Transport for NSW

Swansea Channel Maintenance Dredging

Minor works review of environmental factors

June 2023

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Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which the Swansea channel maintenance dredging is proposed.

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the land, waters and seas and their rich contribution to society.

Document review tracking

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Revision 1	27 April 2023	Dave Hopper Clare Naylor Renae Martin	Track changes provided to BSPE. Biodiversity assessments not available.
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Minor Works REF approval and authorisation

Approved by	Dave Hopper, Senior Officer Programs
Signed	David Hopper
Date	19/06/2023

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1. Introduction

The purpose of this Minor Works review of environmental factors (REF) is to describe the proposal, to document the likely impacts of the proposal on the environment, to detail mitigation measures to be implemented and to determine whether or not the proposal can proceed. For the purposes of this work Transport for NSW (TfNSW) is the proponent and determining authority under Division 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The description of the proposed works and assessment of associated environmental impacts has been undertaken in the context of section 171 of the *Environmental Planning and Assessment Regulation 2021,* Guidelines for Division 5.1 Assessments (DPE, 2022), the *Biodiversity Conservation Act 2016 (NSW)* (BC Act), the *Fisheries Management Act 1994* (FM Act) and the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* (EPBC Act).

In doing so the REF helps to fulfil the requirements of section 5.5 of the EP&A Act including that TfNSW 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 necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces 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 a matter of national environmental significance, including nationally listed threatened biodiversity matters, or the environment of Commonwealth land. Where a significant impact is considered likely on nationally listed biodiversity matters, either the proposal must be reconsidered or a Project REF must be prepared.

2. The proposal

2.1 Description

2.1.1 Proposal location details

Table 2-1: Proposal location details

Location details	
Title	Swansea Navigation Channel Maintenance Dredging
Local government area	Lake Macquarie
Transport for NSW region	Hunter

2.1.2 Proposal location and description

TfNSW proposes to undertake maintenance dredging of the Swansea navigation channel in Lake Macquarie (the proposal). The proposal would include the placement of dredged sand on Elizabeth Island to smother the bitou bush infestation on the island and thereby create additional shorebird nesting areas. The proposal also includes the establishment of a small laydown area in the car park adjacent to the Marks Point boat ramp. The proposed dredging campaign includes an annual maximum removal of 30,000 m^2 of clean channel bed sand until the upper limit of sand placement capacity on Elizabeth Island has been reached at around 60,000 m^2. Figure 2-1 shows the key features of the proposal. Figure 2-2 shows the indicative location and dimensions of the proposed laydown area.

The following terminology is used throughout this REF:

- Study Area – refers to the desktop assessment area in this REF and Aquatic Ecology Assessment contained in Appendix B (see Figure 2-1 and Figure 2-2).
- Dredge Footprint – refers to the channel bed areas subject to direct impacts from the dredging operations (see Figure 2-1).
- Sand Placement Areas – refers to the areas located on Elizabeth Island subject to direct impacts from sand placement/stockpiling (see Figure 2-1).
- Laydown Area – refers to the ancillary area located in the car park located adajcent to the Marks Point Boat Ramp (see Figure 2-2).
- Dredging Campaign – refers to the works described in this REF, being the removal of up to 30,000m^3 of clean channel bed sand.

The dredge footprint as shown in Figure 2-1 has been selected based on historical imagery, hydrographic surveys, community feedback and avoidance of environmentally sensitive areas. The dredge footprint is indicative only and may be slightly adjusted in areas to suit more recent hydrographic surveys and to reduce dredging volumes where possible. Any adjustments would be located within the Study Area and would avoid environmentally sensitive areas as described in this REF including coastal wetlands (see Figure 2-4), marine and native terrestrial vegetation (see Figure 3-2), and seagrass buffer zones (Figure 3-4). Any adjustments would be captured and managed as part of the environmental management plans for the proposal. If environmentally sensitive areas cannot be avoided then further evironmental assessment would be required prior to the commencement of dredging operations.

Figure 2-1 The key features of the proposal. Source: H2O Consulting Group 2023.

