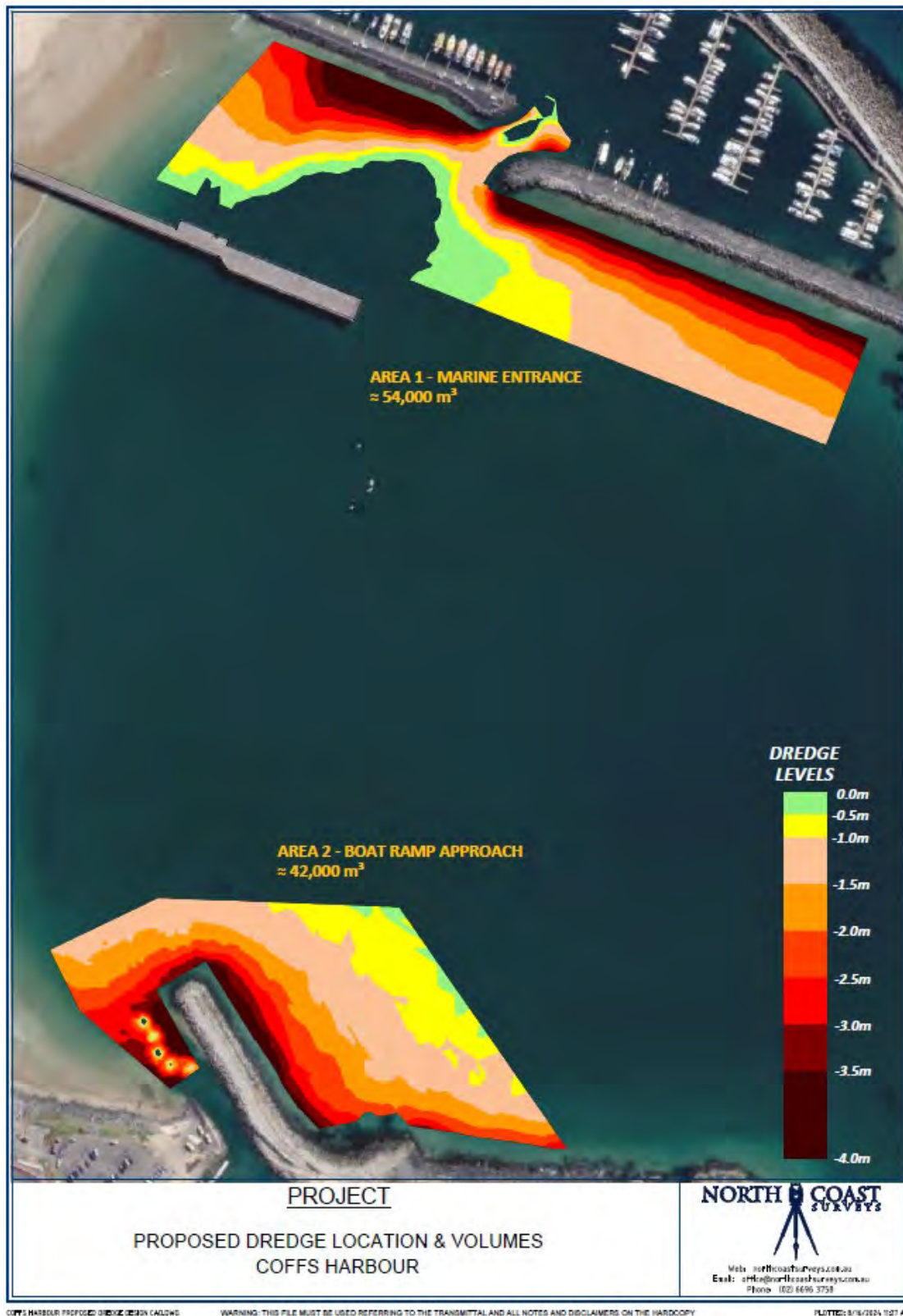


Figure 3: Proposed dredge cut depths and volumes

Source: North Coast Surveys (2024)

2. GEOMORPHIC SETTING

Knowledge of sediment movement patterns within the harbour is important in order to understand the linkages between potential contamination sources, the movement of any contaminants within the system and the likelihood of encountering unsuitable sediments or contaminated material during the proposed dredging.

2.1 Geology

Coffs Harbour lies within the New England Fold Belt province with outcrops that spur outward from coastal ranges in the west to the coastline, forming relatively narrower beach embayments than areas either to the north or south. The bedrock geology is typically composed of highly deformed Palaeozoic meta-sedimentary rock (Troedson *et al.*, 2004). The geology of the area is not overly mineralised and is not expected to contribute in any way to sediment contamination.

2.2 Historic Sand Movement

Coastal sand in the Coffs Harbour region is primarily of marine origin transported in a general northerly direction by coastal processes. Prior to causeway and breakwater construction, South Coffs and Muttonbird Islands were separated from the mainland by a nearshore channel, through which the net northerly littoral drift could proceed uninterrupted from Boambee Beach through the harbour area, North Wall Beach, Park Beach and beyond (RDM, 1998). Northerly littoral sediment transport through this nearshore channel has been previously estimated at 75,000 m³/yr (Lord and Van Kerkvoort, 1981) but did not include offshore transport. Sand buildup in the channel from the sheltering effects of South Coffs Island often slowed sand transport through the channel and sporadic southeast storm surges would transport sand slugs from this material northward (Gordon, 2011). Apart from imported materials associated with reclamation activities, the sands underlying the harbour and nearshore area are considered likely to reflect the dynamic natural open coast sediment regime and consist primarily of quartz sand.

2.3 Sediment Accumulation and Transport Pathways

The harbour is now protected from the predominant southeast swell by the land bridge between the mainland and Corambirra Point which has effectively cut off this inshore sediment transport route, creating a new headland and encouraging sand accretion on Boambee beach to the south and offshore. Indications from the recent draft conceptual model produced by Royal HaskoningDHV are that around 150,000m³ p.a. of sediment is transported east from Boambee Beach, around Corambirra Point and along the eastern breakwater (Royal HaskoningDHV, 2024). Wave action within the harbour is greatly reduced with waves rarely greater than 0.5 m in height. Jetty beach is 1.4 km long and has a wide, low attached bar with no permanent rips, and displays a low tide terrace morphology. The enclosure of the harbour by the artificial breakwaters and land bridge has effectively transformed the embayment into a sand trap. Whilst some sand moving northward will bypass the entrance and Muttonbird Island to continue northward, much of the sand is considered to accumulate within the sediment lobe at the entrance to the harbour (Figure 4, Figure 5) and then be pushed into the harbour through a combination of wave and tidal action.



Figure 4: Sediment transport paths and budget

Source: Blumberg (2020)

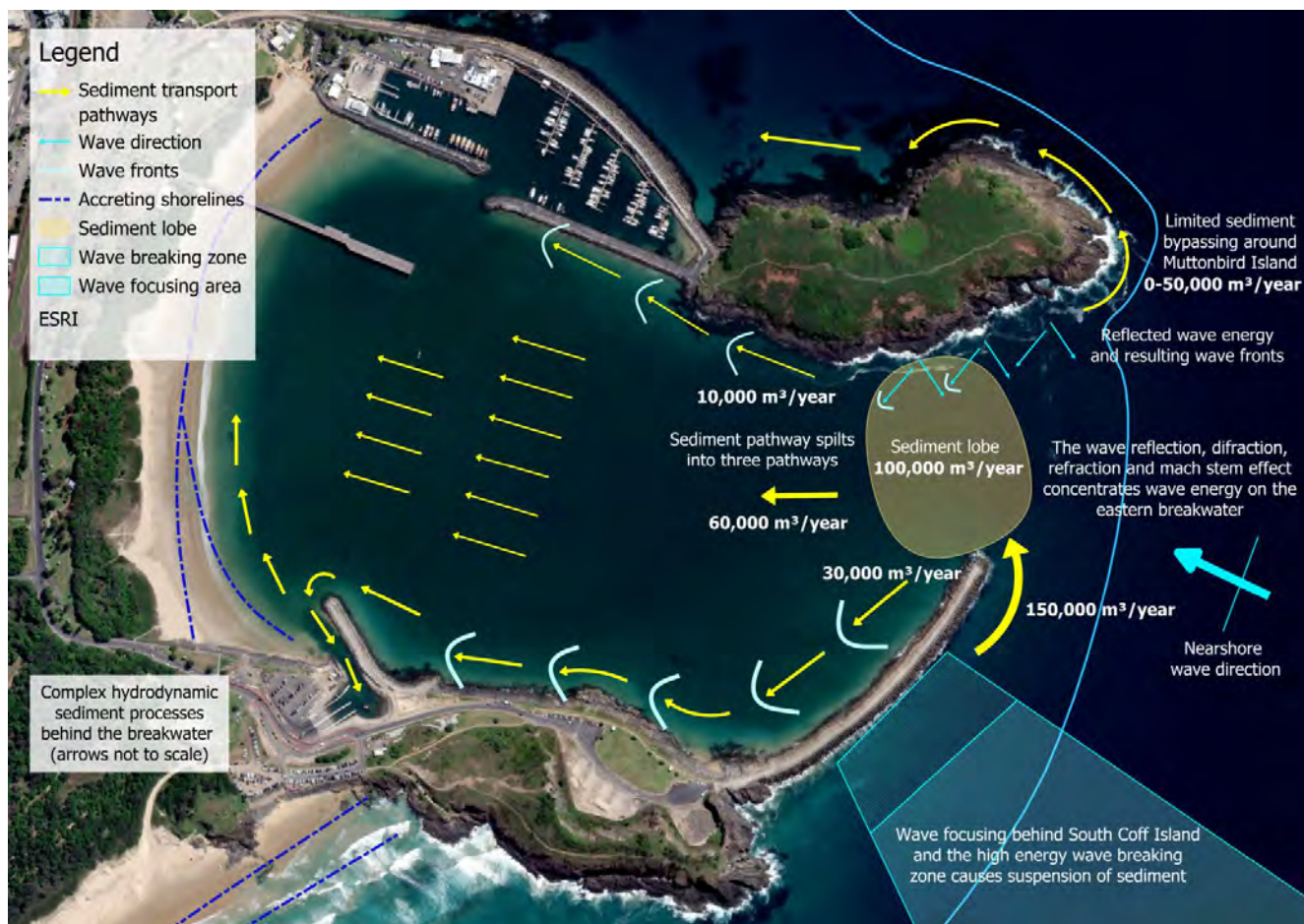


Figure 5: Sediment transport conceptual model harbour (draft)

Source: Royal HaskoningDHV (2024)

2.3.1 Entrance shoal and central harbour

Sand accretion rates within the harbour was estimated to be between 25,000 to 50,000 m³ p.a. (Carley *et al.*, 2006). More recent work by Royal HaskoningDHV (2024) estimates that sand accretion rates of around 100,000m³ p.a. (Figure 5). In 1913, the harbour entrance had a depth of 13 m which reduced to 6.5 m by 2010 (Gordon, 2011). It is clear that surface sediments with the harbour generally are a result of continued recent infill and highly likely to be of marine origin.

2.3.2 Southern harbour shoreline

On average, around 30,000m³ p.a. is expected by Royal HaskoningDHV (2024) to move along the southern shore of the harbour (Figure 5), leading to accumulation of sand in the vicinity of dredge Area 2 and the southern end of Jetty Beach (Figure 6). The annual volume estimates far exceed the relatively modest amounts estimated by Blumberg (2020) of 4,000 to 6,000 m³ p.a. presumably due to assumption that only 20,000 to 25,000 m³ p.a. was entering the harbour (Figure 4). The movement of sand at dredge Area 2 has been modified by the extension of the spur breakwater at this location in 2021/22, with resultant recirculation of sediments at the southern end of Jetty Beach and continued infilling of the boat ramp approach channel (Figure 7).

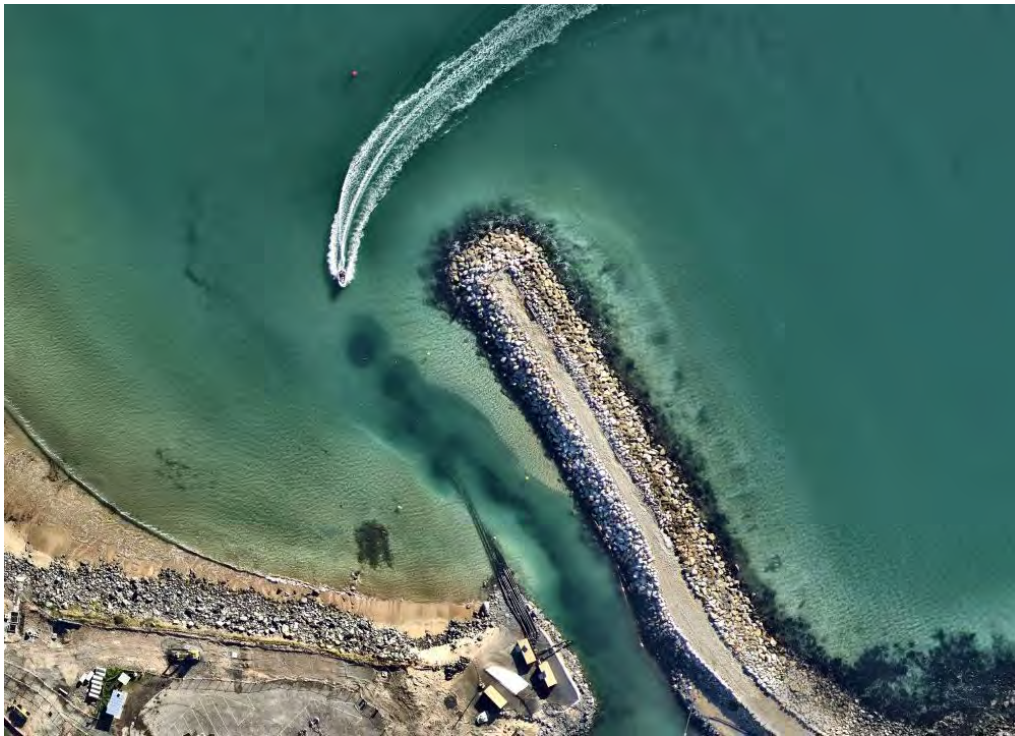


Figure 6: Sand accumulation at dredge Area 2

Source: Nearmap (6 July 2023)

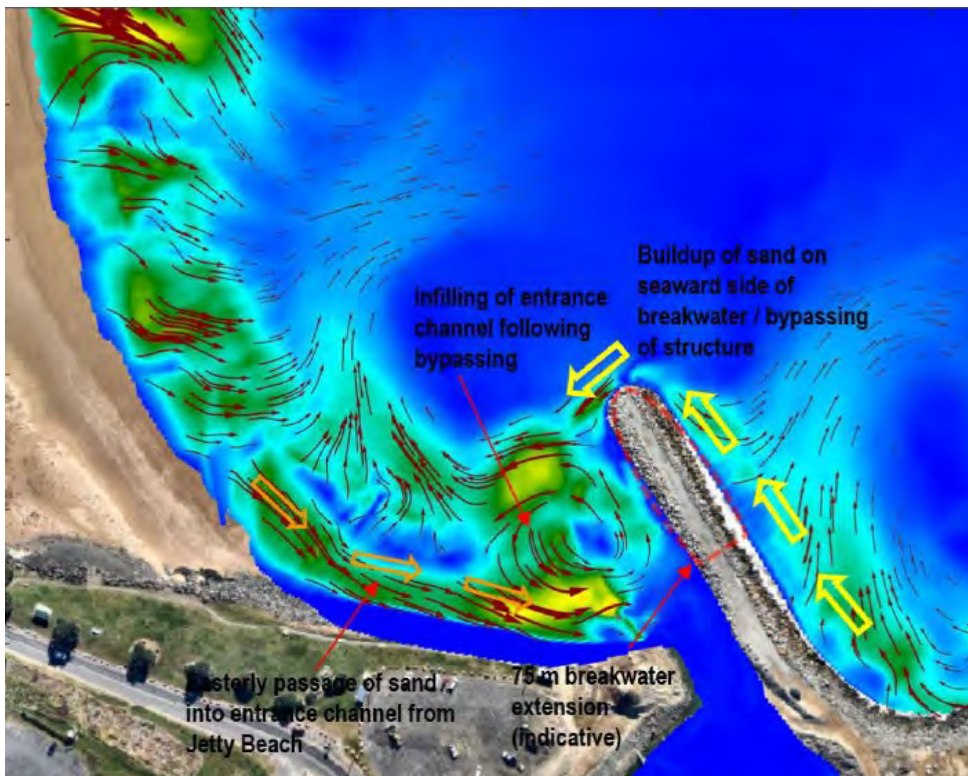


Figure 7: Sediment transport at boat ramp

Source: Transport for NSW (2022b)

2.3.3 Northern harbour shoreline

Around 10,000m³ p.a. is estimated by Royal HaskoningDHV (2024) to be pushed along the northerly perimeter of the harbour (Figure 5). Blumberg (2020) calculated that 4,000 and 6,000 m³ p.a. for this component (Figure 4). Sand moving in this direction leads to sand accumulation along the marina breakwater, across the marina entrance channel at dredge Area 1 and the northern end of Jetty Beach (Figure 8). Some of this sand is also expected to lead to gradual infilling of the inner harbour, particularly in the vicinity of the marina entrance channel as evidenced by the need for periodic dredging, however these infill rates have not been quantified.

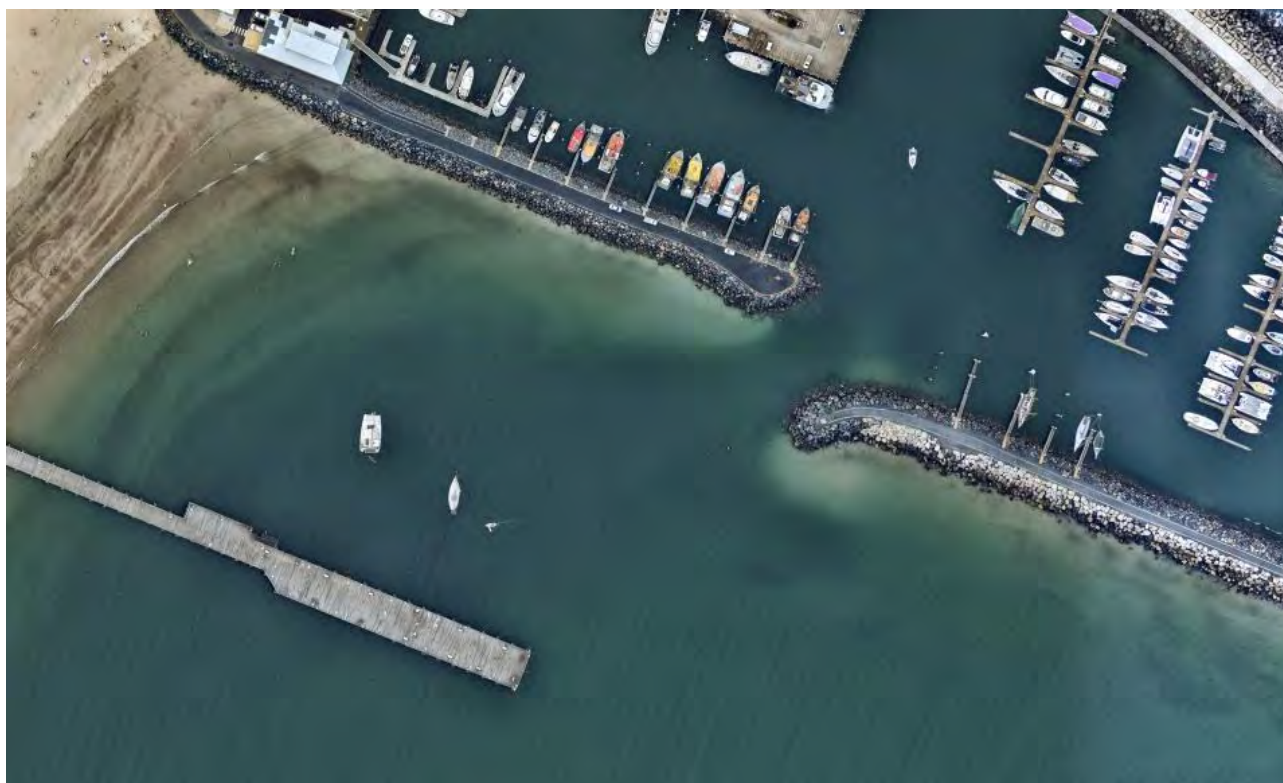


Figure 8: Sand accumulation at dredge Area 1

Source: Nearmap (1 March 2024)

Of particular interest is any export of sediments from the inner harbour as a potential source of contamination. Whilst it is highly likely that the net direction of movement is inward, leading to sediment accumulation within the inner harbour, some export of sediment and any potential contaminants to the dredge areas cannot be discounted. The outward movement of sediment would be most likely immediately after dredging of the entrance, as surrounding sediment is drawn into the dredged basin. More broadly, it is most likely that any outward movement of sediments consists of finer material, mobilised by vessel traffic and transported by tidal currents. No work on sediment transport rates in this regard has been identified.

2.3.4 Outer harbour and Jetty Beach

Of the 100,000 m³ p.a. total infill volumes estimated by Royal HaskoningDHV (2024), around 60% accumulates with the central harbour and/or results in accretion of Jetty Beach. Blumberg (2020) estimated that accretion volumes in the outer harbour from marine sources was up to 20,000 m³ p.a. Carley et al. (2006) reported accumulation on Jetty Beach at an average rate of 1.3 m p.a. Later assessment of total

block volumes indicated the average rate of accretion is 3.4 m p.a. along the beach (BMT WBM, 2011). As sand at the northern end of Jetty Beach is thought to derive primarily from the northern shoreline transport pathway, it is anticipated that sand at dredge Area 1 will be similar to the beach sand at this location.

Terrestrial discharges into the harbour are limited to a small waterway located to the south of the jetty on Jetty Beach. Flows from this waterway are presumably derived from stormwater. These flows would only have localised impacts on beach geomorphology. There are no known sources of potential contamination within this small terrestrial catchment.

2.3.5 North Wall Beach and Park Beach

The interruption in northerly sediment transport past Coffs Harbour has meant that North Wall Beach and Park Beach further to the north have experienced shoreline retreat and have required ongoing beach nourishment. Whilst sand placement to the south of Little Muttonbird Island has been discounted due to potential effects on the Coffs Creek entrance, sand placed further to the north at Park Beach is expected to generally move in a northerly direction along that beach.

Similarly, it is anticipated that nearshore currents will generally be in a northerly direction in keeping with the predominant south-easterly swell. In the absence of any specific modelling or data in this respect, it is assumed that any sediment plumes generated during deposition at placement Area A will tend to move in a northerly direction, away from the surf club, Little Muttonbird Island and the Coffs Creek entrance.

3. PREVIOUS SEDIMENT INVESTIGATIONS

Previous sediment investigations have been conducted prior to dredging campaigns in limited areas around the marina and boat ramp between 2018 and 2020. These investigations were limited in scope both in relation to sampling locations, sediment depths and sample numbers. They do, however provide guidance on potential contamination hotspots and locations where acid sulfate sediments may be encountered.

3.1 Coffs Harbour Inner Entrance Sediment Sampling, GHD 2018

This sampling investigation was limited to the sediments at the entrance to inner harbour, central to dredge Area 1. The investigation was undertaken to assess sediments in accordance with National Assessment Guidelines for Dredging (NAGD) prior to dredging activities. Seven samples were collected from six locations to a maximum depth of 0.8 m below the sediment surface (Figure 9). Samples were analysed for the following:

- Tributyltin (TBT)
- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc)
- Polycyclic aromatic hydrocarbons
- Total recoverable hydrocarbons
- Benzene, toluene, ethylbenzene and xylene
- Organochlorine pesticides
- Polychlorinated biphenyls
- Acid sulfate soils (field screen)

The sediment sampled was found to be marine sands with field screening for Potential Acid Sulfate Soils (PASS) indicating the sediment was not PASS. All other analytes were below the NAGD screening levels.



Figure 9: Sample locations Coffs Harbour Marina entrance

Source: GHD (2018)

3.2 Coffs Harbour Boat Ramp Sediment Assessment, GHD 2019

An investigation of sediments along the Coffs Harbour boat ramp breakwater was undertaken prior to dredging of the materials (Figure 10). Samples were analysed for the same analytes as the Coffs Harbour Inner Entrance investigation of 2018 (see Section 3.1). Materials sampled were fine sands with concentrations all below the NAGD screening levels. Field screening indicated that the sediment was not PASS.



Figure 10: Sampling locations boat ramp breakwater

Source: GHD (2019)

3.3 Geotechnical Report, Regional Geotechnical Solutions, 2020

A preliminary assessment of the sediments within the boat ramp basin and at the location of the breakwall extension was undertaken by Regional Geotechnical Solutions in 2020 to investigate the presence and extent of acid sulfate soils and soil contamination. Analytes sampled were similar to analytes detailed in Section 3.1. The borehole logs indicate that fine-medium grained marine sands are present in most sample locations to approximate depths of between -7.5 and -8.5 m AHD. Median grain size within the upper sediment layers at the boat ramp area ranged from 0.178 mm to 0.182 mm. Sands were largely quartz with little to no shell material. This sediment is interspersed with clay fines. Underlying the marine sands is a silty clay layer to -10 m AHD with extremely weathered argillite underlying this clay layer.

Eighteen samples were submitted for acid sulfate soil analysis (ASS). Nine samples were screened for the presence of actual or potential ASS.

PASS was found within marine sediments in one borehole at depths of between -5.0 m and -6.5 m AHD at the extended breakwall and also within the surface marine sand sediments in the boat ramp area. See Figure 11 and Figure 12 for sample locations.

Chemical analysis was undertaken on select samples from materials likely to be dredged to assess the potential for contamination. All samples returned results either below their Practical Quantitation Limit (PQL) or below the NAGD screening levels except for tributyltin in one sample from BH1, located at the extended breakwater (Figure 11). This sample, from depths of -6.0 m to -6.5 m AHD, significantly exceeded the NAGD screening level for tributyltin by three orders of magnitude. The report speculates that as the marine sediments within the harbour are highly mobile, the contamination may have originated from the harbour precinct to the north, where the former Coffs Harbour Slipway was subject to extensive remediation works in 2016.



Figure 11: PASS and tributyltin contamination, breakwall of boat ramp

Source: Regional Geotechnical Solutions (2020)



Figure 12: Location of PASS, boat ramp

Source: Regional Geotechnical Solutions (2020)

3.4 Coffs Harbour Marine Centre Upgrade – Minor Works REF 2020

A sediment contamination assessment was undertaken for the REF by Advisian in 2020. The assessment was limited to four moorings of the inner harbour area (Figure 13) and placement areas on Park and Jetty beaches. Sediments were found to be fine to medium grained sands with a greater proportion of fines than within the beach sediments. Analytes sampled were similar to analytes detailed in Section 3.1. Field screening and SPOCAS testing did not find actual or potential ASS. Contaminant analysis results were low for most metals, total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH). The exception was copper which was above the NAGD screening levels in two surface samples which exceeded the 95% Upper Confidence Limit (UCL) by 0.1 mg/kg. The 95% UCL is a probability statement expressing confidence in the population mean being less than or equal to the calculated UCL. Tributyltin concentrations were significantly elevated in seven samples to an approximate depth of 2.0 m below sediment surface. The 95% UCL was five times greater than the NAGD screening level for this analyte. See Figure 13 for sample locations.



Figure 13: Tributyltin contamination locations

Source: Advisian (2020)

4. SEDIMENT PHYSICAL PROPERTIES

The key physical properties of interest in relation to dredging and placement activities are particle size distribution, grain mineralogy, colour, degree of organic content and the amount of coarse debris.

Particle size distribution is of importance to evaluate sediment similarity and compatibility with the depositional environment. Ideally the particle size distribution will match the grain size proportions from the dredge site and will match the deposition area. Other parameters such as grain shape and angularity are of less importance for general beach nourishment but can be influential when considering terrestrial placement, particularly when considering slope stability or resistance to factors such as wind erosion.