Figure 2-2 The proposed laydown area. Source: North Coast Surveys 2023.

The proposed maintenance dredging operations follow the long-term scope of the annual maintenance dredging program schedule outlined in the Review of Environmental Factors (REF) associated with the initial large-scale dredging operations approved in 2014 (RHDHV, 2014). The dredging footprint for the current 2023 project (the proposal) is located in the main navigation channel between Pelican Point to the southeast and Elizabeth Island to the northwest and through Airforce Channel, southwest of Elizabeth Island. Notably, the area extent of this site is substantially smaller than the extent of dredging proposed for the initial dredging operations completed in 2015 (RHDHV, 2014). The location and extent of dredging has been generally consistent through the regular maintenance dredging operations completed since completion of the initial large-scale capital dredging project, with the most recent dredging completed in early 2021.

Due to the dynamic nature of Swansea Channel, there will be a continual need to dredge to maintain the draft for vessels within the channel. This REF has been prepared to facilitate the small-scale dredging required in 2023 for larger vessels to access and navigate the channel, as well as small ongoing campaigns that may be required over the next two to three years whilst a strategy is being prepared by TfNSW for a longer-term solution to the infilling of the Swansea channel. A separate and more detailed Project REF will be developed for the dredging works required for the long-term dredging and management of Swansea Channel.

It is likely that the first campaign will run for up to two months subject to weather conditions and working hours and would remove a maximum of 30,000 m^3 of sand. Additional campaigns will be run on an 'as needs' basis with a maximum extraction volume of 30,000 m^3 per year. Surveys of Elizabeth Island (refer to Appendix A) indicate that it currently has the capacity to receive approximately 60,000 m^3 of dredged sand in total, therefore the length and duration of works covered by this REF are limited to the receiving capacity of Elizabeth Island. Once Elizabeth Island has reached its receiving capacity, the proposal will be reviewed and a new sand placement area would be needed, which would be subject to a separate REF.

The key features of the proposal are described below and shown in Figure 2-3:

- Establish a laydown area for the proposal in the car park located adjacent to the Marks Point boat ramp in accordance with Figure 2-2.
- The dredge will arrive by truck and a slew crane (or similar) will lift the dredge into the water from the truck. Whilst the dredge is being mobilized the launching area will be restricted for use by pedestrians and traffic. A permit will be required from Lake Macquarie Council for the use of the car parking area. Seagrass and any other marine vegetation would be avoided during launching by ensuring that the dredge is placed clear of the first 2 metres of the bank where the seagrass is located. The launching operation is likely to take around 2 to 4 hours to complete.
- Remove up to 30,000m^3 per year of channel-bed material, primarily clean marine sand (with a maximum total of 60,000 m^3 due to the sand placement capacity on Elizabeth Island). The dredging is designed to an approximate 60m channel

with 5m batters each side at 1:2.5 slope and -3.5 m Australian Height Datum (AHD) depth as shown in Figure 2-1. The removal of channel-bed material will be via a Cutter Suction Dredge or a Dragflow operated from an excavator on a barge.

- The dredged sand would be transferred via pipeline directly from the dredging site to Elizabeth Island as shown in Figure 2-1. It is unlikely that booster pumps would be required for this proposal. Pipelines would be fixed in position down into shallow water so as to avoid direct contact with any nearshore seagrass patches present, while the sections of pipeline in deeper water are to be floated where practical to avoid contact with the substrate.
- A de-watering area will be set up within the nominated fill area on Elizabeth Island (see Figure 2-1) to create a bund wall for de-watering. Pipes from the dredge will be located through the bund walls to discharge directly into the dewatering area.
- Although the dredged material is expected to comprise only clean marine sands, water quality monitoring will occur daily within the dewatering area to measure turbidity using nephelometric turbidity units (NTU) to provide a measure of tubidity in real-time. A water quality management plan (WQMP) will be developed for the proposal to ensure that turbidity levels remain within the adopted guidelines. The WQMP would include control measures to manage events such as turbdity thresholds being reached. Management measures may include actions such as suspending dredging operations until the turbidity is reduced to acceptable limits. A dredge log would be maintained which would include a record of visual observations and NTU monitoring results, as well as any measures put in place during works to reduce turbidity.
- The bunded area located on Elizabeth Island will be progressively filled with the channel bed sand throughout the dredging operations. The proposal includes the use of an excavator, which will be transported to Elizabeth Island by barge, to ensure that the bund walls and de-watering area can be managed for water quality control, should the proposal cause any turbidity. The excavator movements where possible would be restricted to the nominated fill area only and would primarily operate on the walls of the bund and avoid areas of native vegetation.
- The maximum volume of sand pumped to Elizabeth Island would be 1000m^3 per day.
- At the end of each dredging campaign the dredge and laydown area would be completely removed, followed by the removal of any other maritime or environmental controls. The de-watering area is likely to be filled and levelled at the end of each campaign and is to be left in a manner consistent with the creation of suitable habitat for nesting shorebirds (refer to Appendix F).

The proposal is expected to require the use of the following plant and equipment:

- Cutter Suction Dredge
- Excavator (up to 20T)
- Work barge
- Work boat
- Prime mover for delivery of equipment
- Slew or Franna crane for launching
- Safety fencing around the laydown area and excavator on Elizabeth Island
- Pipe rack
- Storage container
- Pipes

Hours for the contruction (dregding operations and sand placement) of the proposal are as follows:

- Monday to Friday 7 am – 6 pm
- Saturday 8 am – 1 pm
- No work on Sunday or public holidays

TfNSW may alter the hours of operation to suit other requirements (e.g. dredging operations may cease on Saturdays or in other holiday periods to limit disruption to recreational users within the area).

Figure 2-3 Example photograph of a cutter suction dredge and floating pipeline being used to dredge sand on a recent TfNSW project in Coffs Harbour. The floating pipeline transfers sand to a bunded dewatering area adjacent the boat ramp.

2.1.3 Proposal objectives

The objectives of the proposal have not changed since the REF for the capital dredging program and long term maintenance program began in 2014 (Royal Haskoning DHV, 2014). The objective of the maintenance program has always been to maintain a safe navigation channel into Lake Macquarie.

In 2013 Umwelt prepared a strategic document on behalf of NSW Crown Lands titled "*Towards a Sustainable Framework for Navigation in Swansea Channel*". That document included community consultation and identified the following issues associated with navigation depths of less than 2m, which are often experienced in the Swansea channel:

- Scrapes to yacht and motor cruiser hull anti foulant and keel damage.
- Minor injury to crew and passengers thrown around vessels as the keel hits the bottom and the vessel stops suddenly.
- Motors on both keel and motor cruiser vessels becoming clogged with sand.
- Limited navigable area for vessels, especially if several changes of direction are needed to manoeuvre through the channel.
- Vessels being laid over and dragged across the shoals.
- High level of skill required to negotiate the channel under most conditions.
- Safe transit times in relation to water depth are limited to high tide.
- Inefficient use of resources as TfNSW Maritime officers are frequently required to shepherd recreational vessels through the channel or drag them off shoals or through the shallow areas.
- Uncertainty associated with channel conditions affects event planning and tourism business opportunities, when events involve safe passage of vessels into and out of the lake, e.g. regattas on the lake and offshore yacht charter and day cruising.

- Damage to the reputation of Lake Macquarie as a weekend yachting destination as economic impacts. People cannot be certain they can get into the lake safely, and then, once in, cannot be certain when they will be able to leave. Poor navigability indirectly affects spending in local businesses.
- The underutilisation of marine facilities and flow on effects because yachts and large motor cruisers from other ports do not enter the lake. For instance, marinas in Lake Macquarie have facilities suitable for a larger number of visiting vessels than can currently enter the lake safely.

The objectives of the proposal are to reduce the incidence of the negative impacts associated with infilling of the channel and to restore confidence within the community that Lake Macquarie can be accessed by large vessels.