An important aspect related to particle size, is the proportion of sediments classified as 'fines', i.e. silt and clay. The presence of fines will give rise to water column turbidity due suspension of this material in the water column as discussed in Section 6. Introducing a high proportion of fines into a sand environment can lead to smothering of surface biota and clogging of sediments.

Grain mineralogy is typically not an issue with dredging projects on the NSW coast as nearly all the marine sediments are quartz grained and variation on a project scale is negligible.

Sediment colour is a function of several factors including mineralogy, amount of organic content and redox (reduction-oxidation) status of the sediment. Holocene marine sands in the Coffs Harbour area are typically light-tan to yellow in colour and low in organic matter. Sands dredged from depth tend to be anoxic and have a light to dark grey or even black colouration. This grey colour will lighten quickly with exposure and is of temporary concern generally in areas of high public usage, where visual amenity and potentially odours (for supra-tidal placement) are an issue.

Of greater concern, particularly for sediments utilised for beach nourishment, is the degree of embedded organic matter such as seagrass wrack, or kelp, as well as coarse debris such as oyster shell. These aspects are discussed further for both of the dredge areas.

4.1 Existing Conditions

4.1.1 Jetty Beach

Particle size distribution on samples collected by Blumberg (2020) indicated a very high degree of similarity between the sands of Jetty Beach and sands within the harbour. All samples were classified as poorly graded fine-medium sands with surface samples indicating that the sand deposit is mobile. Median grain size for both Jetty Beach and harbour sands was 0.2 mm. The sand is largely quartz with a shell content of 5 to 10%. Jetty Beach sands are yellow with a small percentage of black grains, like that of the boat ramp basin sands.

4.1.2 Park Beach and Nearshore Zone

There is little information regarding physical properties of sands at Park Beach nor its nearshore zone however Lord and Van Kerkvoort (1981) postulate that motorbike racing along the beach indicates coarse grained gravelly beach berms at that time. They map inner nearshore and outer nearshore sediments along the entire coastline from Sawtell Beach in the south to Campbells Beach in the north as sands (Figure 14), indicating that all sediment in this zone along the coast is largely consistent.

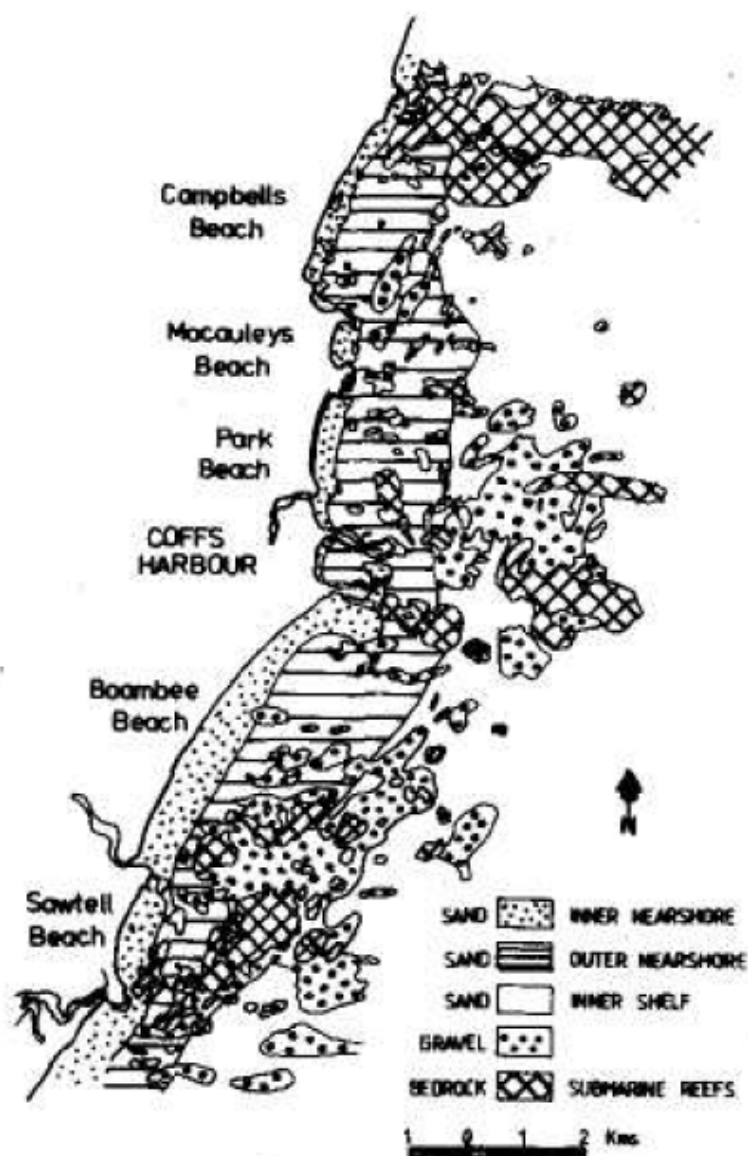


Figure 14: Offshore surface sediment distribution

Source: Lord and Van Kerkvoort (1981)

Results of recent surface sediment sampling undertaken in conjunction with benthic habitat studies by H2O Consulting indicate that the park beach nearshore zone surface sediment consists of between 93% and 98% sands with 1-2% fines. Substrate sampled at the southern end of placement Area A was noted to be variable in nature. Two samples were taken by H2O Consulting at the southern location with one of these containing 6% gravel (2-6 cm diameter), whilst the other was more consistent with, although still slightly coarser, than the sand towards the northern end of the placement area. Appendix 1 provides raw data provided by H2O Consulting.

4.1.3 Dredge Area 1

Sediment investigations at the marina entrance and within the marina (GHD, 2018 and Advisian, 2020) indicate medium-fine grain yellow sands at these locations with similar particle size distributions to that of Jetty and Park Beaches, with slightly higher proportions of fine sediment. Depth of sand layer and other stratigraphic information was not available for the marina area. The lack of seagrass presence or other aquatic vegetation in this area (see Section 6) means it is unlikely that there is a high degree of organic matter within the sediment although sediment surface accumulations of dislodged kelp are known to occur after large swell events in other parts of the embayment.

Given the geomorphic processes and source of the majority of the sand at dredge Area 1, it is expected that the physical characteristics of sediments will be sufficiently similar to existing sediments at the preferred deposition area to have no discernible influence at that site. Comparison of particle size distribution of sediment samples from the dredging and placement areas is required to confirm this expectation.

Results of recent surface sediment sampling undertaken in conjunction with benthic habitat studies by H2O Consulting indicate that dredge Area 1 surface sediment consists of 97% sands with 3% fines (<75µm diameter) and no appreciable amount (i.e. <1%) of gravel (Appendix 1).

4.1.4 Dredge Area 2

From the borehole logs in the geotechnical report for the boat ramp upgrade (Regional Geotechnical Solutions, 2020) surface sediments within the vicinity of the boat ramp appear to be fine to medium grained sands. Deeper sediments contain silt/clay deposits which would not be suitable for beach nourishment; however, they appear to occur significantly deeper than the proposed dredging (-2.5 m LAT) for Area 2 indicating that these fine sediments are unlikely to be encountered. There is low potential for embedded organic matter within the upper sand deposits in this area due to the lack of aquatic vegetation, however accumulation of dislodged kelp has been observed in deep areas, including dredged holes, following large swell events.

Results of recent surface sediment sampling undertaken in conjunction with benthic habitat studies by H2O Consulting indicate that dredge Area 2 surface sediment consists of 99% sands with 1% fines, again with no significant gravel content (Appendix 1).

4.2 Impact Assessment

The physical properties of the sediment primarily influence water quality impacts at both the dredging and placement locations and these are discussed separately in Section 6. The physical characteristics, in particular the particle size distribution, the presence of fines and organic matter is also influential on the retention of chemical contaminants which is discussed in Section 5.

It is expected that some slope instability will occur at the edge of the dredge cut. At the extreme, a near-vertical 'box cut' will result in slumping of the of the wall of the dredge area. Whilst some immediate slumping would be anticipated, further collapse is likely to occur over time and will be dependent on the in situ sediment characteristics and the degree of exposure to waves, currents and vessel movements. In general, the non-cohesive marine sands at both dredge locations will be highly mobile and it is anticipated that cut slopes steeper than 1 in 4 will be subject to excessive instability – potentially resulting in premature channel

infilling or instability of benthic habitats. The dredge design should also consider whether stability of the rock breakwaters at either of the dredging locations is likely to be affected by sediment removal.

Dredging has the potential to expose sediments on the seabed that are not consistent with the surroundings, for instance exposure of a mud layer that continues to give rise to water quality impacts after dredging has been completed. The indications from existing information and anecdotal observations from previous dredging campaigns are that the full extents and depth of the proposed dredging at both Area 1 and Area 2 consist of marine sands, and it is unlikely that non-consistent strata will be encountered.

Based on sediment sampling undertaken by H2O Consulting (Appendix 1), the existing nature of the sediments at placement Area A are generally similar to the inshore beach sediments on Park Beach. The northern end of the placement Area A had finer sands and lacked the gravel content detected at both the southern end of the placement area and on Park Beach.

The reason for the surface sediment variability in placement Area A has not been fully evaluated but is considered to be a result of similar processes occurring on Park Beach, where lenses (layers) of gravelly material occur within the beach face, sorted by wave action and currents. These lenses of coarse material can be buried and/or exposed by the movement of the more mobile sand fraction in response to ocean conditions. The surface sediments sampled, whilst indicative of conditions at the time, may vary in nature in response to shifting sands on the seabed as well as localised variations in current caused by any seabed anomalies. The variable nature of the samples collected by H2O Consulting are likely to represent the natural variation of sediments at placement Area A, which can be summarised as being sand dominated, with variable amounts of gravel, similar to Park Beach.

The sediment to be dredged is dominated by sand, has no gravel, but contains similar proportions of fines to that found in placement Area A. Placement of sand at Area A is to be undertaken by bottom dumping. The depth range at which this is to occur has not been confirmed but is assumed to be in excess of 4m water depth. Dumped sediments will partially sort through differential suspension as they sink through the water column, with larger sediments settling faster and finer sediments settling last, potentially being distributed over a wider area as the sediment plume disperses. To avoid a significant change in the surface sediment characteristics it is important that the placed sediments do not contain excessive fines. Results of recent surface sediment sampling undertaken in conjunction with benthic habitat studies by H2O Consulting in December 2024 indicate that the fines content within the sediments to be dredged is similar to that found at placement Area A. On this basis it is concluded that there will be little impact to surface sediments in this regard. The lack of gravel in the dredge sediments is similarly not of concern. It is considered likely that existing beds of gravelly material would become buried and subsequently exposed regularly through natural processes. Although dumping of gravel-poor material may temporarily alter the surface sediment characteristics in terms of gravel, such changes would be relatively minor, as the placement area was found to be dominated (93-98%) by sand and have relatively modest (maximum 6%) gravel content. Any changes would be temporary due to the likely redistribution of dumped material by coastal processes over time. It is considered therefore that sediment to be dredged from Area 1 and Area 2 can be placed at placement Area A with low risk of altering the sediment characteristics of that site.

4.3 Mitigation Measures

The following measures are recommended to mitigate risks associated with physical sediment properties:

- The dredge design should take into account likely sediment slumping at the edge of the dredge cut. A minimum batter slope of 1 in 4 is recommended for all dredge areas. Where the dredge area is constrained by rock walls and a shallow batter cannot be maintained, the stability of the structure is to be considered and the impact of slumping of any loose sediment in these areas allowed for in the dredge design.
- Confirm particle size distribution compatibility between the dredge cut location and the intended deposition area prior to each dredging campaign.
- Ensure that dredging extents and depths are within the extents considered in this assessment.
- Visual monitoring during works to confirm that sediment being dredged and deposited is consistent with the description of 'clean marine sand'. Whilst direct observation is not always possible, the dredge/delivery barge operator should maintain a frequent watch of the following aspects:
 - o In situ appearance of dredge area sediment when in shallow water and/or clear water.
 - o Characteristics of the hopper/barge sediments and supernatant, in particular sediment colour and presence of coarse debris (shell etc.) or large amounts of organic material.
 - o Sediment plume characteristics during placement (refer to Section 6.3).

5. SEDIMENT CONTAMINATION

5.1 Existing Conditions

Previous investigations undertaken between 2018 and 2020 (Section 3) indicate that tributyltin is present in sediments on both the southern and northern sides of the harbour. The investigations were very site specific with only surface sediments sampled in some areas, not necessarily targeting the full analysis suite recommended by NAGD. Analysis methods for ASS consisted of field screening and SPOCAS for three of the four investigations which does not provide as detailed understanding of acid sulfate soil related risks as the chromium reducible sulfur analysis for PASS. Table 1 is a summary of previous contamination results and locations.

Table 1: Summary of previous contamination results and locations

Report	Location	Maximum Depth	No. Locations/ Samples	Contamination	ASS/PASS
Coffs Harbour Inner Entrance Sediment Sampling, GHD 2018	Marina entrance	0.8 m	6/7	Below NAGD criteria	None detected
Coffs Harbour Boat Ramp Sediment Assessment, GHD 2019	East of breakwall of Boat Ramp	Sediment surface to 0.1 m	6/6	Below NAGD criteria	None detected
Geotechnical Report, Regional Geotechnical Solutions, 2020	Boat ramp and breakwall extension	-7.5 and -8.5 m AHD	10/9	Significant exceedance for tributyltin in one sample -6.0 m to -6.5 m AHD	PASS -5.0 m and -6.5 m AHD at breakwall PASS in surface sediments in boat ramp
Coffs Harbour Marine Centre Upgrade – Minor Works REF 2020	Within moorings in marina	Sediment surface to 2.0 m	5/12	Exceedance of tributyltin in 7 samples at 4 locations	None detected

Within the locations sampled in the previous investigations, significant widespread contamination has not been identified. There are however, two hotspot areas for tributyltin; one located within the marina moorings adjacent to the slipway site the other adjacent to the breakwater to the east of the boat ramp. Although proposed dredging activities will not be undertaken within the marina, there is potential for contaminated sediment to have spread to the marina entrance. The one sample with a high concentration of tributyltin in the vicinity of the boat ramp breakwater may be an outlier but further sampling within this area is required to confirm this.

The primary source of contaminated sediment is from the Boatyard and slipway within Coffs Harbour marina. The boatyard and slipway were constructed in the 1970s for ship maintenance and repair until operations ceased in 2014. Contamination of terrestrial and marine sediments of nickel, lead and tributyltin was identified within a remedial action plan developed in 2015. Remediation including dredging of sediments adjacent to the slipway and boatyard which was undertaken in 2016 by Soil Conservation Service. The works resulted in over 4,760 tonnes of contaminated sediment being removed (Laboyrie, 2017). No validation reports for the remediation have been identified although the sediment investigations undertaken in 2020 by Geotechnical Solutions and Advisian indicated the presence of sediments contaminated with tributyltin within the marina and at the marina entrance after the completion of the remediation works. Although the degree of sediment transport from the inner harbour to the outer harbour is likely to be low, it is possible that sediment to the west of the marina entrance as well as within the marina entrance will have residual tributyltin and other potential contaminants from the boatyard and slipway operations. Sediment sampling and analysis in this area for tributyltin and other potential contaminants specified by the NAGD will be necessary to confirm the contamination status of the dredge Area 1 sediments.

The high concentration of tributyltin in one sample in the location of the boat ramp breakwall may indicate contaminated sediment transport from the boatyard and slipway within the marina to the north or it may be an anomalous result from an outlier (e.g. a paint flake within the sediment). Again, further sampling and analysis for tributyltin and other contaminants will be required in this area to confirm the contamination status of the sediments at dredge Area 2.

5.2 Impact Assessment

5.2.1 Dredging

There is a low potential for the dredging of contaminated or otherwise unsuitable material due to the predominance of clean marine sediment at both dredge areas. Despite this, there is uncertainty regarding the extent of current contamination due to the limited scope of previous investigations and the past occurrence of contaminants in or in proximity to the proposed dredging areas. Further work will need to be undertaken in this regard.

Both areas are thought to have been previously dredged, although it is not known whether the previous dredging depths and extents fully cover the current proposal. For dredge Area 1, the majority of infill material is likely to be derived via the sand transport pathway along the southern edge of Muttonbird Island and the inner harbour breakwater (Figure 5), hence predominantly high-quality marine sand. Whilst of lower probability, infill of dredge Area 1 by siltier material, potentially containing contaminants, from the inner harbour cannot be fully discounted at this stage.

Continued recent accretion at dredge Area 2 principally due to sand moving westwards along the southern sand transport pathway, indicates that there is little scope for contamination of infill sediments. The recent extension of the boat harbour breakwater, which appears to have contributed to increased recirculation of sand at the southern end of Jetty Beach (Figure 7) is not likely to have resulted in the movement of contaminants from the northern end of the harbour, and hence the only known source of contamination. The present of high levels of tributyltin at depth is considered to be anomalous, however, again further work is required to fully determine the contamination status of sediments at Area 2.

5.2.2 Placement

The risk of contamination at the placement area will be minimal if the mitigation measures identified below are implemented. These measures will ensure that sufficient sampling of the source sediments will be undertaken to characterise the sediments and any areas of sediment with contamination above NAGD guideline levels will not be transferred to the placement area.

Any reuse of the dredge materials for beach nourishment in a high public use area (e.g. Jetty Beach) could pose a risk to the general public from contact with contaminated sediment. The NAGD screening levels are generally more stringent than that of NEPM Health-based investigations levels (HILs) for soil contaminants (Recreational C) and in the case of placement Area A, the NEPM HILs are not considered to apply.

5.3 Mitigation Measures

The following mitigation strategies should be followed:

- Undertake sampling investigations under the guidance of a sampling and analysis plan at all proposed dredge areas within 12 months prior to each dredging campaign. The sampling and analysis plan should be specific to dredging volumes, locations and depths of each campaign and should consider the results of previous investigations.
- Any dredge areas considered to be contaminated (i.e. in excess of guideline values specified by the NAGD) are to be further investigated to fully demarcate the extent of contamination. Dredging of any such locations is not to be undertaken without further planning and assessment.
- Ensure that dredging extents and depths are within the extents described in the proposal and considered in this assessment and the other disciplines (e.g. marine ecology) in the proposal REF.
- Visual monitoring during works to confirm that sediment being dredged and deposited is consistent with the description of 'clean marine sand' as described in Section 4.3. Whilst the contamination status of sediments cannot be determined visually or directly in real-time, the dredge/delivery barge operator should maintain a frequent watch of the following indicators, in addition to those listed in Section 4.3:
 - o In situ appearance of dredge area sediment when in shallow water and/or clear water.
 - o Characteristics of the hopper/barge sediments and supernatant. Dark/black sediments and/or sulphurous odours are indicative of anoxic sediments, which similar to fine-grained sediments are more likely to be PASS or have residual contaminants such as tributyltin.
 - o Sediment plume characteristics during placement (refer to Section 6.3).
- If unexpected indicators of sediment contamination risk are evident during dredging, works should cease in that location pending sampling, analysis and classification of the material. In this case, dredging and placement/disposal considerations will be guided by the sampling results.
- Dredge sediment assessed as ASS or PASS can be placed at Placement Area A as the risk of acidification or water column deoxygenation at this placement site is negligible given the open water nature of this site and the pH buffering effects of seawater. This is under the provision that all other sediment characteristics are consistent with 'clean marine sand'.

6. WATER QUALITY

6.1 Existing Conditions

There is limited information on ambient water quality within Coffs Harbour and Jetty Beach areas however water quality is likely to be high given direct marine influences and lack of significant urban and/or industrial development. Water clarity during sediment and marine field surveys associated with the Marine Centre upgrade REF in July 2020 was high with good visibility from the surface to the seafloor. The high level of ocean exchange and the dominance of medium-grained marine sands in all areas previously investigated indicate that water quality at the proposed dredging locations is likely to generally be high. Elgin and Associates (2015) however noted poor water clarity in the inner harbour likely due to regular boating activities, soft sediment seafloor and poor flushing.

The Australian & New Zealand Guidelines for Fresh & Marine Water Quality (2018) provide some guidance with respect to water quality but largely default back to the previous ANZECC (2000) guidelines for specific values. Marine Water Quality Objectives were set for NSW ocean waters (DEC 2000) utilising these guidelines and cite 0.5 – 10 NTU as the turbidity range to maintain or improve the ecological condition of ocean waters. In practice, the turbidity in the study area is highly variable and dependent on weather and coastal conditions, however these values reflect long-term averages/targets.

6.2 Impact Assessment

Key water quality risks arising from dredging and placement activities relate to sediment plumes and plume dispersal direction, turbidity and reduced light availability, sediment settlement on benthic habitats and release of contaminants into the water column.

6.2.1 General

There are general water quality risks associated with any on-water mechanical activity. The specific risks will depend on the selected contractor's equipment, however the key risks are associated with spills of fuel, lubricants, engine coolant or hydraulic fluids. These risks are managed through standard mitigation measures and are not considered significant for the project. All commercial vessels are required by law to address environmental risks associated with discharges.

6.2.2 Dredging

The generation of sediment plumes during dredging will be minimised by the use of suction dredge (either trailing suction hopper dredge or cutter-suction dredge) technology. Suction dredges can lead to generation of turbidity at the dredge head, however much of the liberated sediment is drawn into the dredge's suction hose and transferred with the rest of the dredged material. This is in contrast to mechanical dredging (e.g. excavator or grab) which can result in significant sediment agitation and suspension of sediments with no real mechanism to reduce this impact. Although some sediment plume bypass of the suction field does occur, the rate of suspension is expected to be minimal for the sediment at dredge Areas 1 and 2 due to the sandy nature of these sediments.

If the dredge encounters unexpected fine sediments (i.e. silt and/or clay), it is likely that a visible sediment plume would be generated in the vicinity of the dredge. The sustained presence of such a plume would be

indicative that the dredge is accessing material that is not consistent with 'clean marine sand', thereby giving rise to not only localised water quality impacts, but also elevating the risk of encountering chemical contaminants which are more commonly associated with fines, or potential for excessive siltation at the sediment placement site.

One drawback associated with the use of a cutter-suction and barge combination, or a trailing suction hopper dredging is that excess water from the dredged sediment slurry will need to be discharged in the vicinity of the dredge area. Any discharge of this nature is the most likely to lead to turbid plume generation and will need to be avoided (i.e. reduced sediment transfer loads) or managed utilising the mitigation measures listed below.

Assessment of previous sediment investigations in Section 3 indicates that there is only one potential contamination source, that of the previous boatshed and slipway within the inner harbour. Copper and TBT contamination was found in the sediments within the inner harbour moorings however elutriate testing of sediments confirmed that release of contaminants from sediment during dredged material disposal is possible but unlikely to exceed marine water trigger values (Advisian 2020). Given, the generally sandy nature of both dredge areas, the isolated occurrences of sediment contamination and low solubility contaminants found during previous elutriate testing, it is considered that there is very low risk of liberation of dissolved contaminants in excess of the default marine water quality objectives.

6.2.3 Placement

Bottom dumping of dredged sediments will result in a vertical plume of sediment through the water column. Most of this sediment, being sand, will settle quickly and result in only localised and short-term turbidity. The inclusion of any fines in the dredged material will increase the extent and persistence of any turbidity plumes. Whilst some turbidity is unavoidable any excessive or sustained turbidity at the deposition location is indicative that poor quality sediment is being accessed by the dredge and would therefore necessitate further investigation. Given the relatively large grain size of dredge materials, the occurrence of sediment plumes, and turbidity is anticipated to be localised and short term.

It is likely that anoxic sediments will be dredged, particularly for deeper cut areas. The use of suction dredge technology reduces the risk to the environment as the dredged material is mixed with good quality water drawn into the dredge hopper. In this way gradual re-oxidisation of the sediments is initiated during dredging and transport, thereby reducing the potential for localised dissolved oxygen depletion at the placement site.

Overall, water quality issues at the placement site are largely mitigated by the substantial mixing and dilution associated with discharge into an open coast environment. It is expected that any water quality issues will be temporary and localised.

6.3 Mitigation Measures

The following mitigation strategies should be employed in addition to the measures identified in Sections 4.3 and 5.3:

- A comprehensive water quality management plan (WQMP) should be included as part of the contractor's CEMP. The WQMP should include the following at a minimum:

- o Identification of key water quality risks specific to the contractor's equipment and methodologies to be employed.
 - o Monitoring protocols to detect water quality issues associated with the works. Visual monitoring of turbidity on a near-continuous basis by the relevant operator is regarded as the key mechanism by which most water quality risk can be detected, however formal monitoring of key parameters is also recommended.
 - o Issue response protocols. Including triggers for stop-work.
 - o Responsibilities of personnel in relation to water quality monitoring, management and response.
 - o Recording and reporting protocols.
- Surface water turbidity is to be monitored utilising field equipment at an up-current/un-impacted reference location and 100m down-current of both active dredging and placement areas twice daily. The recommended 'investigation' level for excessive turbidity is to be the turbidity corresponding to 50 mg/L total suspended solids above the reference condition and is to be determined by a correlation study utilising the sediments to be dredged.
 - The location of any slurry supernatant discharge during dredging should be sited to minimise the proximity to environmental receptors which may be sensitive to turbidity. The location is to be determined through a review of marine habitats, likely water circulation patterns within the harbour and the practicalities of the dredging operation.
 - In the event that a turbid plume propagates towards any specific sensitive marine habitat (as defined by a marine ecologist), the maximum allowable increase in turbidity at the boundary to that habitat due to the works is 10 NTU.
 - Ensure that dredging extents and depths are within the extents described in the proposal and considered in this assessment.
 - Visual monitoring during works to confirm that sediment being dredged and deposited is consistent with the description of 'clean marine sand'.
 - All plant is to be in good working order. Regular inspections should be undertaken for hydrocarbon spills/slicks, equipment leaks and maintenance issues.
 - Refuelling of marine plant and equipment and storage of hazardous materials on barges should only occur within a double-bunded areas.
 - If an incident (e.g. spill) occurs, the TfNSW Environmental Incident Classification and Reporting Procedure is to be followed, and the TfNSW Contract Manager notified as soon as practicable.

7. CONCLUSIONS

This document review has found that marine sands dominate sediments within the harbour and given the high accretion rate of marine sands into the harbour, these marine sediments are likely to dominate the proposed dredge areas. Previous analysis of sediment properties and recent sampling indicates that the materials to be dredged are likely to have similar physical properties to those at the proposed placement area offshore of Park Beach.

Given the predominance of clean marine sediment throughout the harbour and sediment flow paths, it is considered that there is a low potential for contaminated sediment within the proposed dredge areas, however given the limited nature of previous studies, contamination at either dredge area cannot ruled out. Further investigations are required to assess contamination within the proposed dredge areas.

Previous investigations indicate predominance of medium-grained marine sediments within the harbour. Recent sampling indicates a low proportion of fines. It is therefore expected that water quality impacts, in particular turbidity, will be manageable but should be monitored.

Overall it is considered that implementation of the mitigation measures identified in sections 4.3, 5.3 and 6.3 of this report will be sufficient to manage issues related to sediment and water quality for the proposed dredging at Coffs Harbour.