The objectives of the sand placement on Elizabeth Island are to address bitou bush infestation and subsequently increase shorebird nesting habitats. The use of Elizabeth Island for sand placement will also allow for a suitable de-watering area to ensure that potential water quality impacts can be addressed for dredged sands.

2.1.4 Ancillary facilities

A laydown area, approximately 6m x 20m in size, would be established in the Marks Point Boat Ramp car park (refer to Figure 2-2) which is an area managed by Lake Macquarie City Council. Pipe racks and a storage container would be located within the laydown area. No site office or earthworks would be required to establish the laydown area. The container and pipe racks would be brought to the laydown area by truck. A permit will be required from Lake Macquarie City Council for the use of the laydown area. Security fencing would be established around the laydown area to prevent public access. The laydown area would be established in a previously cleared area and would not require the removal of any vegetation.

The excavator used for moving sand around on Elizabeth Island is likely to be kept on the barge each night for security purposes, but may also remain on Elizabeth Island each night until each campaign is complete. If it remains on Elizabeth Island it will be parked away from native vegetation and receiving waters.

Table 2-2: Ancillary facilities

Ancillary facilities		
Will the proposal require the use or installation of a compound site? A small laydown area for storage is the only ancillary facility required as described above.	Yes ☐	No ☒
Will the proposal require the use or installation of a stockpile site? No stockpile site is required; however, the dredged sand will be placed on Elizabeth Island to create habitat for nesting shorebirds.	Yes ☐	No ☒
Are any other ancillary facilities required (e.g., temporary plants, parking areas, access tracks)? The clean sand and water mix would be pumped to and deposited on Elizabeth Island as described in Section 2.1.2.	Yes ☒	No ☐

2.1.5 Proposed date of commencement

It is intended to commence dredging in the second half of 2023.

2.1.6 Estimated length of works period

It is likely that the first campaign to remove up to 30,000m^3 will run over a two month period (weather dependant) and additional smaller campaigns will be undertaken to address minor infilling over a two to three year period (where required) until the maximum sand placement capacity at Elizabeth Island has been reached.

2.2 Need and options

2.2.1 Options considered

The options considered for the proposal included:

- Option 1: Do nothing
- Option 2: Main channel dredging with three disposal sites
- Option 3: Dredging of the main channel and airforce channel and disposal on Elizabeth Island

Option 1: Do nothing

This was not considered to be a suitable option as it does not address the objectives of the proposal.

Option 2: Main channel dredging with three disposal sites

This option proposed to remove approximately 30,000m^3 annually of channel-bed material from the main navigation channel only, and dispose of the sand to three separate on-shore disposal sites:

- Former Belmont Sands Processing Plant site.
- Southern tip of Spoil island.
- Southern tip of Elizabeth Island.

This option was not considered feasible as it does not address the infilling of the airforce channel, and the Belmont Sands and Spoil Island sites are constrained by cultural heritage issues.

Option 3: Dredging of the main channel and airforce channel and disposal on Elizabeth Island

This option proposes to remove up to 30,000m^3 annually of channel-bed sand from the main navigation channel and airforce channel and dispose of the sand to Elizabeth Island (which has up to a maximum of 60,000m^3 sand placement capacity).

This is the preferred option as it addresses infilling of the two navigation channels into the lake. It also reduces the potential cultural heritage impacts of sand disposal by placing sand only on Elizabeth Island. The sand will be placed on Elizabeth Island to avoid shorebird nesting season where possible, as discussed in Section 3.7, and will assist with smothering bitou bush which has infested the island. As a consequence of smothering bitou bush, shorebird nesting habitat areas will be improved. Native vegetation would be avoided. This is described further in Section 3.7.

The negative environmental impacts associated with this option mainly relate to potential water quality impacts associated with turbidity during dredging and runoff from the de-watering area on Elizabeth Island and potential non-direct impacts to marine vegetation as a result of reduced water quality. These potential impacts would also be relevant to option 2. Impacts associated with reduced water quality can be satisfactorily managed and mitigated. This is described further in Section 3.2 and Section 3.7.

2.2.2 Justification for the proposal

The proposal is required to improve and maintain safe navigation through the channel entrance to Lake Macquarie. This will have associated benefits for the wider community by improving socio-economic outcomes associated with visitation and the use of the lake.