8. REFERENCES

- Advisian, 2020. *Coffs Harbour Marine Centre Upgrade – Minor Works REF*, report for Transport for NSW.
- Blumberg, B, 2020. *Coffs Harbour Boat Ramp Redevelopment Sediment Transport Modelling*, Manly Hydraulics Laboratory for Transport for NSW, Maritime Infrastructure Delivery Office
- BMT WBM, 2011. *Coffs Coast Coastal Processes and Hazards Definition Study Volume 1: Final Report*, report for Coffs Harbour City Council.
- Carley, J.T., Wyllie, S.J., Lord, D.B. and R.J. Cox, (2006). *Coastal Processes in the Coffs Harbour Region*, Proceedings of the 15th NSW Coastal Conference.
- DEC (2000) *Marine Water Quality Objectives for NSW Ocean Waters North Coast*. Department of Environment and Conservation (NSW), Sydney
- Department of the Environment, Water, Heritage and the Arts (2009) *National Assessment Guidelines for Dredging* (NAGD) (2009). Commonwealth of Australia. Canberra.
- Elgin and Associates (2015). *Coffs Harbour Underwater Inspection*. Report Prepared for NSW department of Trade and Investment (Crown Lands).
- GHD, 2019. *Coffs Harbour Boat Ramp Sediment Assessment*, report for Coffs Harbour City Council.
- GHD 2018. *Coffs Inner Harbour Entrance Sediment Sampling*, report for NSW Department of Industry-Crown Lands
- Gordon, A.D., 2011. *Anchoring coastlines-natural and artificial headlands*. In *Coasts and Ports 2011: Diverse and Developing: Proceedings of the 20th Australasian Coastal and Ocean Engineering Conference and the 13th Australasian Port and Harbour Conference* (pp. 250-255). Barton, ACT: Engineers Australia.
- Laboyrie, K, 2017. *Coffs Harbour Slipway – Contaminated Lands Remediation, Awards of Environmental Excellence*, Soil Conservation Service, Sydney, NSW
- Lord, D.B. and Van Kerkvoort, A., 1981. *A coastal process investigation, Coffs Harbour, NSW*. In *Fifth Australian Conference on Coastal and Ocean Engineering, 1981: Offshore Structures* (pp. 150-154). Barton, ACT: Institution of Engineers, Australia.
- RDM, 1998. *Park Beach Coastline Hazard Definition and Management Study* prepared by Resource Design & Management [RDM] for Coffs Harbour City Council and Department of Land & Water Conservation, December 1998.
- Regional Geotechnical Solutions, 2020. *Coffs Harbour Boat Ramp Upgrade and Precinct Development– Jordan Esplanade, Coffs Jetty*. Geotechnical Report for Transport for NSW.
- Transport for NSW, (2022a). *Coffs Harbour Dredging and Beach Nourishment Program Minor Works Review of Environmental Factors*. NSW Government. Unpublished.
- Transport for NSW (2022b). *Coffs Harbour Sand Management Plan*. NSW Government. Unpublished.

Troedson, A., Hashimoto, T.R., Jaworska, J., Malloch, K., Cain, L. (2004), *New South Wales Coastal Quaternary Geology*, prepared for the Comprehensive Coastal Assessment (DoP) by the NSW Department of Primary Industries, Mineral Resources, Maitland.

WorleyParsons (2014). Sediment Characterisation Report. Coffs Harbour Slipway Remediation. Report Prepared for Crown Lands. July 2014.

APPENDIX 1 SEDIMENT PARTICLE SIZE DISTRIBUTION DATA

The following sediment particle size distribution data was provided by H2O Consulting for samples collected in December 2024 in conjunction with marine ecology surveys for the proposal.



Figure A1: Sample location map

Source: H2O Consulting (2024)

Table A1: Sediment Particle Size Distribution

Source: H2O Consulting (2024)

Matrix:	SOIL		Sample Type:	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG
Workgroup:	EN2416030		ALS Sample Number:	EN2416030001	EN2416030002	EN2416030003	EN2416030004	EN2416030005	EN2416030006	EN2416030007	EN2416030008	EN2416030009	EN2416030010
name/number:	2401 Coffs Harbour Dredging AEA		Sample Date:	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	04/12/2024	04/12/2024	03/12/2024	03/12/2024	03/12/2024
			Client sample ID (1st):	CH-S1	CH-S2	CH-S3r1	CH-S3r2	CH-S4	CH-S5	CH-S6	CH-IT1	CH-IT2	CH-IT3
			Client sample ID (2nd):										
			Depth Type:										
			Depth (m):										
			Site:										
			Purchase Order:										
Analyte grouping	CAS Number	Unit	Limit of reporting	Location	Dredge 2	Dredge 1	Placement A - South	Placement A - South	Placement A - North		Nth Wall Beach	Park Beach South	Park Beach North
EA150: Particle Sizing													
+75µm		%	1		99	97	99	98	98	99	99	99	99
+150µm		%	1		76	66	97	67	64	90	94	91	96
+300µm		%	1		2	8	77	5	2	8	15	26	44
+425µm		%	1		<1	2	65	1	<1	1	2	9	24
+600µm		%	1		<1	<1	50	<1	<1	<1	<1	3	10
+1180µm		%	1		<1	<1	14	<1	<1	<1	<1	<1	1
+2.36mm		%	1		<1	<1	2	<1	<1	<1	<1	<1	7
+4.75mm		%	1		<1	<1	<1	<1	<1	<1	<1	<1	3
+9.5mm		%	1		<1	<1	<1	<1	<1	<1	<1	<1	<1
+19.0mm		%	1		<1	<1	<1	<1	<1	<1	<1	<1	<1
+37.5mm		%	1		<1	<1	<1	<1	<1	<1	<1	<1	<1
+75.0mm		%	1		<1	<1	<1	<1	<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size													
Fines (<75 µm)		%	1		1	3	1	2	2	1	1	1	1
Sand (>75 µm)		%	1		99	97	93	98	98	99	99	99	88
Gravel (>2mm)		%	1		<1	<1	6	<1	<1	<1	<1	1	11
Cobbles (>6cm)		%	1		<1	<1	<1	<1	<1	<1	<1	<1	<1

Appendix E

Agency consultation



Reference no:

File no:

Recipient name

Recipient company (if required)

Address

Suburb State Postcode

**Re: Invitation to comment - proposed Coffs Harbour Dredging for Navigation –
Project Review of Environmental Factors**

16 August 2024

Dear **Name,**

Transport for NSW is proposing to seek long-term (10-year) approvals for maintenance dredging of navigation channels within Coffs Harbour (the proposal). A review of environmental factors (REF) is currently being prepared to assess the likely impacts of the proposal under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Blue Sky Planning and Environment Pty Ltd has been engaged by Transport for NSW to undertake the preparation of the REF for the proposed works.

Transport for NSW invites your organisation to comment and advise of any interests, concerns or statutory requirements relating to the proposal. Comments received will be considered in the REF.

The objectives of the proposal are to restore and maintain navigable depths at the entrance to the boat harbour and the marina in Coffs Harbour.

Figure 1 over the page shows the extent of the study area.



Figure 1: Study area.

Dredge depths, volumes and frequency

The proposal would involve maintenance dredging of the marina navigation channel and boat ramp navigation channel to a depth of around -4.5m LAT (Lowest Astronomical Tide) at the marina navigation channel; and -2.5 LAT at the boat ramp navigation channel.

The proposal will also consider dredging deeper in some areas within the channels and harbour to create sediment traps that target capture of sand being transport towards key navigation areas of the channel.

It is forecast that maintenance dredging would be required every one to three years (depending on infill rates) over a 10-year period with expected maximum volumes of 96,000 m³ in any one year subject to ocean conditions. The most recent bathymetric survey and preliminary channel design indicates a volume of 54,000 m³ above design in the marina channel and 42,000 m³ above design in the boat ramp channel.

Figure 2 below is a survey of the areas to be dredged, showing proposed dredging volumes.

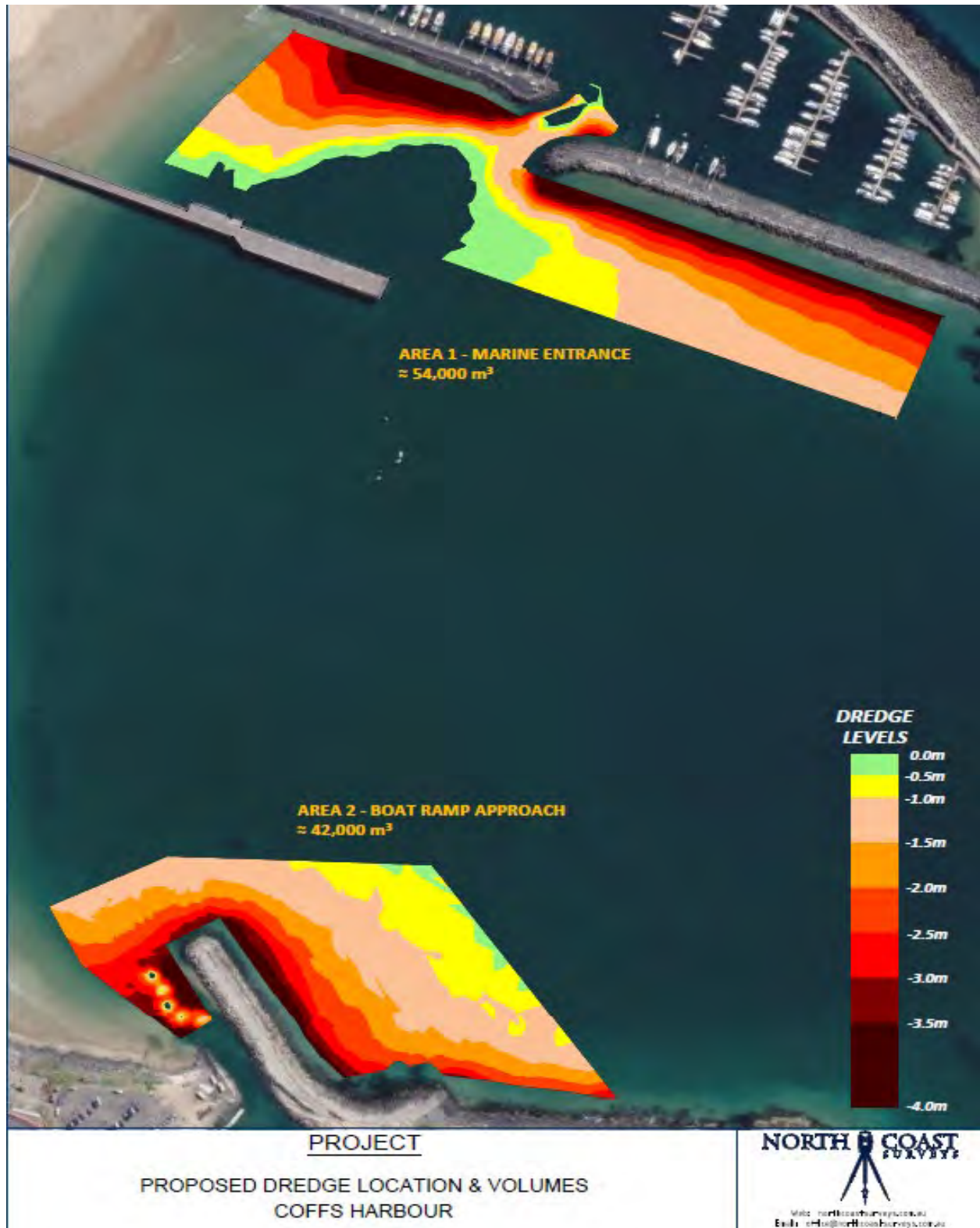


Figure 2: Surveys and volume calculations.

Sediment type

Sediments within both navigation channels are dominated by marine sand, with some decaying organic material (primarily kelp) present, particularly in proximity to the boat ramp.

Potential acid sulphate soils (PASS) are present within the Harbour and sediment sampling is proposed to be undertaken during the REF preparation to determine the risk of actual acid sulfate soils (AASS) and contaminants and recommend appropriate mitigation and management strategies.

Dredging and placement methodologies

Methodologies to be considered in the REF will be:

- An ocean-going trailing suction hopper dredge (TSHD) or split hopper barge (SHB) to remove material from the nominated dredge areas and relocate dredged material via ocean to a nearshore (underwater) placement area off Park Beach.
- A cutter suction dredge which connects with a land-based pipeline to transfer material to Park Beach where it will be de-watered and spread by excavator.
- Bed-levelling where required after dredging and to periodically level high spot areas as a result of natural shoaling and accretion.

The final methodology will be determined by the contractor during the tender period, and it is possible that new methodologies or a combination of the above will be used.

To enable consideration of your comments in the REF, a written response would be appreciated by **Monday 16 September 2024**. Transport for NSW would be pleased to provide further information if required.

Yours sincerely,

Dave Hopper
Principal Manager Dredging
Maritime Infrastructure Delivery Office
Transport for NSW

Contact details: Phone: 0439 306 980 Email: dave.hopper@transport.nsw.gov.au



Your ref: email dated 16/08/2024
Our ref: DOC24/674967-2

Transport for NSW
Maritime Infrastructure Delivery Office
PO Box K659
HAYMARKET NSW 1240

Attention: Mr Dave Hopper

Dear Mr Hopper

Re: Request for input to Planning Secretary's Environmental Assessment Requirements - Review of Environmental Factors – Coffs Harbour dredging for Navigation

Thank you for your email dated 16 August 2024 about the proposed Coffs Harbour dredging for Navigation and deposition options seeking input to the Planning Secretary's Environmental Assessment Requirements (SEARs) from the Biodiversity, Conservation and Science Group (BCS) of the NSW Department of Climate Change, Energy, the Environment and Water for the preparation of a Review of Environmental Factors (REF). I appreciate the opportunity to provide advice.

We note the project will be assessed in accordance with Part 5 Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The environmental assessment requirements provided by BCS for the REF are limited to biodiversity, NPWS estate, acid sulfate soils, flooding, and coastal processes and associated hazards.

BCS anticipates the REF will be sufficiently comprehensive to enable unambiguous assessment of all direct and indirect biodiversity impacts of the proposed activity and will assess all aspects at all stages of the proposal. This includes impacts to migratory birds, threatened species and ecological communities known to occur in the locality and in areas indicated for beach nourishment and pipelines including but not limited to:

- Silverbush (*Sophora tomentosa*)
- Scented Acronychia (*Acronychia littoralis*)
- Native Guava (*Rhodomyrtus psidioides*)
- Wedge-tailed Shearwater (*Ardenna pacifica*)
- Crested Tern (*Thalasseus bergii*)
- Little Tern (*Sternula albifrons*)
- Common Tern (*Sterna hirundo*)
- Sooty Oystercatcher (*Haematopus fuliginosus*)
- Pied Oystercatcher (*Haematopus longirostris*)
- *Littoral rainforest in the NSW North Coast, Sydney Basin and South East Corner bioregions* – Endangered Ecological Community.

BCS recommends that TfNSW considers the high priority action of placement of dredged sand from Coffs Harbour to Park Beach in preparing the REF and undertaking the associated dredging work, in line with the action listed in the Coastal Zone Management Plan (CZMP).

When assessing Option 2, the REF should ensure:

- the pipeline does not impact any native vegetation.
- public safety and access are maintained throughout the dredging activity.
- A sand placement plan for Placement of Area B (including dune heights and revegetation) is prepared by a suitably qualified coastal specialist and a copy supplied to City of Coffs Harbour and BCS.
- A 2-year monitoring and maintenance period is established.

When assessing Option 3, the REF should ensure:

- dredge depositions consider surf amenity.
- bed morphology and subtidal ecosystems in Placement Area A are investigated.
- longshore transport mechanisms in relation to the Placement Area A are investigated to confirm sediment transport does not impact Coffs Creek entrance.
- bed morphology changes are monitored for 2 years to consider where sediment moves within the Park Beach compartment.

BCS support the proposed placement of sand to the north of the Harbour, which will increase the sediment budget within the Park Beach compartment and facilitate the longshore sediment transport processes.

BCS does not support beach nourishment in large volumes as proposed in Option 1 as this will redistribute the sediments back into proposed dredge area 1 and is not in line with Council's CZMP.

The full list of our requirements that may need to be addressed in the REF is provided in **Attachment 1**. In preparing the REF, the proponent can refer to the relevant guidance material in **Attachment 2**.

If you have any further questions about this issue, please contact Ms Elisha Taylor, Senior Conservation Planning Officer North East, BCS, on 6659 8279 or at Elisha.Taylor@environment.nsw.gov.au.

Yours sincerely



DON OWNER
A-/Senior Team Leader Planning North East
Biodiversity, Conservation and Science

17 September 2024

Enclosures:

Attachment 1 - DCCEEW BCS Recommended EARs - REF – Coffs Harbour dredging for Navigation
Attachment 2 - REF Guidance Material

Attachment 1

**NSW Department of Climate Change, Energy, the
Environment and Water**

Biodiversity, Conservation and Science Group

Environmental Assessment Requirements (EARs)

Review of Environmental Factors

Coffs Harbour dredging for Navigation

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A. The Proposed Activity

1. The Review of Environmental Factors (REF) should fully and clearly describe the proposed activity, including any environmental impact mitigation measures, and identify all the processes and activities intended for the site during the life of the proposed activity, including, where relevant:
 - a. the location of the proposed activity and details of the surrounding environment
 - b. appropriate land use zoning
 - c. the size and type of the proposed activity and its operation
 - d. the proposed layout of the site
 - e. the staging and timing of the proposed activity
 - f. the proposed activity's relationship to any other proposal
 - g. all equipment proposed for use at the site
 - h. chemicals, including fuel, used on the site and proposed methods for the transportation storage, use and emergency management
 - i. waste generation, storage and disposal
 - j. the anticipated environment impacts of the proposed activity, both direct and indirect
 - k. a plan showing the distribution of any threatened flora or fauna species and the vegetation communities on or adjacent to the subject site, and the extent of vegetation proposed to be cleared
 - l. ownership details of any residence and/or land likely to be affected by the proposed activity
 - m. maps/diagrams showing the location of residences and properties likely to be affected and other industrial developments, conservation areas, wetlands, etc. in the locality that may be affected by the proposed activity
 - n. methods to mitigate any expected environmental impacts of the proposed activity
 - o. the anticipated level of performance in meeting required environmental standards.

B. Environmental Impacts of the Proposed Activity

1. Impacts related to Biodiversity, NPWS Estate, Acid Sulfate Soils, Flooding, Coastal Processes and Associated Hazards, and Cumulative Impacts, should be assessed, quantified, and reported on in the REF, as required.
2. The REF should address the specific requirements outlined under each heading below, where necessary, and assess impacts in accordance with the relevant guidelines mentioned. A full list of guidelines is at **Attachment 2**.

C. Biodiversity

1. The REF must assess the impacts of the proposed activity on biodiversity values to determine if the proposed activity is “likely to significantly affect threatened species” for the purposes of Section 7.8 of the *Biodiversity Conservation Act 2016* (BC Act) as follows:
 - A. The REF must demonstrate whether the proposed activity is to be carried out in a declared area of outstanding biodiversity value.
 - B. If the proposed activity is not carried out in a declared area of outstanding biodiversity value, then the REF must document *the test for determining whether proposed development or activity is likely to significantly affect threatened species or ecological communities* as outlined in Section 7.3 of the BC Act, by preparing an ecological assessment that should include:
 - I. A field survey of the site of the proposed activity conducted and documented in accordance with relevant guidelines, including:
 - a. *Field survey methods for environmental consultants and surveyors when assessing proposed developments or other activities on sites containing threatened species* (OEH undated) <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/field-survey-method-guidelines.pdf>
 - b. *NSW Survey Guide for Threatened Frogs* (DPIE 2020) <https://www.environment.nsw.gov.au/research-and-publications/publications-search/nsw-survey-guide-for-threatened-frogs>
 - c. *Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020) <https://www.environment.nsw.gov.au/research-and-publications/publications-search/surveying-threatened-plants-and-their-habitats-survey-guide-for-the-biodiversity-assessment-method>
 - d. *“Species credit” threatened bats and their habitats* <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/species-credit-threatened-bats-survey-guide-180466.pdf>
 - e. *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004), <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/draft-threatened-biodiversity-survey-guide.pdf>.

If a proposed field survey methodology is likely to vary significantly from the methods in the guidelines above, then the proponent should discuss the proposed methodology with the Biodiversity, Conservation and Science Group (BCS) prior to undertaking surveys for the REF, to determine whether BCS considers the proposed methodology appropriate.

The results of recent (less than five years old) field surveys may be used. However, the results of previous field surveys should not be used if they have:

- been undertaken in seasons, weather conditions or following extensive disturbance events when the subject species are unlikely to be detected or present, or

- utilised methodologies, survey sampling intensities, timeframes or baits that are not the most appropriate for detecting the target subject species,

unless these differences can be clearly demonstrated to have had an insignificant impact upon the outcomes of the field surveys.

If the results of previous field surveys are used, then field surveys for any additional threatened entities listed under the BC Act since the previous field surveys took place, must be undertaken and documented.

The list of potential threatened species, populations, ecological communities, or their habitats for the site should be determined in accordance with:

- the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004)
<https://www.environment.nsw.gov.au/research-and-publications/publications-search/threatened-biodiversity-survey-and-assessment>
- the Department's Threatened Species website
<http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species>
- the *Bionet Atlas of NSW*
<http://www.environment.nsw.gov.au/wildlifeatlas/about.htm>
- the Vegetation Information System (BioNet Vegetation Classification)
<http://www.environment.nsw.gov.au/research/Visclassification.htm>
- other data sources (e.g. SEED, PlantNET, Online Zoological Collections of Australian Museums (<http://www.ozcam.org/>), previous or nearby surveys etc.) may also be used to compile the list.

II. The following information as a minimum:

- a. A description, spatial data files, and geo-referenced mapping of the study area, (overlays on topographic maps, satellite images and /or aerial photos, including details of map datum, projection and zone), showing all field survey locations, vegetation communities classified in accordance with the BioNet Vegetation Classification (<http://www.environment.nsw.gov.au/research/Visclassification.htm>), key habitat features and reported locations of threatened species and ecological communities present in the subject site and study area.
- b. A description of survey methodologies used, including timing, location and weather conditions.
- c. Details, including qualifications and experience, of all staff undertaking the surveys, mapping and assessment of impacts as part of the REF.
- d. Identification of national and state listed threatened biota known or likely to occur in the study area and their conservation status.
- e. A description of the likely impacts of the proposed activity on biodiversity values, including direct and indirect impacts and construction and operation impacts, with impacts quantified, wherever possible, such as the amount of each vegetation community or species habitat to be cleared or impacted, and/or the degree of fragmentation of a habitat connectivity.
- f. Identification of the avoidance, mitigation and management measures that will be put in place as part of the proposed activity to avoid or minimise biodiversity impacts, including details about alternative options considered and how long-term management arrangements will be guaranteed.
- g. A description of the residual impacts of the proposed activity.

- III. The ‘test for determining whether proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats’ as outlined in Section 7.3 of the BC Act undertaken in accordance with the gazetted *Threatened Species Test of Significance Guidelines* (OEH 2018) available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/threatened-species-test-significance-guidelines-170634.pdf>.
2. If the REF determines under 1 above that the proposed activity is likely to significantly affect threatened species, then in accordance with Section 7.8 of the BC Act, an Environmental Impact Statement must be prepared that is accompanied by a Species Impact Statement prepared in accordance with Part 7, Division 5 of the BC Act, or, if the proponent so elects, a Biodiversity Development Assessment Report prepared in accordance with Part 6, Division 3 of the BC Act.
3. If the REF determines under 1 above that the proposed activity is unlikely to significantly affect threatened species, then the proposed activity should:
- a. be designed to avoid and minimise impacts on biodiversity values to the fullest extent possible, and
 - b. include a biodiversity offset package to offset remaining direct and indirect impacts on biodiversity values, prepared in accordance with the Department’s 13 offsetting principles available at <http://www.environment.nsw.gov.au/biodivoffsets/oehoffsetprincip.htm>.

Note:

For the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*, the REF should identify any relevant Matters of National Environmental Significance and whether the proposal has been referred to the Commonwealth or already determined to be a controlled action.

D. National Parks and Wildlife Service Estate

1. Where appropriate, likely impacts (both direct and indirect) of the proposed development on any adjoining and/or nearby National Parks and Wildlife Service (NPWS) estate reserved under the *National Parks and Wildlife Act 1974* should be considered, with reference to the *Developments adjacent to National Parks and Wildlife Service lands Guidelines for consent and planning authorities* (DPIE, 2020) available at <https://www.environment.nsw.gov.au/research-and-publications/publications-search/developments-adjacent-to-national-parks-and-wildlife-service-lands>.
2. The NPWS has clear guidelines for assessing the environmental impact of developments and activities proposed within NPWS managed lands. These include guidelines for the preparation of a REF for activities proposed on land reserved under the *National Parks and Wildlife Act 1974*, including national parks and nature reserves. The *Guidelines for preparing a Review of Environmental Factors* provides information on how to determine whether certain activities are permissible, as well as specific information on matters for consideration during the preparation of an REF. The guidelines can be found at <http://www.environment.nsw.gov.au/research-and-publications/publications-search/guidelines-for-preparing-a-review-of-environmental-factors>.
3. For those proposals within NPWS managed areas that seek a lease or licence under Section 151 of the *National Parks and Wildlife Act 1974*, in addition to an REF, applications must also be accompanied by a sustainability assessment. The assessment must address the criteria adopted by the Chief Executive of the former Office of Environment and

Heritage. Templates for completing a Sustainability Assessment can be found at <http://www.environment.nsw.gov.au/protectedareas/sustainabilityassessments.htm>.

Note: Proposals which may impact marine protected areas should be referred to the Department of Primary Industries to determine the assessment and approval requirements.

E. Acid Sulfate Soils

1. The potential impacts of the proposed development on acid sulfate soils must be assessed in accordance with the relevant guidelines including:
 - Assessment Guidelines in the Acid Sulfate Soils Manual (Stone et al. 1998),
 - National Acid Sulfate Soils Identification and Laboratory Methods Manual (Sullivan et al. 2018a),
 - National Acid Sulfate Soils Sampling and Identification Methods Manual (Sullivan et al. 2018b), and where relevant,
 - Overview and Management of Monosulfidic Black Ooze (MBO) Accumulations in Waterways and Wetlands (Sullivan et al. 2018c),
 - Guidelines for the Dredging of Acid Sulfate Soil Sediments and Associated Dredge Spoil Management (Simpson et al. 2018), and
 - Guidance for the Dewatering of Acid Sulfate Soils in Shallow Groundwater Environments (Shand et al. 2018).
2. Soil samples must be tested according to procedures in the National Acid Sulfate Soils Identification and Laboratory Methods Manual (Sullivan et al. 2018a).
3. A sound conceptual model must be developed for the site, including an understanding of local hydrogeological conditions, of the stratigraphic and lateral distribution of sulfide minerals, and of the presence of sensitive environmental receptors.
This must include:
 - a. Identifying whether sufficient pyrite is present in sediments to cause significant acidification on oxidation,
 - b. Determining whether mining activities are likely to cause oxidation of pyrite and leach acidity and soluble metals into groundwater or surface waterways,
 - c. Determining the likely extent and severity of groundwater or surface water contamination that may be caused by acidic leachate from oxidising sediments, and
 - d. Identifying whether there are ecosystems or groundwater users in the vicinity of the mine site that are likely to be exposed to contamination from acidic leachate.
4. Describe mitigation and management measures that will be used to prevent, control, abate or minimise potential impacts from the disturbance of acid sulfate soils associated with the proposal and to reduce risks to human health and prevent the degradation of the environment. This must include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.
5. Describe the contingency plan, incorporating a commitment to appropriate monitoring.

F. Flooding, Coastal Process and Associated Hazards

1. The REF should include an assessment of the following referring to the relevant guidelines in Attachment 2:
 - a. The potential effect of coastal processes and coastal hazards including potential impacts of sea level rise:
 - i. on the proposed activity; and
 - ii. arising from the proposed activity.
 - b. Whether the proposed activity is consistent with any coastal zone management plans.
 - c. Whether the proposed activity is consistent with any floodplain risk management plans.
 - d. Whether the proposed activity is compatible with the flood hazard of the land.
 - e. Whether the proposed activity will significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other proposals or properties.
 - f. Whether the proposed activity will significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.
 - g. Whether the proposed activity incorporates appropriate measures to manage risk to life from flood.
 - h. Whether the proposed activity is likely to result in unsustainable social and economic costs to the community as a consequence of flooding.
2. The implications of flooding over the full range of potential flooding, including the probable maximum flood, should be considered as set out in the NSW Government Floodplain Development Manual and should include:
 - a. Full details of the flood assessment and modelling undertaken in determining any design flood levels (if applicable), including the 1 in 100 year flood levels.
 - b. A sensitivity assessment of the potential impacts of an increase in rainfall intensity and runoff (10%, 20% and 30%) and sea level rise on the flood behaviour for the 1 in 100 year design flood if applicable.
3. All site drainage, stormwater quality devices and erosion / sedimentation control measures should be identified and the onsite treatment of stormwater and effluent runoff and predicted stormwater discharge quality from the proposed activity should be detailed.

G. Cumulative Impacts

1. The cumulative impacts, including both construction and operational impacts, from all clearing activities and operations, associated edge effects and other indirect impacts on cultural heritage, biodiversity and NPWS Estate in accordance with the *Environmental Planning and Assessment Act 1979*.
2. The cumulative impacts, including both construction and operational impacts, of the proponent's existing proposals and other proposals and associated infrastructure (such as access tracks etc.), as well as the cumulative impact of the proposed activity in the context of other proposals located in the vicinity.

Attachment 2 – REF Guidance material

Title	Web address
<u>Relevant Legislation</u>	
<i>Biodiversity Conservation Act 2016</i>	https://www.legislation.nsw.gov.au/#/view/act/2016/63/full
<i>Coastal Management Act 2016</i>	https://www.legislation.nsw.gov.au/#/view/act/2016/20/full
<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>	http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
<i>Environmental Planning and Assessment Act 1979</i>	https://legislation.nsw.gov.au/view/html/inforce/current/act-1979-203
<i>Fisheries Management Act 1994</i>	https://legislation.nsw.gov.au/view/html/inforce/current/act-1994-038
<i>Marine Estate Management Act 2014</i>	https://legislation.nsw.gov.au/view/html/inforce/current/act-2014-072
<i>National Parks and Wildlife Act 1974</i>	https://legislation.nsw.gov.au/view/html/inforce/current/act-1974-080
<i>Protection of the Environment Operations Act 1997</i>	https://legislation.nsw.gov.au/view/html/inforce/current/act-1997-156
<i>Water Management Act 2000</i>	https://legislation.nsw.gov.au/view/html/inforce/current/act-2000-092
<i>Wilderness Act 1987</i>	https://legislation.nsw.gov.au/view/html/inforce/current/act-1987-196
<u>Biodiversity</u>	
Biodiversity Assessment Method (DPIE, 2020)	https://www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-method-2020
Biodiversity Development Assessment Report	https://www.legislation.nsw.gov.au/#/view/act/2016/63/part6/div3/sec6.12
Guidance and Criteria to assist a decision maker to determine a serious and irreversible impact (OEH, 2017)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/guidance-decision-makers-determine-serious-irreversible-impact-190511.pdf

Title	Web address
Accreditation Scheme for Application of the Biodiversity Assessment Method Order 2017	https://www.legislation.nsw.gov.au/regulations/2017-471.pdf
Biodiversity conservation actions	https://www.environment.nsw.gov.au/research-and-publications/publications-search/ancillary-rules-biodiversity-conservation-actions
Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying the variation rules	https://www.environment.nsw.gov.au/research-and-publications/publications-search/ancillary-rules-reasonable-steps-to-seek-like-for-like-biodiversity-credits
Threatened Species Website	www.environment.nsw.gov.au/threatenedspecies/
NSW BioNet (Atlas of NSW Wildlife)	www.bionet.nsw.gov.au/
Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020)	https://www.environment.nsw.gov.au/research-and-publications/publications-search/surveying-threatened-plants-and-their-habitats-survey-guide-for-the-biodiversity-assessment-method
Threatened biodiversity survey and assessment - Guidelines for developments and activities (2004 working draft)	https://www.environment.nsw.gov.au/research-and-publications/publications-search/threatened-biodiversity-survey-and-assessment
Field survey methods for environmental consultants and surveyors when assessing proposed developments or other activities on sites containing threatened species (OEH undated)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/field-survey-method-guidelines.pdf
NSW Survey Guide for Threatened Frogs (DPIE 2020)	https://www.environment.nsw.gov.au/research-and-publications/publications-search/nsw-survey-guide-for-threatened-frogs
Koala (<i>Phascolarctos cinereus</i>) Biodiversity Assessment Method Survey Guide (DPE 2022)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/koala-phascolarctos-cinereus-biodiversity-assessment-method-survey-guide-220249.pdf
'Species credit' threatened bats and their habitats (OEH 2018)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/species-credit-threatened-bats-survey-guide-180466.pdf
BioNet Vegetation Classification - NSW Plant Community Type (PCT) database	www.environment.nsw.gov.au/research/Vegetationinformation/system.htm
SEED Data Portal (access to online spatial data)	http://data.environment.nsw.gov.au/

Title	Web address
Threatened Reptiles Biodiversity Assessment Method survey guide (DPE 2022)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/threatened-reptiles-biodiversity-assessment-method-survey-guide-20220563.pdf
Department of Primary Industry Policy and guidelines for fish habitat conservation and management (2013)	https://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/fish-habitat-conservation
<u>NPWS Estate</u>	
List of national parks	http://www.environment.nsw.gov.au/NationalParks/parksearchatoz.aspx
Spatial layers of conservation lands	NPWS-managed lands: https://datasets.seed.nsw.gov.au/dataset/nsw-national-parks-and-wildlife-service-npws-estate3f9e7 Private conservation lands: https://datasets.seed.nsw.gov.au/dataset/bct-agreements
Revocation, recategorisation and road adjustment policy (NPWS 2021)	https://www2.environment.nsw.gov.au/topics/parks-reserves-and-protected-areas/park-policies/revocation-recategorisation-and-road-adjustment
Developments adjacent to NPWS lands Guidelines for consent and planning authorities (DPIE 2020)	https://www2.environment.nsw.gov.au/topics/parks-reserves-and-protected-areas/development-guidelines
<u>Acid Sulfate Soils</u>	
Acid Sulfate Soils Planning Maps	http://data.nsw.gov.au/data/
Acid Sulfate Soils Manual (Stone et al. 1998)	http://www.environment.nsw.gov.au/resources/epa/Acid-Sulfate-Manual-1998.pdf
National Acid Sulfate Soils Guidance: National acid sulfate soils identification and laboratory methods manual, Department of Agriculture and Water Resources, Canberra, ACT. (Sullivan, L, Ward, N, Toppler, N and Lancaster, G. 2018a)	https://www.waterquality.gov.au/issues/acid-sulfate-soils/identification-and-laboratory-methods-manual
National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual, Department of Agriculture and Water Resources, Canberra ACT.(Sullivan, L,	https://www.waterquality.gov.au/issues/acid-sulfate-soils/sampling-and-identification-methods-manual

Title	Web address
Ward, N, Toppler, N and Lancaster, G. 2018b)	
National Acid Sulfate soils Guidance: Overview and management of monosulfidic black ooze (MBO) accumulations in waterways and wetlands, Department of Agriculture and Water Resources, Canberra ACT. (Sullivan, LA, Ward, NJ, Bush, RT, Toppler, NR, Choppala, G. 2018c)	https://www.waterquality.gov.au/issues/acid-sulfate-soils/monosulfidic-black-ooze-accumulation
National Acid sulfate soils guidance: Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management, Department of Agriculture and Water Resources, Canberra, ACT (Simpson, SL, Mosley, L, Batley, GE and Shand P. 2018)	https://www.waterquality.gov.au/sites/default/files/documents/dredging-sediments-spoil.pdf
National Acid Sulfate Soils Guidance: Guidance for the dewatering of acid sulfate soils in shallow groundwater environments, Department of Agriculture and Water Resources, Canberra, ACT. (Shand, P, Appleyard, S, Simpson, SL, Degens, B, Mosley, LM 2018)	https://www.waterquality.gov.au/sites/default/files/documents/dewatering-acid-sulfate-soils.pdf
<u>Flooding, Coastal Processes and Associated Hazards</u>	
Reforms to coastal erosion management	http://www.environment.nsw.gov.au/coasts/coastalerosionmgmt.htm
Floodplain risk management manual	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Floodplains/flood-risk-management-manual-2023-230220.pdf
Guidelines for Preparing Coastal Zone Management Plans	http://www.environment.nsw.gov.au/resources/coasts/130224CZMPGuide.pdf
NSW Climate Impact Profile	http://climatechange.environment.nsw.gov.au/
Climate Change Impacts and Risk Management	Climate Change Impacts and Risk Management: A Guide for Business and Government, AGIC Guidelines for Climate Change Adaptation



16 September 2024

Mr Dave Hopper
Maritime Infrastructure Delivery Office
Transport for NSW

By email: dave.hopper@transport.nsw.gov.au

Dear Mr Hopper

Invitation to Comment – Proposed Coffs Harbour Dredging for Navigation – Project Review of Environmental Factors

Thank you for the invitation to comment on the proposed Coffs Harbour Dredging for Navigation Project Review of Environmental Factors (REF).

The City of Coffs Harbour (City) makes these comments with regard to the Coffs Harbour Coastal Zone Management Plan (2019) and associated coastal processes studies and its observations and recommendations regarding sand transport along the coast.

The City also makes reference to previous correspondence sent on this matter which referred to Council Resolution 2022/124:

"That Council writes to the NSW Premier, NSW Minister for Transport, and our State Government Member requesting prompt action to:

- 1. Remove sand from the Harbour in a similar manner to that employed 21 years ago with a dredge and barge to deposit the sand in the ocean off Park Beach.*
- 2. Design and construct a permanent system for sand bypass or sand removal from the Harbour."*

The City supports the proposal to transfer sand out of the Harbour and to the north. It is anticipated that the REF process will identify the option most beneficial to restoring natural coastal processes and northerly transport of sand trapped by the Harbour.

The City's preferred option is the placement of dredged sand offshore as per Option 3 in the *Invitation to Comment* document, to see it reintroduced into the natural longshore drift north of the Harbour, for the following reasons:

- This is in line with recommendations from the Coffs Harbour Coastal Zone Management Plan (2019),
- This action will reintroduce sand trapped by the Harbour into the natural northerly littoral drift,
- This will help to reduce sediment starvation of beaches to the north caused by interception of sand by the Harbour, and
- This will help reduce the potential for erosion of beaches north of the Harbour.

If sand is to be deposited on Park Beach (Option 2) it should be deposited further north well away from the surf club and the entrance to Coffs Creek, due to the following reasons:

- Previous sand nourishment from dredging campaigns has seen sand placed in front of the Surf Club and this has resulted in an artificially elevated dune height as the sand was blown inland onto the dunes. This has obstructed sight lines from the surf club and has resulted in dune heights having to be lowered, and
- Additional sand placed in this location may also have the potential to blow south and reduce the capacity of the entrance channel to Coffs Creek.

If this option is pursued, the proposal should:

- include a detailed sand placement and management plan for beach nourishment,
- consider placing the sand below mean high water mark to increase its chances of returning to the coastal drift and continuing its journey north,
- consider that sand placed above the mean high-water mark will be more likely to blow landward and accumulate on the adjacent dunes, and
- explore and include a variety of placement options and techniques.

The City is not in favour of the option of sand nourishment at the northern end of Jetty Beach (Option 1), for the following reasons:

- This area is currently accreting and has been accumulating sand that has already been trapped by the Harbour interception. This option will not return sand to the coastal drift to continue its natural northerly movement,
- Studies have also shown that sand is moving from the northern end of Jetty Beach, south to the southern end of Jetty Beach and accumulating at the boat ramp, and
- Adding additional sand to the north of Jetty Beach will retain sand in the Harbour system and is likely to accelerate infilling of the boat ramp.

The City's position on Option 1 is consistent with the approval to dredge sand from the Marina as part of development application 0129/22DA. This approval was conditioned that 'Prior to issue of a construction certificate, the applicant must submit to Council for approval, an assessment detailing the feasibility of options regarding the placement of the dredged sand. The applicant must take into account the 'Coffs Harbour Coastal Zone Management Plan'.

Other matters for consideration in the REF should include:

- Impact on aquatic ecosystems both in the dredging zone and in the spoil receiving zone.
- Potential impact on sand bars and surfing amenity.
- Consideration of potential contaminants in the sediment.

For further information, please contact Paul Bennett on 02 6648 4875.

Yours faithfully



Ian Fitzgibbon
Acting Director City Planning & Communities

Department of Planning, Housing and Infrastructure

Our ref: DOC24/224841

Your ref:

Dave Hopper
Principle Manager Dredging
Marine Infrastructure Delivery Office
By Email: Dave.Hopper@transport.nsw.gov.au

18 September 2024

Subject: Proposed Coffs Harbour Dredging for Navigation 2024-2034 Invitation to comment

Dear Dave,

The Department of Planning, Industry and Environment – Crown Lands and Public Spaces (the department) has reviewed the invitation to comment on the preparation of a Review of Environmental Factors (REF) for navigation dredging at Coffs Harbour dated 16 August 2024.

The Coastal Crown Land Guidelines were published in Nov 2023. The guidelines aim to align coastal Crown land management with the objects and principles of the *Coastal Management Act 2016*. The guidelines are to be applied to certain dealings and decision-making procedures and processes relevant to coastal Crown Land management. The guidelines are available at the following website: [Coastal Crown Land Guidelines | Crown Lands \(nsw.gov.au\)](https://www.nsw.gov.au/crown-lands/crown-land-guidelines).

The Coastal Crown Land Guidelines Principle 5 provides that '*Non-Commercial dredging on coastal Crown Land should be in the broader public and/or environmental interest*'. More specifically the guidelines propose that dredging works must have regard to and be consistent with any relevant CMP and highest priority placement of sand accorded to beach nourishment activities identified in a CMP.

The Coffs Harbour Jetty and surrounding open coast does not form part of a certified CMP. However, dredging and nourishment in this area was previously considered as part of the certified Coffs Harbour Coastal Zone Management Plan 2017 (CZMP). As the most recently endorsed strategy for the open coast in Coffs Harbour, the CZMP provides a framework to guide proposed navigation dredging and sand placement.

It is understood that Transport for NSW are to be the proponent of this activity under Part 5 of the *Environmental Planning and Assessment Act 1979*. The department has reviewed the proposed methods for navigation dredging in Coffs Harbour, considering the Coastal Crown Land Guidelines and the administration of the *Crown Land Management Act 2016* (CLM Act) and related legislation.

Aboriginal Land Claim (ALC) 56060 (*Aboriginal Land Rights Act 1983*)

Department of Planning and Environment

Much of the proposed dredging activity will occur on Crown land that is subject to an undetermined land claim lodged under the *Aboriginal Land Rights Act 1983* - ALC Number: 56060; Claim Lodged: 17-Jul-2024; Land Council: New South Wales Aboriginal Land Council. TfNSW is encouraged to seek the support of the claimant land council for the activities that are being proposed on the Crown land subject to this ALC. Any relevant factors or considerations from this consultation should be documented in the REF.

Dredge Area 1 and 2

- Dredging activities undertaken within Coffs Harbour and the area covered by Crown Land licence to Transport for NSW Licence 618991 for the purpose of Access, Port Facilities and Services, will require no further authorisation under the CLM Act if they are considered consistent with the purpose of this licence.
- Dredging activities undertaken within Crown Reserve 140101 (R 140101) managed by Transport for NSW for the purpose of: Port Facilities And Services; Other Purposes: Pontoon, Accommodation House, Berthing, will require no further authorisation under the CLM Act if they are considered consistent with the reserve purpose.

Deposition Areas

Option 1 Beach Nourishment (Jetty Beach)

- Limited details are provided with regard to the deposition of sand / beach nourishment on Jetty Beach.
- Although there is no CMP in place for the location of the proposed activity, the REF should consider Principle 5 of the Coastal Crown Land Guidelines 2023 and the strategic intent of the CZMP in relation to dredging of Coffs Harbour and related sand deposition / beach nourishment activities. This should include appropriate explanation/ justification as to any inconsistencies with the CZMP.
- The department's preliminary view is that this option is inconsistent with the strategic intent of the CZMP, especially in consideration of the volumes of sand identified in the letter to maintain navigation through the harbour (i.e. maximum volume 96,000 m³ in any 1 year)
- Opportunities to progress minor dredging and sand placement campaigns at Jetty Beach for safety reasons, may be appropriate where delivery of sand to areas on or offshore of Park Beach, cannot be achieved within practical and realistic timeframes.

Placement area A - Offshore Park Beach

Department of Planning and Environment

- Transport of sand via Option 3 ocean going trailing suction hopper dredge to be placed offshore from Park Beach in Placement Area A is likely to require a Crown Lands licence as the location is Crown waterway, under the direct management of the Minister for Crown Lands.
- Placement Area A is located in the Solitary Islands Marine Park declared in accordance with Part 5, Division 1, section 23 of the *Marine Estate Management Act 2014* (MEMA). A Marine Park Permit will be required for any part of the proposed activity located in the Habitat Zone Solitary Island Marine Park.
- Although there is no CMP in place for the location of the proposed activity, the REF should consider Principle 5 of the Coastal Crown Land Guidelines 2023 and the strategic intent of the CZMP in relation to dredging of Coffs Harbour and related sand deposition / beach nourishment activities. This should include appropriate explanation/ justification as to any inconsistencies with the CZMP.
- The department's preliminary view is that nourishment in Placement Area A is generally consistent with Action BD.1 of the CZMP.

Placement Area B - Onshore Park Beach

- Delivery of dredging material to Park Beach (Placement Area B) via Option 2 Overland Pipeline will traverse:
 - Part R140102 Managed by Coffs Harbour City Council (Purpose: Environmental Protection, Public Recreation; Other Purposes: Business Purposes, Vegetation Management)
 - ALCs 41188 and 41189 (NSW LALC) has been granted for part of R140102 (Lot 1 DP740302; Lot 7056 DP1114092)
 - Crown Waterway (Coffs Creek)
 - R63966 Managed by Coffs Harbour City Council (Purpose: Public Recreation, Resting Place; Other Purpose: Business Purposes, Vegetation Management).

Transport for NSW will be required to seek a licence, support or other authorisation from relevant parties for all activities associated with construction and operation of the sand pipeline. This would include a Crown Lands licence if the pipeline is to traverse Coffs Creek which is a Crown waterway, under the direct management of the Minister for Crown Lands.

- Although there is no CMP in place for the location of the proposed activity, the REF should consider Principle 5 of the Coastal Crown Land Guidelines 2023 and the strategic intent of the CZMP in relation to dredging of Coffs Harbour and related sand deposition / beach

Department of Planning and Environment

nourishment activities. This should include appropriate explanation/ justification as to any inconsistencies with the CZMP.

- The department's preliminary view is that nourishment in Placement Area B is generally consistent with Action BD.1 of the CZMP.

General considerations

- Activities proposed on Crown land managed by the Minister for Crown Lands or which are inconsistent with the reserve purpose will require a Crown Lands licence. Information regarding the licence process is available on the department's website <https://www.crownland.nsw.gov.au/licences-leases-and-permits>
- The proposed dredging campaigns will be subject to Section 199 of the *Fisheries Management Act 1994* and require a referral to NSW DPI Fisheries. In this regard it is recommended that Transport for NSW consult with NSW DPI Fisheries regarding the preparation of the REF.
- The activities proposed are located on land mapped as a coastal vulnerability area under the SEPP (Resilience and Hazards) 2021. This REF should address any relevant provisions in the SEPP with regard to the mapped coastal vulnerability area
- The activities proposed are located on land mapped as a proximity area to littoral rainforest. This REF should appropriately address any relevant provisions in the SEPP with regard to the mapped proximity area.
- As required under Division 5.1 of the *Environmental Planning and Assessment Act 1979* the environmental impacts of the proposed activity should be given due consideration, including the provision of safe-guards and mitigation measures to limit potential impacts.

Should you wish to discuss our feedback or would like to schedule a meeting to discuss the comments in more detail, please do not hesitate to contact Mr Grant Nelson by email at grant.nelson@crownland.nsw.gov.au.

Yours sincerely,

A handwritten signature in blue ink, appearing to read "Grant Nelson".

Grant Nelson

Senior Project Officer Coastal
Crown Lands and Public Spaces

Dave Hopper
Principal Manager Dredging
Maritime Infrastructure Delivery Office
Transport for NSW
Via email: dave.hopper@transport.nsw.gov.au

Re: DPIRD Fisheries comments on the preparation of a review of environmental factors (REF) for maintenance dredging of navigation channels within the Coffs Harbour marina and boat ramp, Coffs Harbour, City of Coffs Harbour Council LGA.

Dear Mr Hopper

I refer to your letter dated 16 August 2024 seeking comment on the preparation of a review of environmental factors (REF) for the subject proposal.

It is understood that the proposal is for Transport for NSW (TfNSW) to undertake long-term (10-year) maintenance dredging of navigation channels within Coffs Harbour marina and boat ramp with placement of dredged sediment to the north of Coffs Creek. It is understood that this proposed dredging would be in addition to the existing jet pump dredging that occurs at the Coffs Harbour Regional Boat Ramp.

Marine Estate Management Act 2014

The location of the proposed placement area for dredged materials, as well as the overland pipeline, are within the Solitary Islands Marine Park.

Marine parks are areas set aside with special legislative protection to conserve marine biological diversity and ecosystems. The Department of Primary Industries and Regional Development (DPIRD) Fisheries must ensure that activities comply with the requirements of the *Marine Estate Management Act 2014 (MEM Act)* and regulations.

The options for the proposed dredge spoil placement areas and overland pipe across Coffs Creek lie within marine park habitat protection zone (HPZ). These proposed works will require a permit under clause 1.16 of the Marine Estate Management (Management Rules) Regulation 1999 to harm, damage or interfere with habitat (including soil, sand, shells or other material occurring naturally within the zone). Clause 1.8 of the Marine Estate Management (Management Rules) Regulation 1999 establishes the objectives of HPZ as to provide a high level of protection for biological diversity,

habitat and ecosystems. Consent for activities within HPZ can only be granted for research, environmental protection, public health, traditional use or public safety purposes, or for the purposes of an ecologically sustainable use that does not have a significant impact on fish populations within the zone or on any other animals, plants or habitats.

The REF should address the assessment criteria for marine park permits specified in clause 9 of the Marine Estate Management Regulation 2017, including how the proposal satisfies the objects of the MEM Act, purposes of marine parks and objects of HPZ and the arrangements that have been made for the prevention, mitigation and making good of any damage to the marine park arising from the proposed activity.

Consistent with the NSW Government Guidelines for Division 5.1 assessments (pages 20 and 21), the REF must describe any alternatives considered with sufficient detail to understand the differences between the proposal and the alternatives (including the 'do nothing' alternative). The REF must describe how alternatives were assessed to inform selection of the preferred option, including justification for disregarding each alternative (where relevant). The REF must describe how potential impacts can be eliminated or reduced through mitigation measures and list these measures against each potential impact. This includes residual impacts and proposed mitigation measures.

To adequately assess the potential impacts, the following factors should also be addressed in the REF:

- Sediment and core analysis at dredge and placement sites
- Comparison of dredge and disposal locations to determine consistency between habitat forming sediments
- Categorisation of benthic fauna at dredge and placement sites.
- Modelling of baseline sediment transport within the relevant Coffs Harbour sand compartments.
- Modelling of sediment dispersal for each dredging and placement options.
- Comparison of environmental risk between each option (1-3) and proposed Placement Area (A-C)
- Long to medium term monitoring of sediment dispersal post-dredging to inform future dredging campaigns.

In addition, DPIRD Fisheries requests post-dredging monitoring to estimate the recovery of benthic organisms at the sediment placement sites:

- Immediately following dredging
- 6 months following dredging.

Proposed disposal locations

At this stage DPIRD Fisheries is most supportive of option 3 and the use of Placement Area A. This option appears to use natural sediment transport pathways to distribute dredged sediment and is likely to have the beneficial outcomes captured below:

- Facilitate soft-engineering coastal erosion mitigation methods
- Potentially less loss of marine invertebrates through not landing and stockpiling materials
- No land-based dewatering
- No loss of sediment from the sediment budget of the coastal system

Care must be taken to ensure that that Placement Area A will not be adjacent to a natural sub-tidal reef which must be avoided during this phase of the works.

However DPIRD Fisheries will consider the results of initial modelling from the REF to better inform a preferred option that best meets the design outcomes of the dredging campaign and the objectives of the MEM Act and regulations.

Fisheries Management Act 1994

DPIRD Fisheries is responsible for ensuring that fish stocks are conserved and that there is “no net loss” of key fish habitats upon which they depend. To achieve this, the Coastal Systems Unit assesses activities under Parts 4 and 5 of the *Environmental Planning and Assessment Act 1979* in accordance with the objectives of the *Fisheries Management Act 1994* (FM Act), the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the FM Act, and the *Policy and Guidelines for Fish Habitat Conservation and Management (2013 Update)* (DPIRD Fisheries P&G). In addition, DPIRD Fisheries is responsible for ensuring the sustainable management of commercial fishing and aquaculture, quality recreational fishing and the continuation of Aboriginal cultural fishing within NSW.

The proposed works would constitute dredging and reclamation in Key Fish Habitat. Consequently, TfNSW is required to undertake consultation with DPIRD Fisheries, in accordance with section 199 of the FM Act, so that we may raise any matters for consideration, prior to undertaking or authorising the undertaking of these works.

Please note, however, impacts to marine vegetation, including seagrass, mangroves, saltmarsh and kelp, are not covered under s199 consultation. A separate authority under s205 of the *Fisheries Management Act 1994* is required for any works that will cause harm to marine vegetation (please see Table 1 below).

Part 7 Fisheries Management Act 1994 Approvals

Table 1: Trigger sections of the FM Act.

Sections	Description of action	Legislative trigger
198-202	Dredge (digging) and/or reclamation (filling) of land permanently or periodically inundated by water (including wetlands).	Digging and/or filling below the Highest Astronomical Tide (~1m AHD) in estuaries. Digging and/or filling within the high bed of 3 rd order and higher watercourses (based on 1:25,000 scale maps) and/or draining water from land for its reclamation. Digging and/or filling within Coastal Wetlands. Activities described in cl 226 <i>Fisheries Management (General) Regulation 2019</i>

Sections	Description of action	Legislative trigger
205	Harming marine vegetation (seagrass, mangroves, and kelp)	Gather, cut, pull up, destroy, poison, dig up, remove, injure, or otherwise harm marine vegetation or any part of it. Activities described in cls 228-229 <i>Fisheries Management (General) Regulation 2019</i>
218-220	Obstructing free passage of fish, in waterways	Construction or alteration of a dam, floodgate, causeways, or weir or otherwise creation of an obstruction

FM Act Considerations for the Proposal

Key fish habitats (KFH), as defined in the DPIRD Fisheries P&G, are classified based on their sensitivity and importance to fish survival. All marine parks within NSW are considered to be Type 1 KFH. A key objective of the FM Act is to conserve these habitats. DPIRD Fisheries requires proponents to prioritize avoiding impacts on key fish habitats. When avoidance is not feasible, efforts should focus on minimizing and mitigating impacts, with a preference for impacting less sensitive habitats over more sensitive ones. Any unavoidable impacts must be mitigated and offset in accordance with Section 3.3.3 of the DPIRD Fisheries P&G.

Information Requirements

Dredging can cause immediate issues, such as water pollution and poor water quality, as well as longer-term problems, like channel instability and the destruction of aquatic habitats. All potential impacts of the proposed dredging activities — whether direct, indirect, short-term, long-term, or cumulative — must be thoroughly assessed. This includes evaluating alternative options with lesser impacts to minimize environmental harm.

For long-term dredging projects, ongoing monitoring is necessary to assess environmental impacts and the effectiveness of mitigation measures, with management practices adapted based on the findings of these programs.

In light of this, the REF should specifically address the following requirements:

- **Consideration of Alternatives:** Information on alternative options with lesser impacts that have been considered, and justification for why these options were not selected.
- **Impact Justification:** A detailed explanation of the impacts and why they are in the best interest of the community.
- **Impact Assessment and Mitigation:** Identification of all impacts to key fish habitats, including detailed plans of dredge areas, volumes, and sensitive receivers (e.g., seagrass beds, mangroves, threatened species). Additionally, the methodology and timing of the dredging, potential impacts on water quality and how they will be monitored and mitigated particularly during the placement stages of the project, in addition to measures to control off-site impacts should be outlined.

- **Monitoring and Rehabilitation:** Details of a monitoring program to identify where impact mitigation and adaptive management may be required, and a site rehabilitation plan with appropriate offset proposals for unavoidable impacts to sensitive habitats.

Additional standard information requirements for the environmental assessment of this proposal are detailed in Attachment 1.

Offsetting Unavoidable Impacts

DPIRD Fisheries enforces a "no net loss" habitat policy. An offset ratio of 2:1 applies for harm to marine vegetation, requiring proponents to conduct habitat rehabilitation or provide environmental compensation for all unavoidable impacts.

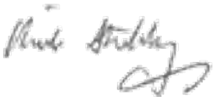
Threatened Species Considerations

DPIRD Fisheries manages threatened aquatic species under Part 7A of the FM Act. The site falls within the known or expected distribution of the threatened species Brown Alga (*Nereia lophocladia*). A test of significance must be undertaken to determine whether the proposed dredging is likely to significantly affect this species.

If you have any queries regarding information relating to the *Fisheries Management Act 1994*, please contact me on 0499 689 583 or fletcher.mingramm@dpi.nsw.gov.au.

If you have any queries relating to *Marine Estate Management Act 2014* requirements, please contact David Greenhalgh by email to solitary.islands@dpird.nsw.gov.au or on 0419 126 594.

Yours sincerely



Nicole Strehling
Marine Park Manager
Solitary Islands Marine Park



Fletcher Mingramm
Fisheries Manager, Coastal Systems (North Coast)
Marine Estate Management, Primary Industries and Regional Development NSW

Attachment 1

DPIRD Fisheries' standard minimum information requirements for environmental assessment are clearly detailed in section 3.3 of the DPIRD Fisheries P&G. See: *Policy and guidelines for fish habitat conservation and management (update 2013)* (nsw.gov.au).

A: General Requirements

- Site address and contact details.
- Property description (e.g. Lot and DP numbers).
- A clear description of the proposal including details of construction methods and materials.
- Map(s) of the development area and adjacent areas – this should include nearby waterways, adjacent infrastructure (such as jetties) and land use.
- Photographs of the site (at low and high tide in estuaries), including photographs of any riparian and aquatic vegetation present.
- A clear description of the physical and hydrological features of the development area (which may extend upstream and downstream of the development site in the case of flowing rivers or tidal waterways).
- A clear description of aquatic environments including: an aquatic and riparian vegetation survey map of the area which shows the location and/or coverage of saltmarsh, mangrove, seagrass, macroalgae, macrophytes, riparian vegetation and snags.
- Details of the nature, timing, magnitude and duration of the proposed disturbance to the aquatic environment.
- Assessments of predicted impacts upon any threatened species (fish and marine vegetation - <https://www.dpi.nsw.gov.au/fishing/species-protection>) (i.e. completion of an Assessment of Significance and/or species impact statement(s)) and other aquatic flora and fauna.
- Details of any mitigation measures to limit environmental impacts.
- Details of the general regional context, any protected areas, other developments in the area, and/or cumulative impacts.

Dredging and reclamation works

- Purpose of works.
- Type(s) and distribution of marine vegetation in the vicinity of the proposed works.
- Method of dredging/excavation to be used.
- Timing and duration of works.
- A discussion on options of lesser impact that were considered and why these were discounted.
- Dimensions of area of works including levels and volume of material to be extracted or placed as fill.
- Nature of sediment to be dredged, including Acid Sulphate Soil, contaminated soils etc.
- Method of marking area subject to works.
- Environmental safeguards to be used during and after works.
- Measures for minimising harm to key fish habitat.
- Soil type and source location for reclamation activities location and duration of spoil stockpiling, if planned.

Activities that damage marine vegetation

- Type and area of marine vegetation to be harmed.
- Map of density and distribution of marine vegetation.
- Reasons for harming marine vegetation.
- Methods of harming marine vegetation.
- Construction details.
- A discussion on options of lesser impact that were considered and why these were discounted.
- Duration of works/activities.
- Measures for avoiding or minimising harm to marine vegetation and details of compensatory works to offset unavoidable impacts to marine vegetation.

B. Aquatic habitat assessment

The aim of the aquatic habitat assessment should be to define the presence of 'key fish habitat' within the study site, adjacent areas (upstream and downstream), and the broader regional area. There may be a range of potential fish habitats that could be impacted by a particular activity. Some points to consider include:

- Is it mapped as key fish habitat? For key fish habitat mapping, see DPI Fisheries Spatial Data Portal on the web.
- Description of local wave and current regimes (in tidal areas).
- Description of the water quality (e.g. discoloration, sedimentation, turbidity, pH, dissolved oxygen, nutrients).
- Types of surrounding land use (e.g. agricultural, urban, aquaculture).
- Condition of riparian vegetation (i.e. present or absent. Are species native or exotic? Is the density of vegetation thick or sparse?).
- Condition of marine vegetation (i.e. information on type, species, shoot density and/or percentage cover. Is the vegetation continuous or sparse in coverage? What is the aerial extent? Is the vegetation healthy or degraded? Is wrack (dead seagrass or macroalgae) present?).
- Substrate type (e.g. rock, gravel, silt, sand).
- Presence of any listed threatened or protected aquatic species or 'critical habitat' under the FM Act and EPBC Act.
-

C. Assessment of likely impacts

- Indicate the location, nature and extent of habitat removal or modification (both direct and indirect) which may result from the proposed action.
- Discuss the potential impact of the modification or removal of habitat (potential direct and indirect sources of impact are stated in the latter with this attachments).

Note: In defining the proposal area, discussion must be provided in regard to possible indirect effects of the proposal on species/habitats in the area surrounding the subject site: for example, through altered hydrological regimes, soil erosion or pollution.

D. Ameliorative measures

The environmental assessment should consider and provide detail on how the proposal has been or may be modified and managed to minimise impacts and conserve key fish habitat on the subject site and in the study area.

USEFUL DEFINITIONS

The definitions given below are relevant to these requirements:

Dredging work means:

- (a) any work that involves excavating water land, or
- (b) any work that involves the removal of material from water land that is prescribed by the regulations as being dredging work to which this Division applies.

Farm Dam means the backed up waters of any dam, or impoundment, located on land that is not public water land.

Fish means any part of marine, estuarine, or freshwater fish or other aquatic animal life at any stage of their life history (whether alive or dead). Fish include oysters and other aquatic molluscs, crustaceans, echinoderms and beach worms and other aquatic polychaetes.

Marine vegetation means any species of plant that at any time in its life must inhabit water (other than fresh water).

Reclamation Work means any work that involves:

- (a) using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber, or rocks) to fill in or reclaim water land, or
- (b) depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge), or
- (c) draining water from water land for the purpose of its reclamation.

Stream Order (Strahler) When two first order streams come together, they form a second-order stream. When two second order streams come together, they form a third order stream. Streams of lower order joining a higher order stream do not change the order of the higher stream. Thus, if a first order stream joins a third order stream it remains a third order stream. It is not until a third order stream combines with another third order stream that it becomes a fourth order stream. DPIRD Fisheries, using maps at a scale of 1:25,000, consider 3rd order and above (i.e. 4th, 5th, 6th etc) waterways as Key Fish Habitats and works in these waterways in almost all instances trigger permit requirements under the *Fisheries Management Act 1994*.

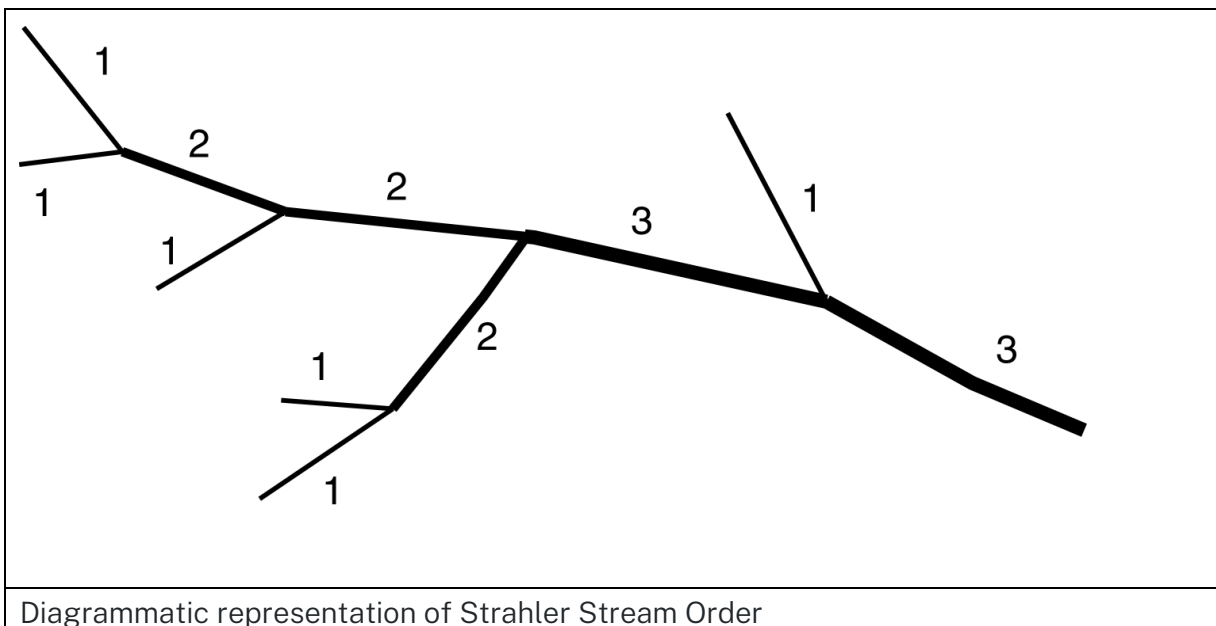
Water Land means land submerged by water:

- a) whether permanently or intermittently, or
- b) whether forming an artificial or natural body of water,

and includes wetlands and any other land prescribed by the regulations as water land to which this Division applies.

Waters refers to all waters including tidal waters to the Astronomical High Tide Level (AHTL) as well as flowing streams, irregularly flowing streams, gullies, rivers, lakes, coastal lagoons, wetlands, and other forms of natural or man-made water bodies on both private and public land.

Wetlands include marshes, mangroves, swamps, or other areas that form a shallow body of water when inundated intermittently or permanently with fresh, brackish, or salt water, and where the inundation determines the type and productivity of the soils and the plant and animal communities



Further Information

DPIRD Fisheries' Policy and Guidelines series contains more detailed information on techniques and practices that satisfy DPIRD Fisheries' requirements to minimise impacts of developments on fish and fish habitat. The Guidelines are available at:

<http://www.dpi.nsw.gov.au/fisheries/habitat/protecting-habitats/toolkit>

Considering the information in these documents prior to developing and submitting your proposal is strongly recommended.

Another document "*Guidelines for the Assessment of Aquatic Ecology in EIA*" (Draft 1998) produced by the Department for Urban Affairs and Planning (now the Department of Planning and Environment) may prove useful in outlining appropriate procedures and methodologies for conducting aquatic surveys required for the preparation of an environmental assessment.

Good afternoon Laura,

Sincere apologies for the delay in responding to your email.

I write to confirm that CHDLALC approves for dredging of the inner harbour within land that is currently under ALC 56060.

Please be advised that should any aspect of the planned works be changed or altered in any way that CHDLALC is notified of these changes and the impacts they propose or negate.

Please do not hesitate to contact me if you have any questions in regard to this matter.

Kind regards



Coffs Harbour and District
Local Aboriginal Land Council
PO Box 6150 Coffs Harbour NSW 2450
02 6652 8740

**Coffs Harbour
& District LALC**

Chris Spencer
Chief Executive Officer
ceo@coffsharbournalc.com.au
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Gumbaynggirr — Ngilyaala junga-ngarraanga Gurrwanld foon gungungula m-wa-kungul gurrigil-wariggaan-wil.

I acknowledge the traditional custodians of country throughout Australia and their continued connections to land, water and community.

I pay my respects to Elders past and present of the Gumbaynggirr nation where I live and work.

Appendix F

PACHCI assessment

1 September 2025

Project Manager Dave Hopper
Organisational Unit Principal Manager Dredging
Department Maritime Infrastructure Programs
Agency Transport For NSW

Dear Dave,

Preliminary assessment results for Coffs Harbour Sand dredging. Based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI)*. Desktop assessment 01.09.2025

The project, dredging of excess sand, (removal and redistribution) as described in the Stage 1 assessment, was assessed as being unlikely to have an impact on Aboriginal cultural heritage.

The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did indicate moderate to high concentrations of Aboriginal objects or places in the study area. (This project, being water based, does not impact on registered sites)
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Transport for NSW procedure.
- The cultural heritage potential of the study area appears to be reduced due to past disturbance.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If the scope of your project changes, you must contact me and your regional environmental staff to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Transport for NSW ***Unexpected Archaeological Finds Procedure***.

For further assistance in this matter do not hesitate to contact me.

Yours sincerely



Laura Bowen
Aboriginal Cultural Heritage Officer– Region North

Appendix G

Sand Management Strategy

REPORT

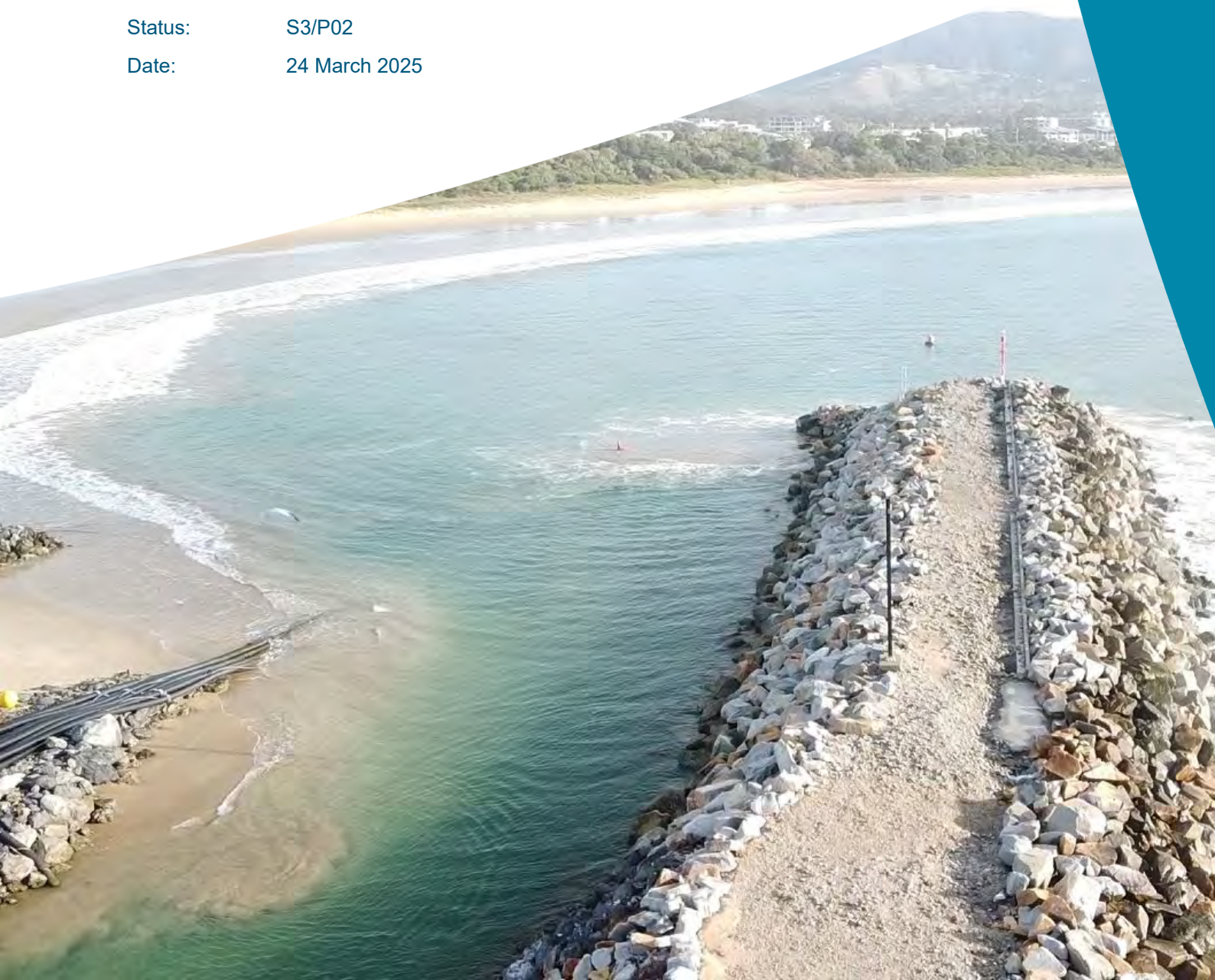
Coffs Harbour Sand Management Strategy

Client: Transport for NSW

Reference: PA4025-WM-RP-250211-1156

Status: S3/P02

Date: 24 March 2025



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Status: S3/P02
Date: 24 March 2025
Project name: Coffs Harbour Sand Management Strategy
Project number: PA4025
Author(s): Josh Parkinson

Drafted by: Josh Parkinson

Checked by: Matt Potter

Date: 14/03/2025

Approved by: Dan Messiter

Date: 24/03/2025

Classification: Confidential

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Revision	Date	Description	Prepared	Checked	Approved
01	24 March 2025	Draft for Client Review	JP	MP	DM

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Appendices

Appendix A: Drawings of Proposed Dredge Areas

Executive Summary

The Coffs Harbour Sand Management Strategy, prepared by Royal HaskoningDHV (RHDHV) for Transport for NSW (TfNSW), presents a comprehensive approach to managing sedimentation within Coffs Harbour. This strategy addresses the challenges posed by current sediment transport pathways and increased sediment deposition at coastal structures.

The conceptual sediment transport model indicates that Coffs Harbour accumulates approximately 100,000 m³ of sediment annually, primarily from beaches to the south. Significant sediment deposition occurs at the entrance to the newly constructed Coffs Harbour Boat Ramp and along Jetty Beach. Current maintenance methods include a sand pumping system, a small cutter suction dredger (CSD), and a long-reach excavator. However, several issues with the sand pumping system have been identified, including:

- inefficiency in the current system, leading to re-entry of pumped sediment back into the harbour;
- non-uniform dredging creates navigation hazards and increases sedimentation rates;
- presence of sand banks and jet pump pipelines pose risks to vessel safety and navigation;
- accumulation of marine vegetation in deep seabed depressions leads to hypoxic conditions and potential fish kills; and
- high ongoing costs of the current pumping regime.

This report presents estimates of previous and ongoing dredging costs for maintenance operations. The analysis shows that jet pumping is not the most cost-efficient or technically efficient method of dredging. RHDHV therefore proposes the removal of existing static jet pumps and the implementation of a multi-stage dredging approach, including:

1. **Stage 1:** Maintenance dredging of navigation channels to design levels.
 - **Boat Ramp Entrance Channel:** Use of a small CSD due to the narrow channel, providing a more cost-effective solution compared to jet pumps.
 - **Marina Entrance Channel:** Combination of CSD and TSHD, with the CSD used for areas with restricted access and ongoing maintenance. The TSHD can be used for broader areas alongside capital dredging campaigns.
2. **Stage 2:** Dredging along sediment pathways.
 - **Updrift Area of Sediment Pathway to Boat Ramp Entrance (Eastern Side of Southern Breakwater):** Use of TSHD to create a sediment sink, enabling placement at the preferred deposition site at Park Beach, north of Little Muttonbird Island.
 - **Updrift Area of Sediment Pathway to Marina Entrance (South of Northern Breakwater):** Use of TSHD for cost-effective dredging and placement at the preferred deposition site at Park Beach, north of Little Muttonbird Island.
3. **Stage 3:** Creating a sediment sink near the harbour entrance.
 - **Sediment Sink Near the Harbour Entrance:** Use of TSHD to create a sediment sink, facilitating placement at the preferred deposition site at Park Beach, north of Little Muttonbird Island.

RHDHV notes these stages will need to be followed with annual maintenance dredging and additional capital dredging. Sediment transport into the Harbour is expected to continue for as long as existing structures are in-place. Regular maintenance dredging programs will be required indefinitely within the harbour to prevent accretion at the current boat ramp and marina sites.



Suitable dredging plant options include small TSHDs and CSDs. CSD operations will continue to pump to Gallows Beach, with TSHDs transporting dredged material to the preferred placement location at Park Beach, north of Little Muttonbird Island. This report also provides cost estimates for initial and ongoing maintenance dredging campaigns and recommends improving operational efficiencies to reduce costs and environmental impacts.

Acronyms

Acronym	Acronym description
AHD	Australian Height Datum
BHD	Backhoe Dredger
CSD	Cutter Suction Dredger
LAT	Lowest Astronomical Tide
RHDHV	Royal HaskoningDHV
SMS	Sand Management Strategy
TfNSW	Transport for New South Wales
TSHD	Trailing Suction Hopper Dredger

1 Introduction

1.1 Project area

In 2024, Royal HaskoningDHV (RHDHV) was engaged by Transport for NSW (TfNSW) to develop a conceptual sediment transport model for Coffs Harbour, alongside several other locations. Following the sediment transport model, TfNSW identified opportunities for improved sand management operations within the harbour. This document aims to utilise the conceptual models and historical information to develop a Sand Management Strategy (SMS) for Coffs Harbour.

Coffs Harbour is located on the north coast of New South Wales. The harbour has been formed by the construction of an Eastern Breakwater, and the Northern Breakwaters forming the Coffs Harbour Marina (see **Figure 1-1**). Additionally, the Coffs Harbour Boat Ramp and Entrance Channel (see **Figure 1-2**) was recently upgraded, which included the construction of a breakwater extension and dredging of the boat ramp basin and entrance area. The development of these structures has changed the coastal processes in the area, which has altered sediment transport pathways and led to increased sediment deposition in navigation channels (i.e. the Boat Ramp Entrance Channel).

When developing the Coffs Harbour SMS, RHDHV will use our understanding of the coastal and sediment transport processes to assess the current maintenance dredging practices and inform future sand management decisions.



Figure 1-1: Coffs Harbour key features map



Figure 1-2: Coffs Harbour Boat Ramp

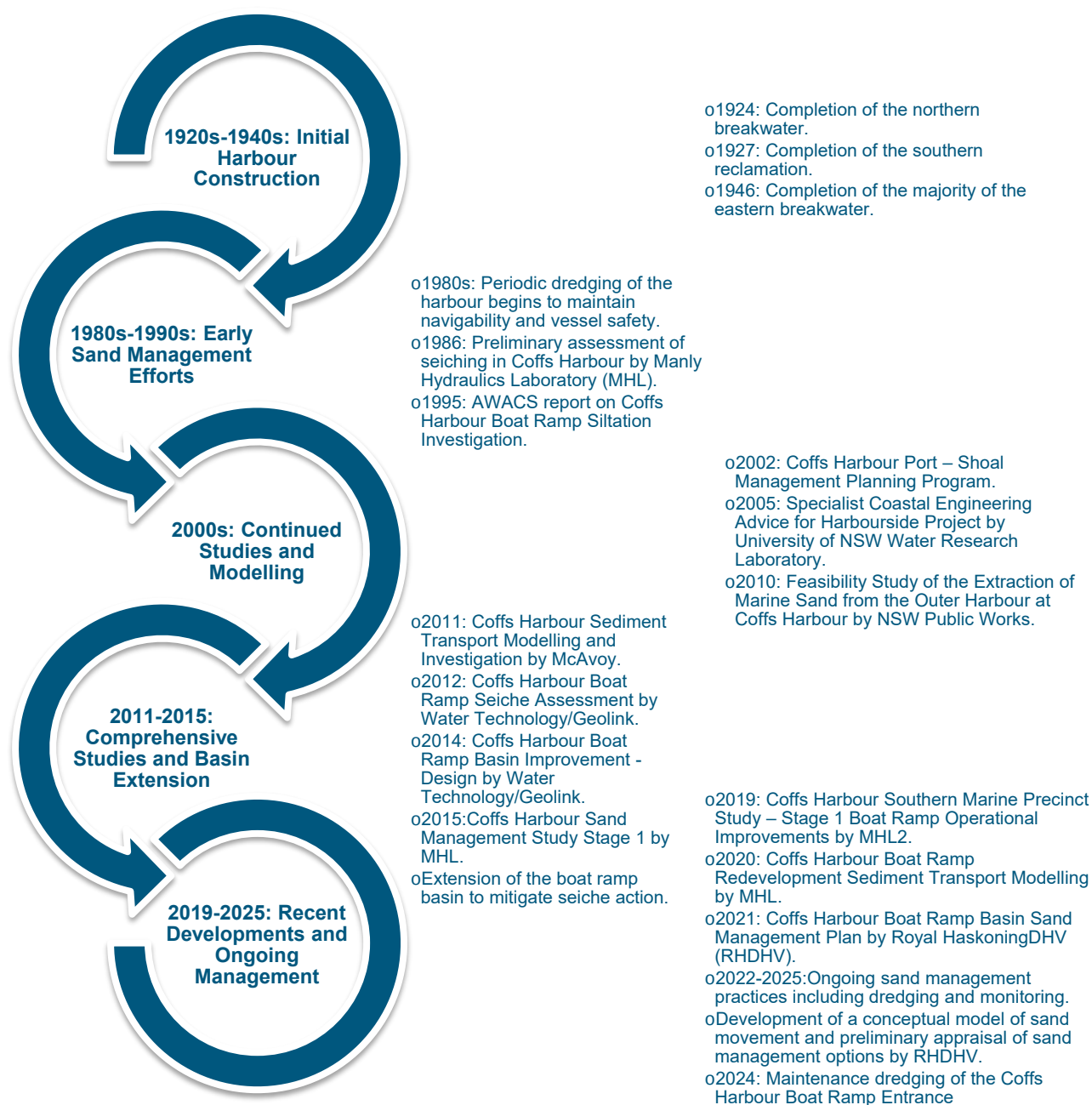
1.2 Purpose

The purpose of the Coffs Harbour SMS is to develop a comprehensive and sustainable approach to managing sedimentation within Coffs Harbour. This strategy aims to address the challenges posed by current sediment transport pathways and increased sediment deposition in vessel navigation areas resulting from the construction of coastal structures. This strategy will assess the challenges associated with the current sand management practices and identify suitable alternatives.

This document will predominantly focus on the management of sediment at the Coffs Harbour Boat Ramp entrance due to the high sedimentation rates experienced in this area and challenges associated with maintaining the entrance channel for boat ramp users.

1.3 Site history and previous studies

Coffs Harbour has been developed since before the 1900s, with ongoing construction stages undertaken to develop the harbour and its coastal defences. Alongside these developments have been various rounds of studies to characterise the metocean and coastal processes, and feasibility of sand management strategies. A summary of the history of the harbour from the 1920s is summarised below.



2 Conceptual Sediment Transport Model

2.1 Regional context

In 2024, RHDHV developed a conceptual sediment transport model for Coffs Harbour as part of a TfNSW project developing conceptual models at five sites along the NSW coast. The current conceptual model is presented in **Figure 2-1** and **Figure 2-2**. The wider model (**Figure 2-1**) shows sediment transported from Boambee Beach to the south, moving into Coffs Harbour, with some sediment bypassing the harbour and moving towards Park Beach to the north.

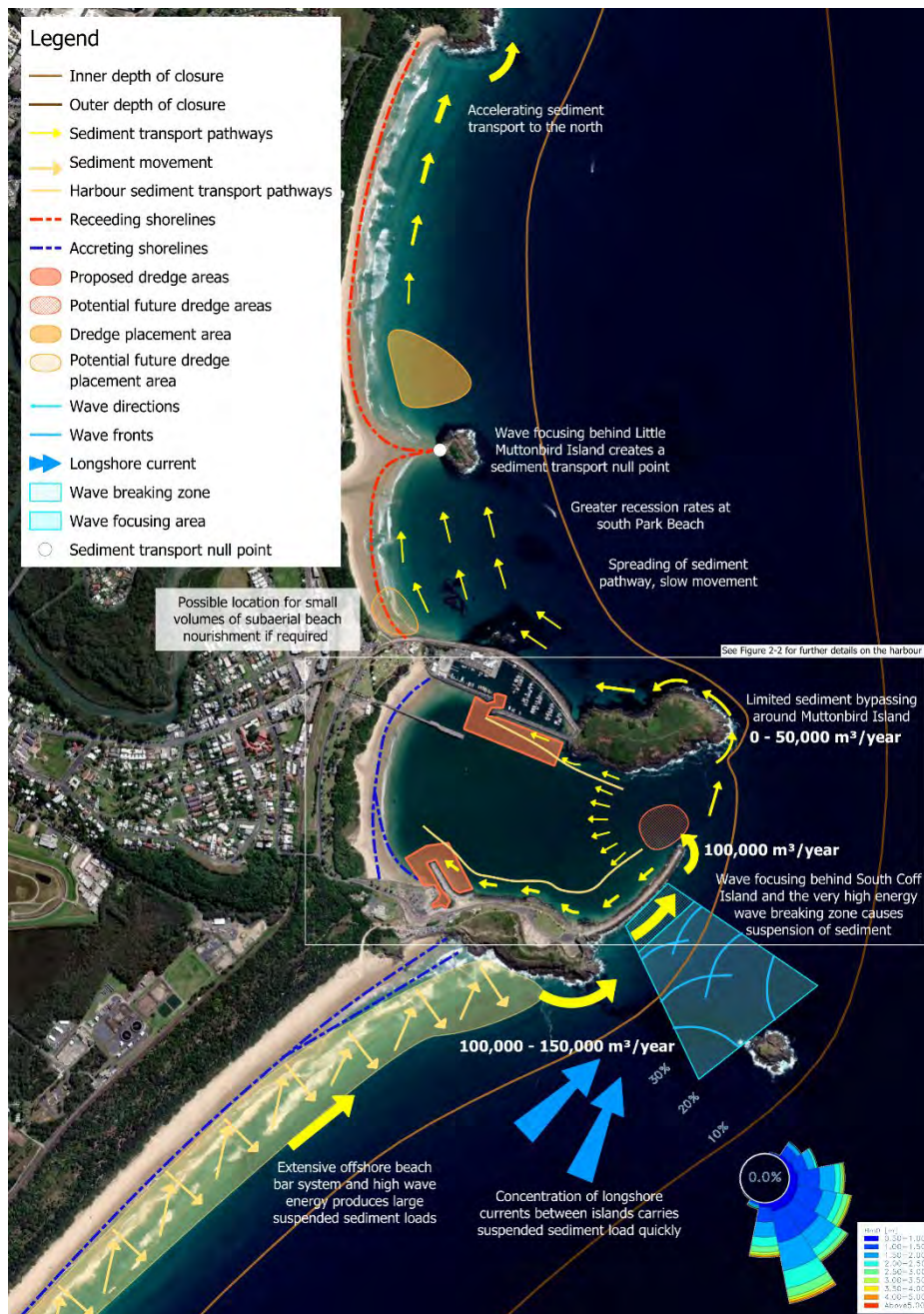


Figure 2-1: Conceptual sediment transport model for Coffs Harbour and Surrounds

The model indicates that Coffs Harbour accretes sediment at a rate of approximately 100,000 m³ per year, with sediment transported northward from Boambee Beach into the harbour entrance. The sediment propagates along the harbour bed towards Jetty Beach, with a significant proportion (approximately 30,000 m³) travelling along the Eastern Breakwater and southern shoreline to the south end of Jetty Beach, where it accretes in the entrance to the newly constructed Coffs Harbour Boat Ramp. Additional sediment is transported along the harbour bed (approximately 60,000 m³), and along the northern shorelines (approximately 10,000 m³). This sediment accumulates along Jetty Beach, where longshore transport carries it predominantly northward. Some southward sediment transport is observed at the southern end of Jetty Beach, towards the boat ramp entrance channel.

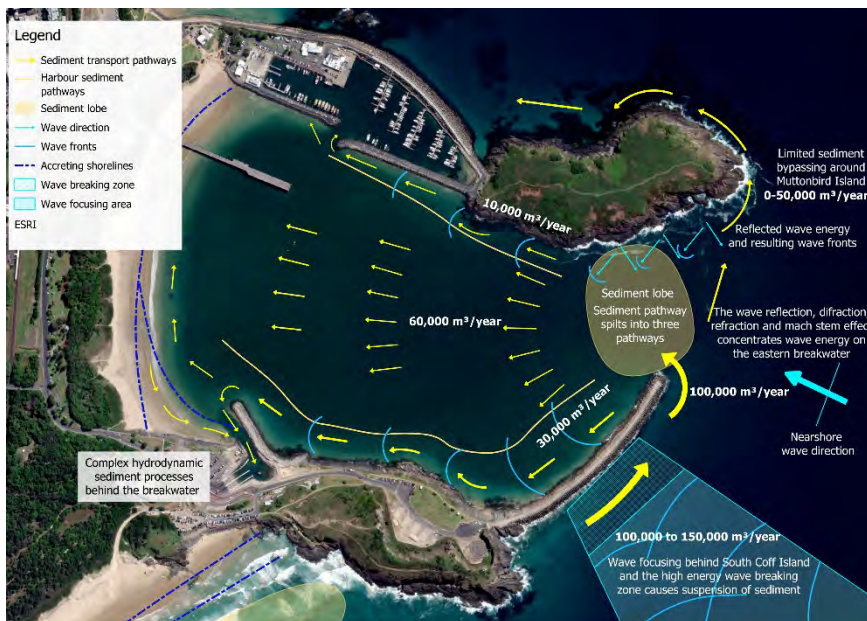


Figure 2-2: Coffs Harbour conceptual sediment transport model

2.2 Coffs Harbour Boat Ramp Entrance

RHDHV understands that an easterly migration of sand towards the boat ramp entrance from Jetty Beach has been observed prior to and following construction of the 75m Southern Breakwater extension, which was completed in late 2021. Also, movement of sand has been observed along the seaward side of the Southern Breakwater extension due to wave action with deposition occurring at the head of the breakwater to form a new shoal bar in that area.

Given the magnitude of change that is evident from dredging records and bathymetric surveys, TfNSW engaged RHDHV to develop and consider a range of options that can provide a cost-effective means of short-term and long-term management of the boat ramp entrance to prevent ongoing build-up of sand.

The transport of sand from offshore around the Southern Breakwater to Jetty Beach is driven by wave energy penetration into the greater harbour area. Sand will collect at the new breakwater extension to an equilibrium cross shore profile slope and alongshore beach plan shape and subsequently bypass the structure once this equilibrium is reached. Complex wave patterns around the head of the breakwater deliver sand in the area in the lee of the breakwater extension in three ways: mach stem effect (where long wave energy is “trapped” by the structure and runs directly along the leeside of the breakwater into the basin); diffraction and refraction (due to the formation of sediment shoals) of wave energy into the sheltered area in the lee of the structure; and direct wave energy passing the head of the structure

towards Jetty Beach. Wave breaking aids the transport of sand at and around the head of the breakwater by lifting the sediment from the bed into suspension where it is readily transported by wave associated currents.

The sand redistribution from Jetty Beach towards the boat ramp entrance is driven by the modified inshore wave conditions induced following construction of the breakwater extension. The extended breakwater influences the way that waves diffract and penetrate to the Jetty Beach shoreline. In addition, wave-induced currents (from both breaking waves and the spatial differential in wave setup at the shoreline) flowing eastward along the boat ramp coastline create a large counterclockwise eddy behind the breakwater which transports sediment from Jetty Beach towards the boat ramp entrance.

2.3 Previous sand management investigations

RHDHV prepared a Sand Management Plan for the site in 2021 (RHDHV, 2021). This was followed by three phases of Sand Management Investigations between 2022 and 2023 (RHDHV, 2022a; 2022b; 2023). These plans assessed different methods of minimising infilling within the boat ramp basin and impacts from extension of existing structures. The previous reports provide a detailed assessment of the local sediment transport mechanisms at the boat ramp, and an assessment of various options. These documents also outline potential changes to existing structures, or new structures based on hydrodynamic modelling, alongside a range of sand management methods.

The previous studies noted that the current boat ramp construction, and Coffs Harbour in general have not adequately considered natural processes in design. The studies note natural sediment transport processes are working in opposition to the primary goal of the boat ramp facility. The natural response of the system to the current southern breakwater is to develop an active beach profile in the boat ramp entrance, whereas the goal of the facility is to maintain a stable, relatively deep, navigable channel.

In the coastal environment, working against nature is not sustainable. Accordingly, options to manage the sediment influx that threatens to close the facility entrance (and will so do so if mechanical sediment removal is not continued in perpetuity) will need to consider modification to the incident wave climate (most likely through redirection) such that the influx of sediment is reduced to a manageable and sustainable level. Nevertheless, it is considered that ongoing dredging will still be required to some extent. Dredging a channel in an active beach profile where there is limited tidal prism upstream and no freshwater flows assisting in naturally keeping the entrance open, is likely to require mechanical removal of sediment in perpetuity.

3 Appraisal of Current Maintenance Methods

3.1 Dredging methods

TfNSW has implemented several dredging methods to manage sediment accretion at the boat ramp entrance channel. The methods utilised include:

1. **Sand pumping system:** the program has primarily relied on a sand pumping system for removing sand from the channel, using an array of static jet pumps and pipelines to pump sand to Gallows Beach. To date, this has been a temporary trial diesel powered system.
2. **Small cutter suction dredger (CSD):** A small CSD has been used for periodic maintenance dredging to supplement the jet pump operation (approximately quarterly).
3. **Long-reach excavator:** An excavator was used for additional removal of sediment around the breakwater when required

The current methodology has not been optimised for cost or efficiency at this stage. Additionally, stakeholders have identified several costs unexpected issues associated with these systems (discussed in **Section 3.4**).

3.2 Overview of sand pumping system

TfNSW currently operate a sand pumping system, powered by diesel equipment to pump sand over 150 m to Gallows beach, south of the boat ramp. This system was implemented for a trial period in 2023, with the purpose of removing sediment accumulating at the boat ramp entrance. A previous initial evaluation by TfNSW noted the shore-based pumping equipment could be installed and removed at significantly less cost than alternative dredging options. In addition, these systems could be utilised as needed and respond quickly to sediment inflows from high swell events.

The pumping system comprises several pipelines entering the harbour to the south-west of the Southern Breakwater (see **Figure 3-1**). These pipelines are linked to five (5) static jet pump locations that remove sand at specific locations within the entrance channel area. The extraction of sand by the jet pumps creates deep holes in the bed, with naturally forming side-slopes which join to meet the depth requirements for navigation. The sand is pumped to a discharge location on Gallows Beach (see **Figure 3-2**).

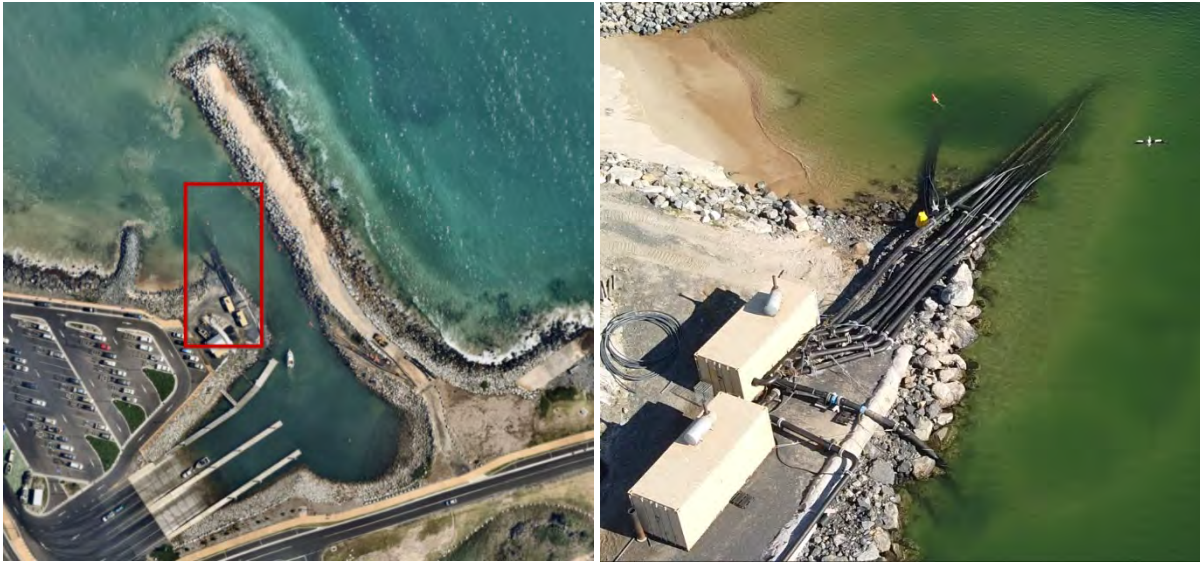


Figure 3-1: Aerial imagery of the current pumping setup at Coffs Harbour Boat Ramp (left), Photo of jet pump pipelines entering the water (right)



Figure 3-2: Aerial imagery of the discharge pipeline exiting at Gallows Beach (left), Photo of the discharge pipeline outlet at Gallows Beach (right)

3.3 Previous dredging volumes

In April 2023 TfNSW installed jet pumps at the boat ramp entrance channel for trialling as a long-term SMS. In late 2023 additional dredging was commenced using a cutter suction dredge (CSD). The total dredging volumes from previous dredging campaigns is summarised in **Table 3-1**, and has comprised:

- **2023:** 5,817 m³;
- **2024:** 16,302 m³; and
- **2025 (1st Jan to 17th Feb):** 6,678 m³.

Between early December 2024 and mid-February 2025, TfNSW has implemented a concentrated dredging campaign. This campaign has removed approximately 11,500 m³ of sand from the entrance channel, comprising:

- **Small CSD:** 8,900 m³; and
- **Jet pumps:** 2,600 m³.

A recent survey completed in February 2025 identified that an additional 2,400 m³ of dredging would be required to meet the current channel design requirements.

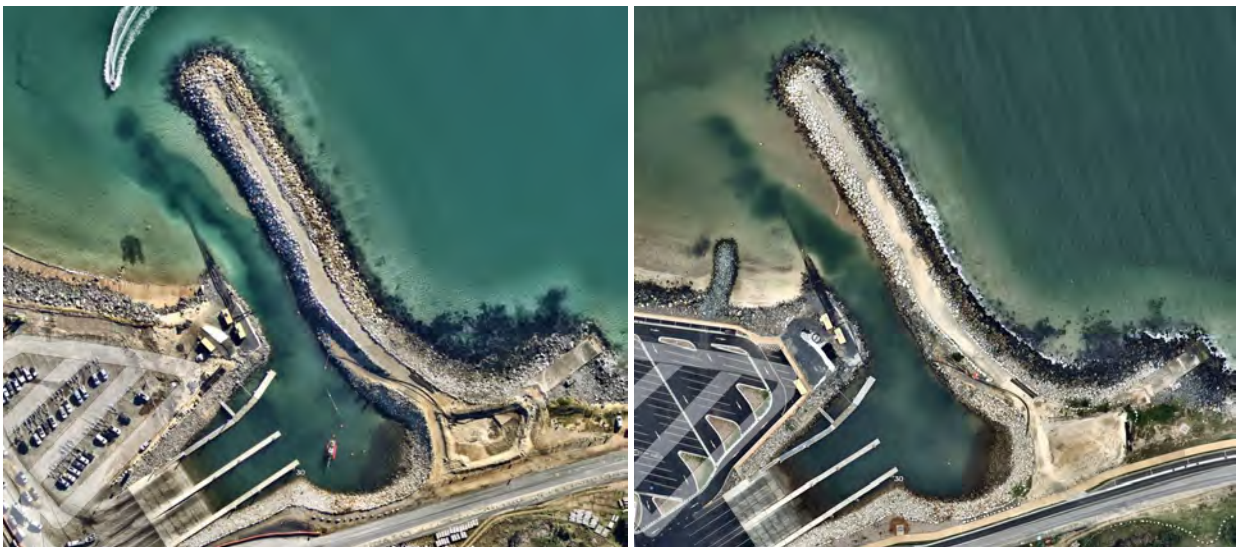


Figure 3-3: Entrance Channel 06 July 2023 (left) and 01 March 2024 (right)

Table 3-1: Production rates for different dredging operations at Coffs Harbour boat ramp (based on TfNSW records)

Month	Pumping operations						Long-reach excavator operations		Cutter-suction dredger operations		Total volume removed (m³)
	Pump 1 output (m³)	Pump 2 output (m³)	Pump 3 output (m³)	Pump 4 output (m³)	Pump 5 output (m³)	Days of pumping operation	Long-reach excavator output (m³)	Days of long-reach excavator operation	CSD output (m³)	Days of CSD operation	
2023 Total	841	729	710	936	-	11	900	2	1701	11	5817
Apr 2023	93	100	100	100	-	1	-	-	216	1	609
May 2023	50	30	70	120	-	1	-	-	-	-	270
Jun 2023	11	11	60	132	-	1	-	-	-	-	214
Jul 2023	118	21	35	90	-	2	-	-	-	-	264
Aug 2023	7	5	12	26	-	1	300	1	360	1	710
Sep 2023	-	-	-	-	-	-	-	-	-	-	0
Oct 2023	385	378	401	411	-	2	-	-	-	-	1575
Nov 2023	33	6	18	43	-	1	600	1	250	2	950
Dec 2023	144	178	14	14	-	2			875	7	1225
2024 Total	1287	959	2062	3558	1061	35	1000	8	6374	34	16302
Jan 2024	165	69	151	165	-	1	-	-	150	1	700
Feb 2024	60	190	251	441	-	1	-	-	-	-	942
Mar 2024	272	161	426	470	-	5	400	3	-	-	1729



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Apr 2024	110	110	25	200	-	3	-	-	437	3	882
May 2024	77	29	154	354	-	2	-	-	2907	15	3521
Jun 2024	10	6	14	102	-	3	-	-	-	-	132
Jul 2024	33	11	22	128	-	4	-	-	-	-	193
Aug 2024	176	119	259	468	211	4	200	1	-	-	1434
Sep 2024	106	133	412	527	116	4	100	1	-	-	1394
Oct 2024	118	16	54	238	587	4	300	3	-	-	1313
Nov 2024	51	14	116	120	69	2	-	-	-	-	370
Dec 2024	109	101	178	346	78	2	-	-	2880	15	3691
2025 Total (Jan – 21st Feb)	13	73	426	1134	112	2	-	-	6000	28	6678
Jan 2025	7	0	13	344	0	1	-	-	1920	10	2283
Feb 2025 (1-21 st)	6	73	414	791	112	1	-	-	4080	18	4395
Grand Total	2141	1761	3198	5629	1173	48	1900	10	14075	73	28797

3.3.1 Sand pumping system production

Pumping operations started in early April 2023, utilising 4 jet pumps within the channel. This was increased to 5 jet pumps in August 2024. Sand was pumped from static jet pump locations within the channel. These pump locations could be shifted if required, with potential deployment locations shown in **Figure 3-4**. Pumping rates were relatively variable across the months, with periods of high pumping (e.g. August to October 2024) and periods of low pumping (e.g. August to September 2023) (see **Table 3-1**). The average pumped volume for all pumps is approximately 600 m³/month.

Table 3-2: Summary of pumping production rates

Year	Average monthly volume (m ³)	Total operational days	Average production per operational day (m ³ /day)	Total volume (m ³)
2023	268	12	268	3216
2024	744	40	223	8928
2025 (to 21 st Feb)	879	3	586	1758
Total		55		13902



Figure 3-4: Possible pumping locations within the channel (TfNSW)

3.3.2 CSD production

TfNSW has deployed a small CSD to regularly to remove sand from the entrance channel in areas that are not captured by the static jet pump locations. This was done for a total of 73 days between April 2024 and Feb 2025. The dredging production rates are summarised in **Table 3-3**, based on TfNSW records. The results show the CSD has been increasing its dredging volumes over time and has been increasing its productivity rates as the operation has become more regular. The maximum estimated production rate from TfNSW records is approximately 360 m³ per day. Sand dredged by the CSD is pumped to Gallows Beach via a connection into the common discharge line used by the jet pump system.

Table 3-3: Summary of CSD production rates

Year	Total days of operation	Average production (m ³ /day)	Max Production volume (m ³ /day)	Total volume (m ³)
2023	11	155	360	1701
2024	32	199	320	6374
2025 (to 21 st Feb)	18	273	360	4920
Total	73	-	360	12995

3.3.3 Long-reach excavator production

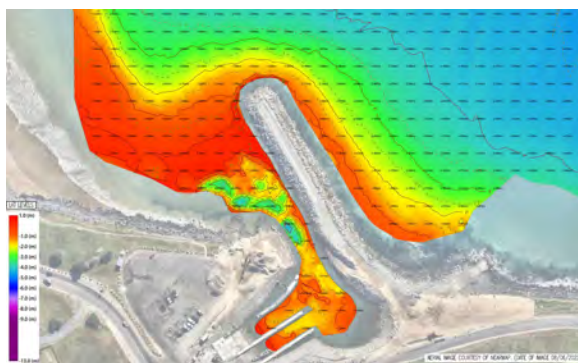
TfNSW has used a long-reach excavator very occasionally to remove sand from around the breakwater. This was done for a total of 10 days between 2023-2025, with very limited sand volume removed. Excavated sand has been placed on the crest of the breakwater. The outputs from the long-reach excavator are summarised in **Table 3-4**.

Table 3-4: Summary of excavator production rates

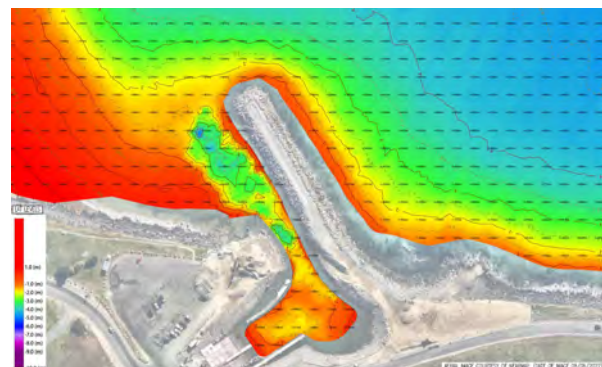
Year	Total days of operation	Average production (m ³ /day of operation)	Max Production volume (m ³ /day)	Total volume (m ³)
2023	2	155	600	900
2024	8	133	200	1000
2025 (to 21 st Feb)	-	-	-	-
Total	10	-	600	1900

3.3.4 Observed sedimentation rates

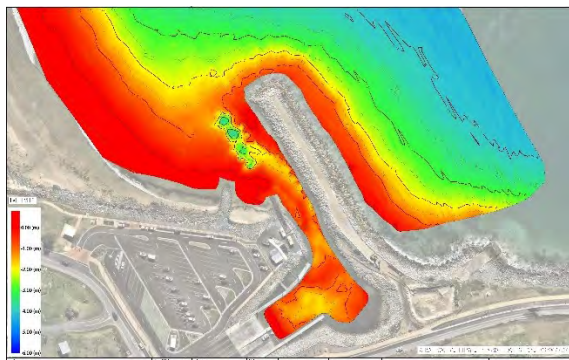
The difference in dredging volumes across years is likely due to the infilling of sediment propagation pathways along the southern coastline, and the surrounding area. Due to the high observed infilling rates, TfNSW has commissioned regular bathymetric surveys of the southern boat ramp entrance channel (see **Figure 3-5**). These surveys, alongside dredging records, have been used to assess infilling rates within the channel.



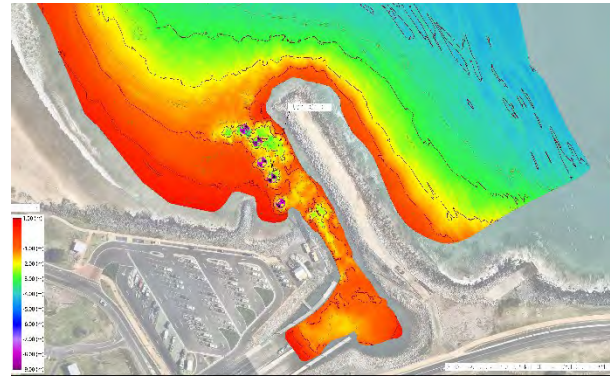
08/11/2022



04/04/2023



06/09/2024



11/02/2025

Figure 3-5: Bathymetric surveys of the boat ramp navigation channel in m LAT (0.99m below AHD)

RHDHV note that infilling is often associated with high swell events, which increase the sediment transport rates into the entrance channel significantly. The records reflect this, showing a highly variable infilling rate (see **Figure 3-6**). Generally, the trend shows an average sediment inflow of approximately 46 m³ per day, with rates of inflow observed up to approximately 300 m³ per day in mid-March 2024 (corresponding with recorded coastal storm events at these times).

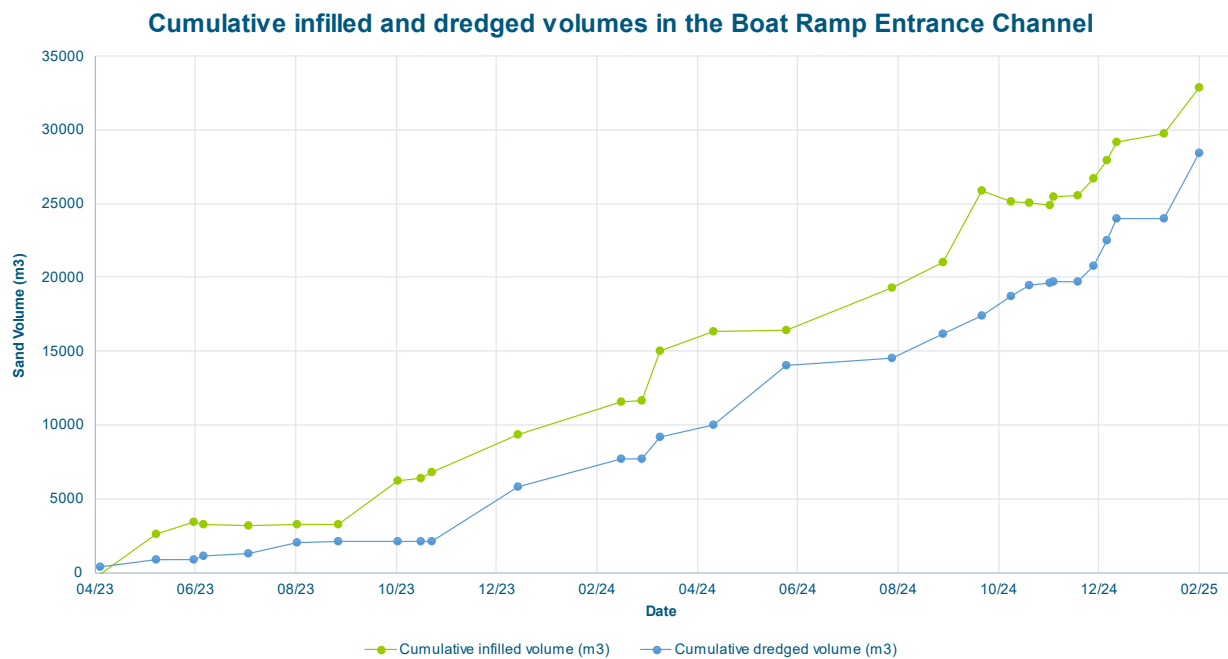


Figure 3-6: Cumulative infilled and dredged volumes in the Boat Ramp entrance channel

3.4 Identified issues

The current sediment pumping system was initially implemented as a cost-saving trial to reduce the expenses associated with regular dredging. However, several issues have emerged during this trial period. These include high ongoing costs, technical challenges, and environmental impacts. This section details these observed challenges.

3.4.1 Sediment transport

The existing pumping system is inefficient, and cycles sediment through a sediment transport 'loop'. The existing jet pumps and CSD transfer sediment from the intake near Coffs Harbour Boat Ramp to the discharge outlet at Gallows Beach. This deposition site is located 'updrift' in the sediment pathway to Coffs Harbour and potentially augments the pathway, increasing the efficiency of natural bypassing of Corambirra Point. Consequently, a significant portion of the sediment deposited at Gallows Beach is reworked and transported back into Coffs Harbour over time (see **Figure 3-7**). This method works against natural sediment transport pathways and will necessitate increased pumping as the pumped sediment re-enters the transport cycle. Ideally, dredged sediment should be transported north of Coffs Harbour, where coastal processes will carry it further northward and away from the Harbour.



Figure 3-7: Sediment transport pathways between Gallows Beach and Coffs Harbour Boat Ramp

3.4.2 Bed profiles and dredge uniformity

The use of static jet pump locations has resulted in the formation of large depressions in the seabed (see **Figure 3-8**). These depressions have been ineffective in managing sediment build-up within the channel for several reasons:

- larger steep holes are prone to high sediment accumulation, which increases long-term pumping requirements compared to a uniformly dredged channel level;
- the non-uniform channel enables the formation of shallow channel sections and sand banks, increasing risks to vessel navigation (see **Figure 3-9**), the depressions exceed 3 m in depth relative to the surrounding bed (observed deeper than -4m LAT), while sand banks have formed in the channel up to 0m LAT, reducing the tidal range at which the boat ramp is accessible to vessels;
- the use of static jet pumps for removal of bed material does not appear to have been entirely successful in preventing the movement of sand into the entrance channel due to the complex sediment transport processes surrounding the entrance channel enabling sand to move from various directions and pathways, which has allowed large quantities of sand to bypass the jet pumped areas near the channel entrance, and form sand banks within the upper channel (see **Figure 3-8** and **Figure 3-9**); and
- the progradation of Jetty Beach due to the inability of the system to keep up with the sediment influx rates has now outflanked the system such that there is a significant entrance bar feature that is beyond the reach of the most seaward jet pump location



Figure 3-8: Visible non-uniform bed levels from pumping

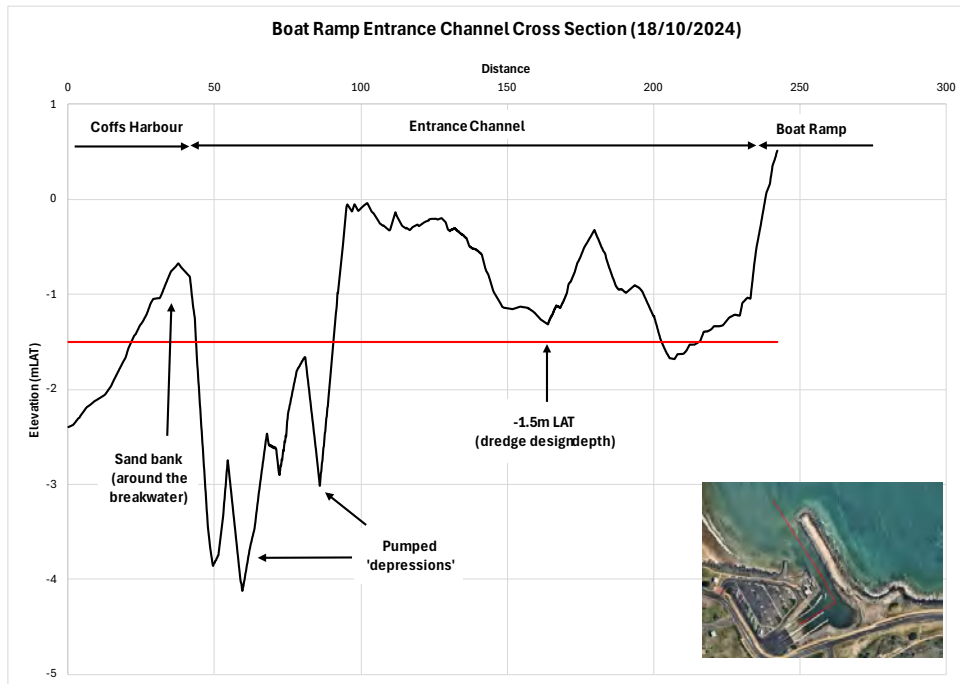


Figure 3-9: Cross Section of Boat Ramp Entrance Channel bathymetry from October 2024

3.4.3 Navigation risk

The presence of sand banks along the channel presents a risk to navigation and public safety. There is a high likelihood of beaching vessels at low tides along the channel's sand banks, as observed from recent bathymetric surveys (see **Figure 3-9**). This will significantly limit the use of the current boat ramp facilities. Additionally, the jet pump pipelines themselves have been identified as a navigation risk, with site crews noting several instances of interaction between vessels and pumps despite the placement of marker buoys to delineate the hazard.

3.4.4 Water quality

The depressions formed by the static jet pumps have been observed to collect marine vegetation (such as kelp and seaweed) between pumping operations. The lag between pumping operations can last up to a month, leaving time for accumulation, smothering and decomposition of significant volumes of kelp and seaweed. Recent water quality monitoring reports identified very low oxygen levels, odours, and visible rotting seaweed within and surrounding the jet pump depressions. The site teams have also noted indications of potential fish kills surrounding the depressions at the onset of pumping operations.

The breakdown of organic matter within stagnant zones appears to be creating hypoxic (low oxygen) zones along the seabed. These hypoxic pools are dispersed at the onset of dredging, and can have several detrimental impacts, including:

- hypoxic conditions and toxic plumes can lead to fish kills and affect invertebrates;
- nutrient release into the water, leading to eutrophication;
- poor water quality and unsightly debris deterring tourists and affecting recreational activities such as swimming, boating, and fishing; and
- poor water quality during discharge operations at Gallows Beach.

The negative impacts associated with these deep seabed depressions could be mitigated by using conventional dredging methods, which can create relatively uniform bed levels.

3.4.5 Operational costs

RHDHV understands that the current pumping regime incurs relatively high costs. Current estimates of ongoing monthly costs are approximately \$69,000 for pump hire, with additional pumping costs per unit. Since 2023, there has been an average cost of \$125 per cubic metre of sand pumped. An additional rate of approximately \$6,325 per day is charged for maintenance dredging activities using a small cutter suction dredger (CSD) where required with a relatively high mobilisation and demobilisation cost associated with this work. RHDHV recommends that the cost of this pumping regime be compared to estimates for a multi-stage SMS, which could more effectively manage sediment transport into the harbour.

Table 3-5: Summary of operational costs for jet pumps (estimated based on TfNSW records)

Year	Operational months recorded	Estimated volume pumped (m ³) *	Approximate Cost (\$) **	\$/m ³
2023	9	3,216	\$ 657,000	\$ 204.2
2024	12	8,928	\$ 925,000	\$ 103.7
2025	2	1,758	\$ 157,000	\$ 89.4
Total	23	13,902	\$ 1,739,000	\$ 125.1

* Volume estimates based on TfNSW dredging records.

**Cost is estimated based on unit costs provided by TfNSW and the boat ramp entrance dredging records.

Table 3-6: Summary of operational costs for CSD (estimated based on TfNSW dredging records)

Year	Mobilisation/ Demobilisation costs (\$) *	Estimated operating cost*	Estimated standdown costs*	Total Costs (\$)	Estimated volume dredged (m ³) **	\$/m ³
2023	\$ 100,000	\$ 82,225	\$ 14,586	\$ 196,811	1601	\$ 122.9
2024	\$ 100,000	\$ 208,725	\$ 27,027	\$ 335,752	6374	\$ 52.7
2025	\$ 20,000	\$ 145,475	\$ 13,299	\$ 178,774	6000	\$ 29.8

* Cost is estimated based on TfNSW records.

**Cost is estimated based on unit costs provided by TfNSW and the boat ramp entrance dredging records.

3.5 Appraisal

The current sand pumping system at Coffs Harbour appears to be inefficient and environmentally detrimental. The system's design, which involves the use of static jet pumps to transport sediment to Gallows Beach, feeds sediment into a circular sediment cycle, and does not create a reliable entrance channel for safe vessel navigation. The deep depressions left by the jet pump operation are also believed to increase sedimentation rates and have negative impacts on marine life and water quality. This inefficiency and adverse impacts highlights the need for a more sustainable approach.

Conventional dredging methods may offer a viable alternative by creating uniform bed levels, which can mitigate the issues associated with the current system. These methods are more effective in managing sediment transport and reducing the environmental impacts observed with the static jet pump system. By adopting conventional dredging, the harbour can achieve a more stable and efficient SMS, ultimately leading to better environmental and economic outcomes.

4 Evaluation of Dredging Methodologies

4.1 Material transportation and deposition

4.1.1 Pipeline options

RHDHV understands previous assessments of discharge pipeline paths from Coffs Harbour northward identified significant constraints associated with crossing the Marina. RHDHV have not conducted a detailed investigation of pumping options from the harbour to the deposition sites on Park Beach.

When utilising a discharge pipeline for sediment transport, the pumping distance is governed by the size of the pump installed on the dredger. This can be supplemented by placing booster pumps in series at predetermined locations along the discharge line to increase the pumping distance. For small to medium sized dredgers, as would be used for this dredging program, the use of high-density polyethylene (HDPE) pipelines can be used for ease of handling and assembly/disassembly. The method and pipe material for discharge of materials would be decided by the contractor.

4.1.2 TSHD/Barge options

Dredged material can be transported to a deposition site using a TSHD or hopper barge. These vessels may either be self-propelled or towed by a workboat to the deposition site. Material used for beach nourishment, as is expected in this dredging program, is generally bottom dumped within the nearshore zone, enabling natural wave action to rework and distribute sand along the beach over time. Targeted pattern placement can augment natural sand formations to improve surf conditions whilst this distribution takes place for additional recreational/community amenity benefit.

TSHDs can vary in their cruising speed significantly. The approximate speeds of McQuade Marine TSHD vessels are between 9-12 km/h (5-7 knots). This means that transport to the deposition site would take between 15-20 mins each way (excluding mobilising and dumping time). Bottom dumping in the nearshore zone at bed levels between -3 m LAT and -5 m LAT would be the most efficient method of deposition. The wave climate at Park Beach would rework the sand and transport it towards the shore. Rainbowing can also be used for depositing sand closer to the beach (see **Figure 4-1**). However, this method is slower, and unlikely to be necessary given the high wave energy environment.



Figure 4-1: TSHD 'Rainbowing' dredged sand for beach nourishment (Source: Maritime and Civil Delivery Group)

4.1.3 Maintenance dredging

Boat ramp entrance

The current management of dredged material includes transport through an onshore pipeline to Gallows Beach. As discussed in **Section 3**, RHDHV does not see pumping to the south for future dredging activities as the optimal solution. However, pumping to Gallows Beach is expected for boat ramp entrance maintenance operations, when transporting sediment northward would be cost-prohibitive (e.g. regular maintenance dredging where sand volumes are lower).

Marina entrance

For maintenance dredging operations at the Marina entrance, previous deposition sites have included pumping to the northern end of Jetty Beach (approximately 150 m from the channel) and pumping northward to Park Beach (see **Figure 4-2**). The cost and complexity of pumping northward may inhibit maintenance dredging at the Marina entrance. The complexity of pumping northward would also increase the time required to set up operations, reducing the response time for maintenance operations. RHDHV note the placement location for CSD works at the marina entrance should be assessed in consultation with local stakeholders.



Figure 4-2: Pumping paths from Marina Entrance Channel

Summary

RHDHV recommends that, where possible, sediment should be dredged and transported by TSHD for placement in the nearshore zone at Park Beach, to the north of Little Muttonbird Island. This would prevent dredged material from re-entering the harbour and reduce long-term dredging requirements as well as providing positive benefits to the beach compartments north of the harbour. RHDHV understands pumping north of Little Muttonbird Island may be costly for maintenance operations, and there have been challenges identified in routing pipelines through the marina and across the northern breakwaters. For the Boat Ramp entrance, pumping should occur to Gallows Beach. For the Marina, no preferred location has been identified at this stage and should be agreed in consultation with local stakeholders. The transport of dredged materials to the north could be undertaken through several pathways and should be evaluated in consultation with dredging contractors.

4.2 Dredging Plant

4.2.1 Guidance on the selection of plant

The selection of dredging plant will be dependent on the available plant and contractors able to undertake ongoing maintenance dredging of the channel. Given the material properties, relatively low dredge volumes and sheltered conditions within the harbour, guidance from BS6349-5 (2016) Table 11 (see **Figure 4-3**) identifies the following:

- The most suitable options are:

- o a small (<5000 m³) TSHD, or
- o a small CSD.
- A backhoe dredger is also considered acceptable given the volume of material. Backhoe dredgers are generally more precise and can be useful for areas close to existing structures, where CSD and TSHDs are unable to safely approach.

Table 11 Guidance on the selection of plant for maintenance dredging

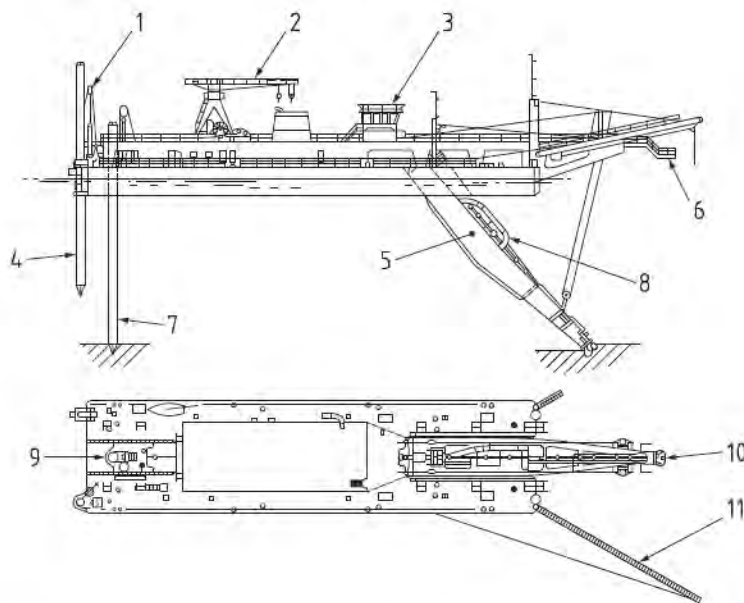
Table 7: Guidance on the selection of plant for maintenance dredging							
Site conditions	Trailing suction			Cutter suction	Grab pontoon	Backhoe	Barge unloader
	<5 000 m ³	> Capacity <	>15 000 m ³				
Bed material							
Loose silt	1	1	1	1	2	2	1
Cohesive silt	2	1	1	1	1	1	2
Fine sand	1	1	1	1	2	2	1
Medium sand	1	1	1	1	2	2	1
Coarse sand	1	1	1	1	2	1	1
Sea conditions							
Enclosed water	2	3	N	1	1	1	2
Sheltered water	1	1	1	1	1	1	1
Exposed water	2	1	1	3	3	3	N
Disposal to:							
Shore	1	1	1	1	32	3	1
Tide	1	1	1	1	N	N	N
Sea bed	1	1	1	3	1	1	N
Quantities							
< 100 000 m ³	1	2	3	1	1	1	1
< 250 000 m ³	2	1	2	1	2	1	1
< 500 000 m ³	2	1	2	1	3	3	1
> 500 000 m ³	3	1	1	1	3	3	1
Heavy traffic	1	1	1	2	2	1	1
Confined working	2	3	3	1	1	1	2
Key							
1 = Most suitable; 2 = Acceptable; 3 = Marginal; N = Not usually suitable.							
<i>NOTE Other factors not referred to can influence the choice of dredger. The table provides only a general guide.</i>							

Figure 4-3: Guidance on the selection of plant for maintenance dredging (BS6349-5, 2016)

4.2.2 Cutter suction dredger (CSD)

A CSD is a suction dredger equipped with a rotating cutterhead (see **Figure 4-4** and **Figure 4-5**), suitable for dredging silts, sands, clay, and rock. The process requires the loosening of soil using the cutterhead, then transporting the dredge material in slurry form through a dredge pump and floating pipeline (see **Figure 4-5**) to the discharge point, or directly loading onto barges.

This is an effective dredging method for cutting and depositing sediments near the dredge channel or transporting to a designated loading zone. These systems are often not self-propelled and require towing into position.

**Key**

1 Spud hoist	7 Anchor or working spud
2 Service crane	8 Underwater pump
3 Control cabin	9 Spud carriage
4 Auxiliary spud	10 Cutterhead
5 Ladder	11 Anchor boom
6 Cutter service platform	

Figure 4-4: A modern cutter suction dredger fitted with submerged ladder pump and spud carriage (Source: British Standard BS6349-5, 2016)



Figure 4-5: Small CSD and floating pipeline (Source: Maritime and Civil Group)

The ability for CSDs to operate in proximity structures (e.g. breakwaters) is dependent on the cutterhead used. The cutterhead utilised on-site for current maintenance dredging operations at the entrance channel (i.e. a four-jet cutterhead) can dredge very close to hard structures. However, more commonly used cutterheads (e.g. rosebud cutterhead) are likely to be significantly damaged if they touch hard structures

and these dredgers require a safe offset to be maintained when dredging adjacent to structures. Additionally, the operation of small CSDs may be restricted by local wave conditions, with significant limitations imposed by their allowable swell and current conditions during dredging operations. The transport and use of small CSDs in high wave energy environments can be a significant limitation of this method.

4.2.3 Trailing suction hopper dredger (TSHD)

TSHDs are self-propelled ships with onboard hoppers (see **Figure 4-6** and **Figure 4-7**), which are storage areas in the hull for transport of dredged material. These are classified as hydraulic dredgers, utilising centrifugal pumps, and can operate in open-sea conditions (generally up to 1.5 m swell). The self-propulsion capability of TSHDs enables these dredgers to extract material from dredging areas and transport the material to placement areas. The self-propulsion capabilities also reduce the challenges associated with mobilisation to site. Discharge is by means of a bottom dumping arrangement or by pump discharge to shore for land reclamation, and some TSHDs have the capability to 'rainbow' dredge material from their bow discharge point.

TSHDs can often be limited in their ability to dredge in areas of very restricted navigation and shallow depth. These vessels may not be able to operate in the very restricted entrance channel to the Coffs Harbour boat ramp, however they could target the open harbour areas outside of the southern breakwater.

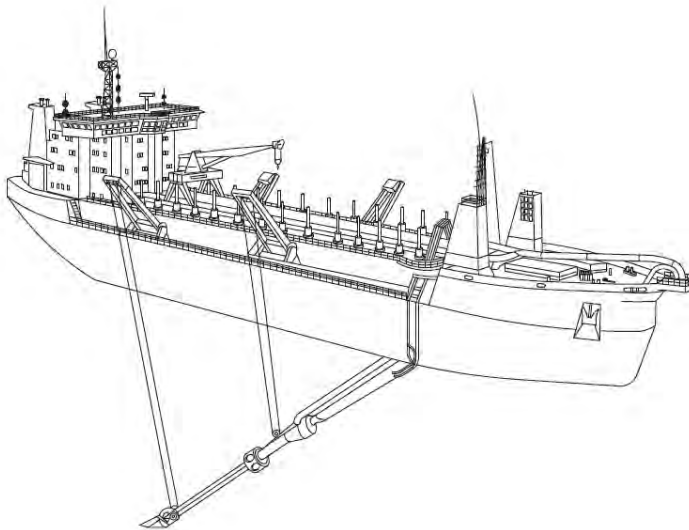


Figure 4-6: A modern TSHD (Source: British Standard 6349-5, 2016)



Figure 4-7: A TSHD vessel and hopper discharge (Source: McQuade Marine)

4.2.4 Backhoe dredgers (BHD)

A Backhoe Dredger (BHD) (see **Figure 4-8**) may be used for dredging near existing structures (i.e. the Southern Breakwater), where alternative dredge methods are unable to safely approach these structures. A BHD is a water-based excavator that evolved from its land-based counterpart. It features a hydraulic excavator (the “backhoe”) mounted on a dedicated dredging pontoon. BHD’s pontoon is anchored with spud poles to ensure stability during excavation. hydraulic excavator draws material backward, removing sediment from the waterbed more precisely than with some alternative dredging methods (i.e. TSHD).

A long arm excavator may also be considered for excavation at the toe of existing structures, assuming suitable reach to remove material from the edges of existing breakwater or a barge (see **Figure 4-9**).

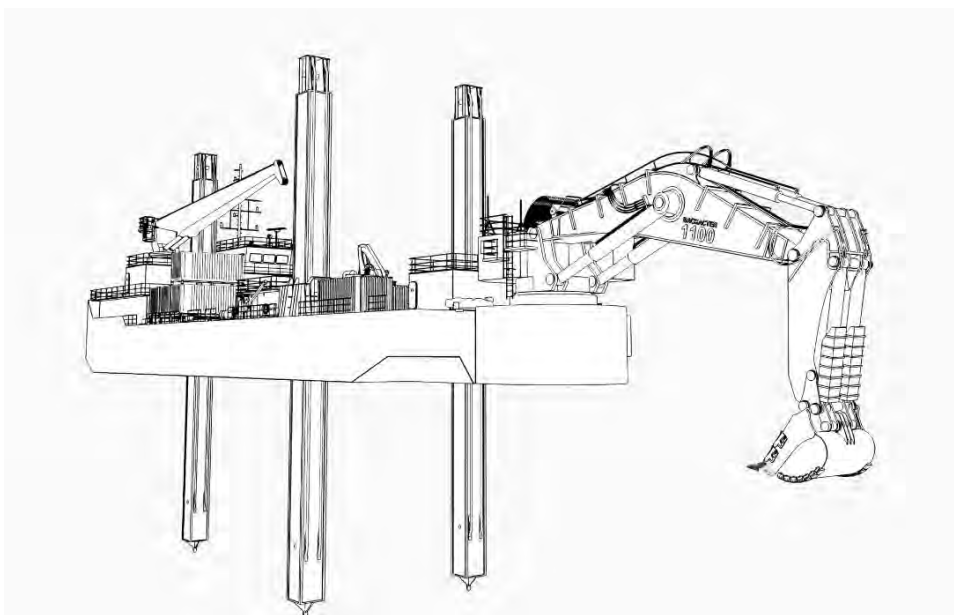


Figure 4-8: Backhoe dredger (BHD) (Source: MGT)



Figure 4-9: Barge-mounted backhoe (Source: Maritime and Civil Delivery Group)

4.2.5 Summary of preferred methods

Table 4-1 presents summary of the preferred dredging methods for each dredge area. Dredge areas are shown in **Appendix A**.

Table 4-1: Summary of preferred dredging methods

Dredge Area	Purpose	Preferred Method	Reason
1. Boat Ramp Entrance Channel (Current)	Navigation Channel	CSD	Channel is currently too narrow for a small TSHD. Existing jet pumps are high cost, with a CSD providing a more cost-effective solution.
2. Updrift area of sediment pathway to boat ramp entrance (eastern side of Southern Breakwater)	Sediment Sink	TSHD	TSHD offers a relatively cost-effective dredging method and enables placement at the preferred deposition site (Park Beach, north of Little Muttonbird Island).
3. Marina Entrance Channel	Navigation Channel	CSD/TSHD	The inner section of the channel is expected to be too narrow for a small TSHD. Where possible a small TSHD should be used (alongside other capital dredging operations). A small CSD may be used for additional maintenance or where access is restricted.
4. Updrift area sediment pathway to marina entrance (south of the Northern Breakwater)	Sediment Sink	TSHD	TSHD offers a relatively cost-effective dredging method and enables placement at the preferred deposition site (Park Beach, north of Little Muttonbird Island).
5. Sediment sink near the harbour entrance	Sediment Sink	TSHD	TSHD offers a relatively cost-effective dredging method and enables placement at the preferred deposition site (Park Beach, north of Little Muttonbird Island).

4.3 Stakeholder Consultation

RHDHV have discussed the current and future sand management options with both; the existing TfNSW project team and management, and contractors currently engaged, or in contract discussions with TfNSW. The information from these stakeholders is invaluable in assessing the; technical feasibility of solutions, costs, and site-specific constraints. No community consultation has been undertaken at this stage.

4.3.1 TfNSW Project Team

TfNSW is leading the sand management process within Coffs Harbour, with an on-site facility for overseeing operations. The TfNSW project team and management has provided RHDHV with a detailed overview of the dredging procedures, site constraints (including community concerns), and historical dredging records. In addition, TfNSW has provided bathymetric surveys which have been used in this assessment to understand sedimentation rates. The TfNSW personnel consulted as part of this project include:

- Dave Hopper (Principal Manager Dredging, Maritime Infrastructure Delivery Office);
- Brett Fletcher (Project Manager, Maritime Infrastructure Delivery Office);
- Kim Bowra (Senior Manager Maritime Infrastructure Programs, Maritime Infrastructure Delivery Office).

Continued input from the TfNSW project team will be critical to optimising sand management operations within Coffs Harbour, as well as engaging local stakeholders where required.

4.3.2 Contractors currently engaged

RHDHV have consulted with local contractors operating in the area on the feasibility of updates to the operations, and constraints presented by the proposed works. This has included:

- **Maritime and Civil Delivery Group Pty Ltd.**, who has recently been undertaking the CSD operations at the Boat Ramp Entrance; and
- **McQuade Marine Pty Ltd.**, who was consulted regarding TSHD operations within Coffs Harbour. TfNSW have been in contract discussions with McQuade regarding capital dredging within the harbour.

4.3.2.1 Maritime and Civil Delivery Group

Maritime and Civil is a specialised contractor offering maritime and civil engineering services. Their expertise spans a wide range of coastal and marine projects, including dredging, beach nourishment, and coastal erosion management. Maritime and Civil Delivery Group have been undertaking CSD dredging operations within Coffs Harbour in recent months and have developed a comprehensive understanding of the local area and conditions.

Within Coffs Harbour, Maritime and Civil have deployed a small (3.0m H x 2.4m W x 7.5m L, with a 6-inch discharge pipeline) Cutter Suction Dredger. This small CSD has a draft of 0.3 m and can access relatively narrow channels, making it suitable for the Boat Ramp Entrance. They additionally offer submersible electric dredgers (with 4-inch discharge pipeline), booster stations, excavators, a barge, and a shallow draft bed-levelling tugboat.

Maritime and Civil Delivery Group were contacted to understand the; current dredging operations and costs, areas for operational improvement, constraints for a small CSD within Coffs Harbour, and feasible dredge outputs.

4.3.2.2 McQuade Marine

McQuade Marine is an Australian-based dredging company with significant project experience within Australia and the Pacific. They currently offer a suite of dredging equipment, including small TSHDs, excavation barges and hopper barges. The TSHDs have a hopper capacity of between 350-450 m³ and are expected to be suitable to undertake the current proposed work within Coffs Harbour. Based on discussions with McQuade Marine, at least one TSHD within their fleet can dredge close to existing structures in low swell conditions by potholing using a suction pipe connected to the dredge vessel's bow discharge point.

McQuade was contacted to understand the; operational constraints of small TSHD vessels, methods of dredging near structures, deposition methods, and costs. Information regarding McQuade's methods and costs have also been shared by TfNSW based on previous contract discussions.

5 Dredging Design

5.1 Dredging needs

The current focus areas for maintenance dredging within Coffs Harbour comprise the boat ramp entrance channel and the marina entrance channel. Both facilities will need ongoing maintenance dredging, with the boat ramp entrance requiring a significantly higher frequency of dredging to manage the high sedimentation rates in this area of relatively shallow depth. The sediment build-up at the marina entrance requires periodic maintenance dredging, which is currently undertaken by a small CSD and has previously been pumped over a short distance (approximately 150m from the channel) to the northern end of Jetty Beach and pumping northward to Park Beach.

To limit the rate of sedimentation within the harbour, RHDHV would suggest additional capital dredging along transport pathways to create sediment sinks at key locations and reduce the requirement for dredging along entrance channels. This capital dredging would allow for larger, more cost-effective plant to be used, and enable less frequent dredging operations.

There are two previously proposed dredge areas within the harbour (refer to **Figure 5-1**). One dredge area includes the northern breakwater and marina entrance. The other dredge area is around both sides of the boat ramp breakwater (southern breakwater). An additional sediment sink is proposed near the entrance to the harbour (see **Figure 2-2**).



Figure 5-1: Preferred dredge transport option plan (North Coast Surveys, April 2024)

5.2 Staging

Discussions with TfNSW have highlighted that dredging within the Coffs Harbour approved dredge boundary (see **Figure 5-1**) is limited to 100,000 m³ per year in accordance with the current approvals. To comply with this limitation, RHDHV suggest a multi-stage dredging program to maximise the effectiveness of the program, while remaining within the annual dredging limit. Any dredging program must prioritise initial maintenance dredging of both navigation channels, followed by creation of sediment sinks.

TfNSW have highlighted the presence of local contractors with a suitable small CSD for maintenance dredging operations, and TSHDs for capital dredging works. RHDHV propose that dredging is undertaken in three stages (the respective dredging areas are also indicated in **Figure 5-5**):

Stage 1: Maintenance dredging of current navigation channels

- Dredging of the current entrance channel for the Coffs Harbour Boat Ramp to a new target design level.
- Dredging of the entrance channel to the Coffs Harbour Marina to existing target design level

Stage 2: Dredging along sediment pathways leading to navigation channels

- Dredging along sediment pathways leading to navigation channels with a small dredger
- Dredging closer to existing structures using potholing methods with TSHDs or CSDs (provisional).

Stage 3: Dredging a sediment sink near the harbour entrance

- Dredging a sediment sink near the entrance to Coffs Harbour.
- Identification of areas requiring dredging, including the marina entrance and boat ramp entrance.

It should be noted that each of the dredging activities listed above would generally need to be repeated in perpetuity to provide long-term sand management at Coffs Harbour.

5.3 Dredge material characterisation

The sediment within Coffs Harbour predominantly comprises fine to medium grained sand, based on available particle size distribution (PSD) records from the Coffs Harbour Boat Ramp Redevelopment (Manly Hydraulics Laboratory, 2020). This study assessed sediment sampled from various locations on Jetty beach and along the southern shoreline (see **Figure 5-2**). The results showed relatively consistent particle compositions across the beach, with generally 98-100% of material comprising fine to medium sand. This has been corroborated by dredging records and existing literature.

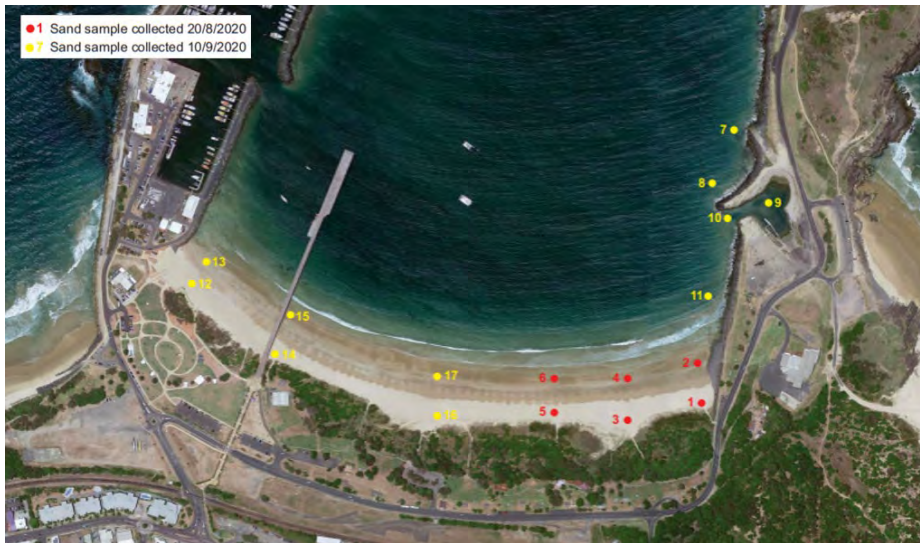


Figure 5-2: Sediment sampling locations (Manly Hydraulics Laboratory, 2020)

5.4 Dredging design parameters

5.4.1 Slopes for dredging

Slopes for dredge designs are to be consistent with previous design assumptions adopted in the boat ramp upgrade works in 2021. These designs assumed a maximum slope of 1 in 4 (vertical to horizontal), with the allowance for higher slopes adjacent to rock structures (but not below the toe of these structures). This is consistent with slopes observed within existing navigation channels (i.e. marina and boat ramp entrance), alongside typical underwater side slopes in still water conditions prescribed in British Standard BS6349-3 (2012). The existing slopes along the current boat ramp entrance and marina entrance are generally 10-15°, with areas of up to 20°.

5.4.2 Typical working vertical accuracy of dredging plant

The dredge design should consider the vertical accuracy of the required dredging plant to assess the overdredging allowance. Vertical accuracies of small CSDs and TSHDs are dependent on the vessel size, bed material, and sea conditions. Using methods outlined in British Standard BS6349-5, the vertical accuracy is the sum of the variability for plant and environmental conditions, and assumed to be:

- $\pm 150\text{mm}$ for a small CSD in fine to medium grained sand;
- $\pm 150\text{mm}$ for a small CSD due to sea conditions in sheltered waters;
- $\pm 200\text{mm}$ for a light TSHD ($<10,000 \text{ m}^3$) in medium sand;
- $\pm 100\text{mm}$ for a small TSHD due to sea conditions in sheltered waters; and
- ± 0 due to currents (assuming $<1.0 \text{ m/s}$ current speeds).

The total vertical accuracy is assumed to be $\pm 300\text{mm}$ for both a small CSD and small TSHD. This accuracy can vary depending on the plant, and the local environmental conditions (wave heights, currents). If dredging is conducted in areas with exposed water conditions, or high swell environment, vertical accuracies will be significantly reduced.

5.4.3 Target dredging levels

RHDHV understand the current target dredging levels for the boat ramp entrance and the marina entrance are -1.5 m LAT and -4.5 m LAT, respectively. RHDHV suggest increasing the target dredging level for the boat ramp entrance by 0.3 m to -1.8 m LAT to provide additional sedimentation capacity during high swell events. This will reduce the required frequency of dredging and provide additional sedimentation capacity before dredging equipment needs to be mobilised. Dredge areas and target dredging levels are summarised in **Table 5-1**.

Levels proposed for sediment sinks are suggested to fit in-line with the surrounding bathymetry, and to provide a reasonable dredging volume within the annual harbour limits for each stage. These have been selected through iterative volume calculations until suitable depths and footprints were identified. Footprints and volumes are presented in **Appendix A**.

Table 5-1: Summary of target dredging levels

Dredge Area	Purpose	Target Dredging Level (m LAT)	Overdredging Allowance (m)*	Preferred Method
Boat Ramp Entrance Channel (current)	Navigation Channel	-1.5	0.3	CSD
Boat Ramp Entrance Channel (proposed)	Navigation Channel	-1.8	0.3	CSD
Marina Entrance Channel (current)	Navigation Channel	-4.5	0.3	CSD/TSHD
Updrift area of sediment pathway to boat ramp entrance (eastern side of Southern Breakwater)	Sediment Sink	-4.0	0.3	TSHD
Updrift area sediment pathway to marina entrance (south of the Northern Breakwater)	Sediment Sink	-4.0	0.3	TSHD
Sediment sink near the harbour entrance	Sediment Sink	-6.0	0.3	TSHD

* Overdredging volumes assume 0.3 m overdredging allowance below target dredging levels, based on tolerances prescribed in BS6349-5 (2016)

5.4.4 Geotechnical conditions

Previous geotechnical investigations (Regional Geotechnical Solutions, 2020) identified marine sediment thicknesses at several borehole locations surrounding the southern breakwater. The marine sediment was observed in boreholes underlying the existing breakwater to approximately -6.5 m LAT (see **Figure 5-3**), underlain by approximately 4 m of silty clay (residual Argillite). This marine sediment level is likely to be variable and may be shallower closer to shore. There is not sufficient geotechnical information to inform the depth of marine sediment over the entire dredging extent.



Figure 5-3: Borehole locations (Regional Geotechnical Solutions, 2020)

5.5 Material reuse options

There are two previously proposed dredge material placement areas to the north of the harbour. The preferred location is in the nearshore zone of Park Beach, north of Little Muttonbird Island (see **Figure 5-4**).

An alternative location has been identified on the southern end of Park Beach (for smaller volumes), however this is currently not preferred due to concerns regarding infilling impacting the dynamics at the mouth of Coffs Creek, and potential environmental impacts associated with the littoral rainforest adjacent to Coffs Creek and known Aboriginal heritage sites in the area. However, it may be considered beneficial during periods of beach recovery following erosion events induced by large waves.

Placement of dredge material at the preferred location in the nearshore zone of Park Beach, north of Little Muttonbird Island, would reduce the concerns for placement on the southern end of Park Beach.



Figure 5-4: Proposed dredge material placement locations

5.6 Dredging footprints

RHDHV have drafted conceptual dredging footprints, based on previous dredging footprints and sediment transport pathways identified in the conceptual model (see **Section 2**). Due to the annual dredging limit within Coffs Harbour (100,000 m³ per year), a staged program will be required to dredge the proposed areas over two years. The staging and preliminary dredge volumes are summarised in **Table 5-2** and **Table 5-3**. The dredging areas are identified in **Figure 5-5** and **Appendix A**.

Annual maintenance dredging volumes have only been estimated for the Boat Ramp Entrance channel (see **Section 3.3**), however this volume is expected to be highly variable. Navigation channel dredging (Areas 1 and 3) is likely to have changed significantly since the October 2024 survey and should be re-assessed close to the program commencement date.

The capital dredging volumes (Areas 2, 4, and 5) should be targeted with a TSHD. Ideally, a proportion of Area 3 should also be targeted with a TSHD, where feasible with the navigation constraints presented by the marina entrance (as identified in **Section 4.2.5**).

Dredging footprints will require refinement to consider the extent of the breakwaters and interface with existing structures (as identified in **Section 5.4.1**).

Table 5-2: Dredging stages, estimated volumes, and current proposed timeline (volumes based on inner and outer harbour survey, 18/10/2024)

Year	Area	Dredge Area	Target Dredging Level (m LAT) ^a	Approximate Volume (design level, m ³)	Total (incl. overdredging, m ³) ^d	Preferred Method
Annual	Annual Maintenance ^b	Boat Ramp Entrance Channel	Maintenance	17,000	-	CSD
		Marina Entrance Channel	Maintenance	Unknown	-	CSD
2025	1a	Boat Ramp Entrance Channel ^c	-1.5	3,947 ^e	5,814	CSD
	1b		-1.8	1,932	2,147	CSD
	2	East of Southern Breakwater	-4.0	15,067	19,769	TSHD
	3	Marina Entrance Channel	-4.5	5,097 ^f	7,063	CSD/TSHD ^g
	4	South of Northern Breakwater	-4.0	19,190	27,130	TSHD
2026	5	Outer Harbour Sediment Sink	-6.0	70,287	80,679	TSHD

a. Australian Height Datum (AHD) is 0.99m above LAT

b. Annual sedimentation volumes are approximate, and highly dependent on metocean conditions and storm events. Estimated annual maintenance dredging volume for boat ramp entrance channel is based on average infilling rates between April 2023 to February 2025 (see **Section 3.3.4**).

c. This study proposes dredging beyond the current (-1.5 m LAT) design depth, to -1.8 m LAT.

d. Overdredging volumes assume 0.3 m overdredging allowance below target dredging levels, based on tolerances prescribed in BS6349-5 (2016)

e. Dredge volume required to return the boat ramp entrance channel to the design level will have changed significantly due to recent dredging operations and storm events.

f. Dredge volume required to meet the marina entrance channel design level will have changed significantly since the most recent survey due to recent storm events. Updated dredging volumes should be assessed prior to any dredging works.

g. Where possible, dredging should be undertaken with a TSHD, with a CSD used where navigation risk prevents a TSHD from accessing.

Table 5-3: Estimated volumes for dredging in 2025 and 2026.

Year	Approximate Volume (design level, m ³)	Total (incl. overdredging, m ³)**
Annual maintenance dredging (boat ramp channel only)	17,000	-
2025 (excluding maintenance dredging)	45,233	61,923
2026 (excluding maintenance dredging)	70,287	80,679

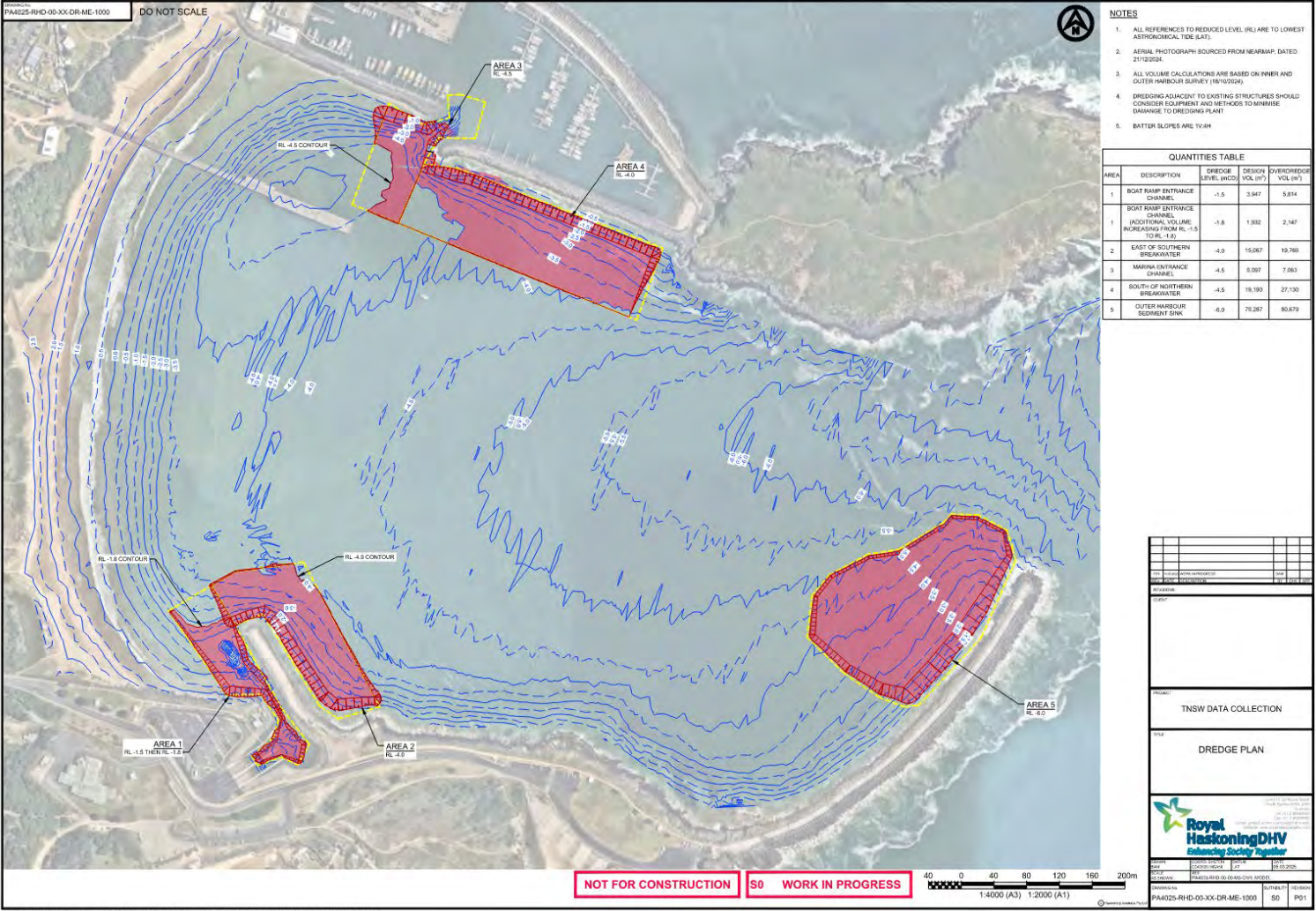


Figure 5-5: Concept Dredge Plan for Coffs Harbour

6 Cost Estimation

6.1 Historical costs per dredging method

Based on historical production rates between April 2023 and 2025, the average costs of each dredging method are summarised in **Table 6-1** below. The cost range shown identifies the range of average costs for the 2023 to 2025 calendar years. The costs per m³ varied significantly due to the staging of campaigns, mobilisation and demobilisation costs, and variation in pumping rates. It should be noted that due to the relatively high mobilisation/demobilisation costs for the current CSD, the CSD was significantly more cost effective per unit dredged when used for extended periods, rather than more frequent mobilisations for smaller volumes.

Table 6-1: Estimated costs of dredging the boat ramp entrance per method between April 2023 and February 2025

Method	Average cost (\$/m ³)	Cost range (\$/m ³)
Jet Pumps *	125	89 - 204
CSD	46	30 - 123

* The costs above do not account for installation/removal costs of jet-pumping infrastructure.

6.2 Capital dredging costs

Based on initial estimates of dredging costs provided by TfNSW, the cost for capital dredging using a TSHD would be approximately \$23/m³, assuming a 90,000 m³ campaign (i.e. total cost of \$2.07 million). This cost is well above the annual spend over previous years (refer **Table 3-5** and **Table 3-6**), however it represents a significantly larger volume of sand removed from the harbour. The unit cost is markedly below the cost of other methods used previously and presents an opportunity to effectively reduce maintenance dredging costs.

Dredging with a TSHD will be limited to areas that are navigable with the selected TSHD. TfNSW should note that the dredging costs per m³ may differ significantly depending on a range of factors, including:

- the proposed dredge volumes per campaign;
- dredge material properties (particle size distribution, consistency);
- dredge material placement location and method (bottom dumping vs rainbowing); and
- proximity to structures (requiring slower dredging methods).

6.3 Estimation of ongoing maintenance dredging costs

RHDHV have assessed the operational cost of maintaining the boat ramp entrance channel using a CSD. This is based on current operational costs for the CSD and based on the calculated historical sediment inflow rate to the southern channel. This analysis has not considered inflation or potential increases in costs due to market volatility.

Assuming the CSD can maintain a 300m³/day pumping rate, the CSD will be required for approximately 57 days per year. This may vary significantly depending on the number of high swell days.

Due to the relatively high mobilisation/demobilisation costs for the small CSD, it is more cost effective to undertake larger dredge campaigns and pay daily stand-down rates for the CSD rather than remobilise more frequently. We have assumed 4 mobilisations annually (i.e. one mobilisation every 3 months), with each dredging campaign lasting approximately 28 days on-site including stand-down days.

The estimated operational costs for this solution are significantly less per cubic metre dredged than the cost incurred by the jet pump and CSD operations currently (see **Table 3-5** and **Table 3-6**). This solution therefore represents a cost-optimised solution for channel maintenance.

Table 6-2: Estimation of CSD operational costs

CSD Operational Cost Estimate	
Estimated annual infilling volume (m ³) *	17,000
Average daily production (m ³ /day)	300
Annual dredging days	57
Stand-down days (assumed)**	57
Annual stand-down costs (CSD)	\$ 48,906
Annual operation cost	\$ 360,525
Number of Mobilisations (assumed)	4
Mobilisation/Demobilisation costs (4 x \$20,000 mobilisation, 4 x \$20,000 demobilisation)	\$ 160,000
Total annual cost (\$)	\$ 569,431
Approximate cost per unit (\$/m³)	\$ 33.5

* Estimated annual volumes based on average infilling rates between April 2023 to February 2025 (see **Section 3.3.4**).

** Number of stand-down days assumed to be the same as operational days based on previous dredge records

6.4 Operational recommendations

RHDHV recommend the removal of the existing static jet pumps, and the utilisation of a small CSD for ongoing maintenance dredging. To maximise the efficiency of CSD operations, TfNSW should consider methods for reducing daily mobilisation/demobilisation times and improving operational efficiency. This should be conducted in consultation with the preferred contractor and adjusted based on operational observations. Several methods for improving efficiency of operations have been identified below, based on consultation with the current CSD operator in the harbour.

CSD pumping connections

TfNSW could extend or develop infrastructure to improve the efficiency of maintenance dredging within the harbour. Methods to reduce the amount of pipework required to be mobilised/connected on a regular basis would significantly increase the operational efficiency of the CSD. This could include installation of permanent pipelines to reduce daily pipeline mobilisation times and provision of multiple connection points to the discharge pipeline to Gallows Beach for improved flexibility.

Leaving dredge anchored

TfNSW could consider options to allow the CSD vessel to be anchored close to site and connected to the discharge pipeline to Gallows Beach for multi-day operations in low swell conditions, reducing the daily mobilisation/demobilisation time that is currently incurred (estimated to be 1-2 hours daily) to move the dredger in and out of the basin and connect/disconnect from the discharge pipeline. This is likely to have a relatively small cost impact relative to the scale of spending, however, this could add-up to a significant amount depending on the duration of a campaign.

7 Conclusion

7.1 Summary

This Sand Management Strategy assesses the challenges posed by the high sedimentation rates impacting operations at recreational facilities within Coffs Harbour, mainly the Coffs Harbour Boat Ramp. This document highlights some inefficiencies and environmental impacts associated with the current methodology and proposes a multi-stage dredging approach to improve outcomes and reduce costs. This includes maintenance dredging of navigation channels, dredging along sediment transport pathways, and creation of a sediment sink near the main harbour entrance.

This report evaluates various dredging methodologies and recommends suitable dredging plant options, such as small TSHDs and CSDs. Cost estimates of previous activities and proposed solutions have been based on records provided by TfNSW, and estimates should be validated in consultation with contractors. Overall, the strategy aims to ensure the long-term functionality and safety of the harbour's navigation channels through sustainable and cost-effective sand management practices.

7.2 Next steps

7.2.1 Future surveys of infilling rates

RHDHV recommends ongoing surveys of infilling rates to validate infilling rates at the onset of new dredging methods. The volume change within these areas should be assessed alongside dredging records to understand the sediment inflows within the channel.

7.2.2 Update of Review of Environmental Factors

Based on the new capital and maintenance dredging methodologies, RHDHV recommend an update of the existing REF to include the new operational and capital dredging changes. This should include long-term pumping to Gallows Beach, emergency dredging operations, Park Beach placement locations, and capital works dredging.

7.3 Recommendations

7.3.1 Dredging methodologies:

1. **Multi-Stage Dredging Program:** Implement a multi-stage dredging program to maximise effectiveness while staying within the annual dredging limit of 100,000 m³ (see **Section 5.2**). This should comprise maintenance dredging of navigation channels first, followed by creation of sediment sinks along sediment transport pathways to reduce the rate of infilling in navigation channels. It should be noted that each of the dredging activities would generally need to be repeated in perpetuity to provide long-term sand management at Coffs Harbour.
2. **Remove Static Jet Pumps:** Eliminate the existing static jet pumps and utilise a small Cutter Suction Dredger (CSD) for targeted dredging operations (**Section 3**).
3. **Maintenance Dredging:** Utilise the small CSD for maintenance dredging. This should use the CSD for longer dredging campaigns to minimise mobilisation costs. If possible, TfNSW could attempt to maintain the CSD in the harbour year-round or coordinate multi-stage campaigns to minimise mobilisation fees (e.g. dredging both the marina and boat ramp entrance, and where feasible re-dredging sediment sinks during low swell conditions).
4. **Capital Dredging:** Use small Trailer Suction Hopper Dredgers (TSHDs) for capital dredging operations within the harbour (**Section 4.2.5**).

7.3.2 Operational efficiencies:

5. Extend or develop infrastructure to reduce the amount of pipework required to be mobilised/connected to for CSD operations, increasing operational hours and reducing costs (**Section 6.4**). This could include installation of permanent pipelines to reduce daily pipeline mobilisation times and provision of multiple connection points to the discharge pipeline to Gallows Beach for improved flexibility.

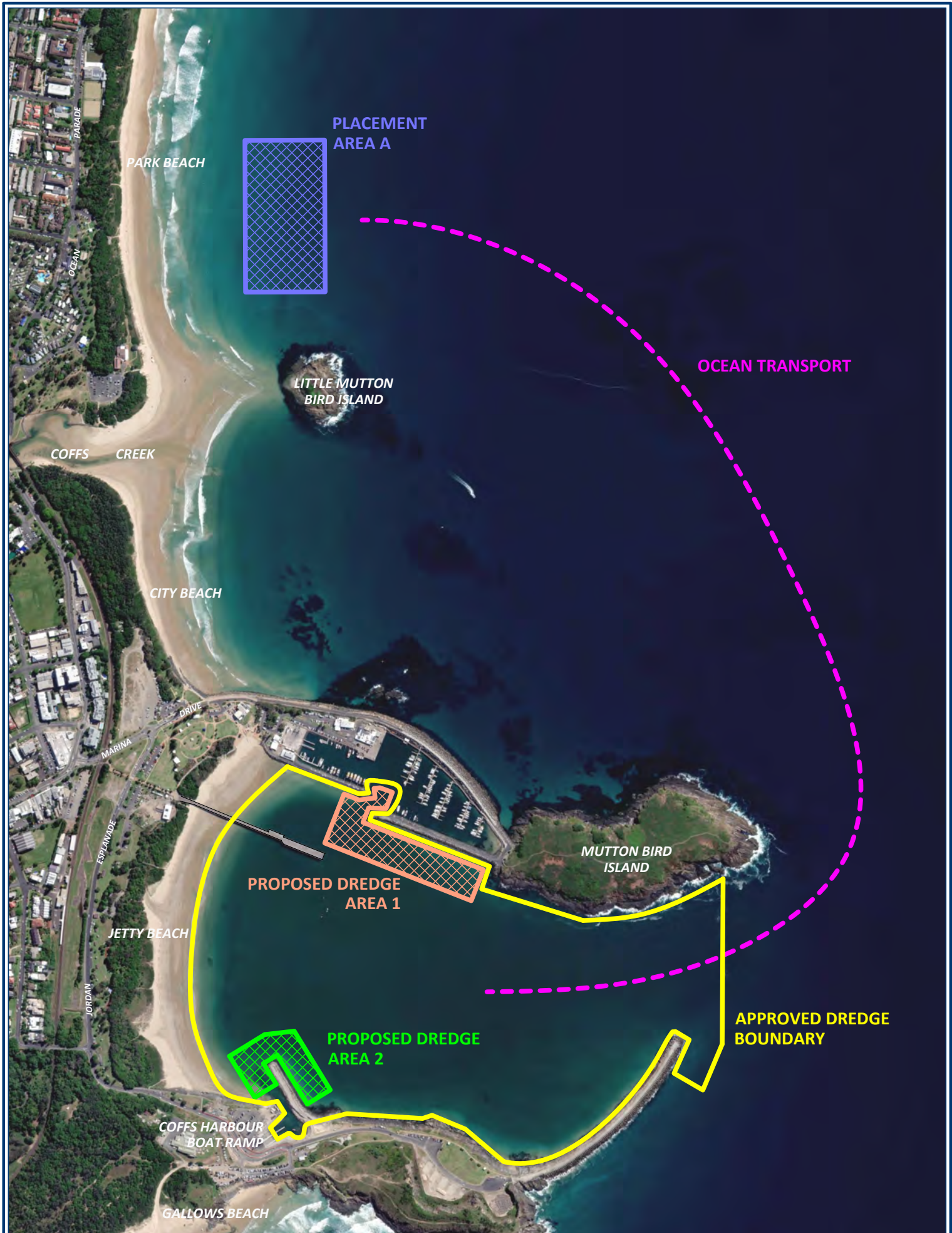
7.3.3 Material reuse:

6. Where possible (during TSHD operations), bottom-dump dredged material in the nearshore zone at Park Beach, north of Little Muttonbird Island, pattern placed for enhanced surf amenity during sediment reworking and distribution by waves, to prevent re-entry of sediment into the harbour (**Section 5.5**).
7. Continue pumping sand to Gallows Beach for small CSD maintenance dredging campaigns unless another suitable alternative becomes available.

8 References

- Manly Hydraulics Laboratory. (2019). *Coffs Harbour Southern Marine Precinct Study - Stage 1 Boat Ramp Operational Improvements (Draft Report MHL2715)*.
- Manly Hydraulics Laboratory. (2020). *Coffs Harbour Boat Ramp Redevelopment (Report MHL2784)*.
- Regional Geotechnical Solutions. (2020). *Coffs Harbour Boat Ramp Upgrade and Precinct Development*.
- Regional Geotechnical Solutions. (2020). *Coffs Harbour Boat Ramp Upgrade and Precinct Development - Jordan Esplanade, Coffs Jetty Geotechnical Report, RGS32282.1 – AB (Rev 1)*. Coffs Harbour.
- Royal HaskoningDHV. (2021). *Coffs Harbour Boat Ramp Basin - Sand Management Plan*. Newcastle.
- Royal HaskoningDHV. (2022). *Coffs Harbour Boat Ramp Upgrade Sand Management Investigations (Phase 2)*.
- Royal HaskoningDHV. (2022). *Technical Note: Coffs Harbour Boat Ramp Upgrade – Ongoing Sand Management*. Newcastle.
- Royal HaskoningDHV. (2023). *Coffs Harbour Boat Ramp Upgrade Sand Management Investigations (Phase 3)*.

Appendix A: Drawings of Proposed Dredge Areas



PROJECT

PREFERRED DREDGE TRANSPORT OPTION
COFFS HARBOUR

NORTH COAST
SURVEYS



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