While the proposal would involve potential negative impacts to the surrounding environment, including water quality impacts, visual impacts, traffic/access disruption and impacts on biodiversity, the potential environmental impacts of the proposal have been identified as relatively minor and short term. Furthermore, it is considered that the impacts would be minimised and managed with the implementation of the safeguards outlined in Section 5.

The placement of the sand on Elizabeth Island has been strategically designed to stabilise the island, create additional foreshore habitat for nesting birds and smother the bitou bush which is currently infesting the island and making it unsuitable for native species.

On balance, the benefits derived from the proceeding with the proposal are considered to outweigh the potential negative impacts.

2.3 Statutory and planning framework

2.3.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 aims to facilitate the effective delivery of infrastructure across the state.

Division 13, 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"*. A reference to environmental management works in the SEPP includes environmental protection works, which are defined as "*works associated with the rehabilitation of land towards its natural state or any work to protect land from environmental degradation, and includes bush regeneration works, wetland protection works, erosion protection works, dune restoration works and the like*".

As the proposal is characterised as development for the purpose of navigation facilities, wharf or boating facilities and involves dredging and environmental protection works and is to be carried out by or on behalf of TfNSW for safety reasons, it can be assessed under *Division 5.1* of the *EP&A Act*. Development consent from council is not required.

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 (Resilience and Hazards) 2021, 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*.

2.3.2 Other relevant legislation and environmental planning instruments

Environmental Planning and Assessment Act 1979

The objects of this Act are as follows:

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.

Comment: The proposal is consistent with the objectives of the Act as it promotes the social and economic welfare of the community by ensuring that the entrance to Lake Macquarie 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.

Subdivision 2 *Duty of determining authorities to consider environmental impact of activities* Clause 5.5(1) of the Act requires that a determining authority in its consideration of an activity shall fully consider all matters affecting or likely to affect the environment by reason of that activity. This REF fulfills that requirement.

Environmental Planning and Assessment Regulation 2021

Clause 171 of the Regulations requires the determining authority to consider several environmental factors when considering the likely impact of an activity on the environment. This REF considers those factors in detail and Chapter 4 provides a summary of how the Proposal complies with the Regulations.

Coastal Management 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:

> *(1) 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*.

Comment: 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.

The Draft Lake Macquarie Coastal Management Program includes actions for the dredging of Swansea Channel. Part C of the Draft Plan addresses the navigability of Swansea Channel. The proposal is consistent with the management actions to maintain the navigability of the Channel. Although this proposal does not include the re-use of dredged sand for beach nourishment, this action is being considered as part of a broader dredging strategy framework, whereby all options and environmental impacts associated with beach nourishment can be fully considered.

Fisheries Management (FM) 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 habi*tats,* 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 205 – A permit to harm (cut, remove, damage, destroy, shade etc) marine vegetation (saltmarshes, mangroves, seagrass and seaweeds).

• Section 219 – A permit to obstruct the free passage of fish.

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 the 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.

Comment: The proposal is consistent with the objectives of the FM Act 2016 as it promotes quality recreational fishing opportunities and provides social and economic benefits for the community. The safeguards proposed in Chapter 3 would ensure that no marine vegetation is damaged or harmed and that there is no obstruction of free fish passage and therefore no permits under Sections 205 and 219 would be required. DPI Fisheries has been consulted under Section 199 of the FM Act regarding the proposal in October 2022 and again in March 2023. DPI Fisheries have advised that the REF should address potential impacts to marine vegetation and threatened species. These potential impacts have been considered in Section 3.7 of this REF and in detail in Appendix B. No objections to the proposal were raised by DPI Fisheries.

Provided that the safeguards in this REF are implemented during the dredging operations, no permits would be required under the FM Act.

Biodiversity Conservation (BC) Act 2016

The Biodiversity Conservation Act 2016 (BC Act) and its supporting regulations set out the environmental impact assessment framework for threatened species, threatened ecological communities and Areas of Outstanding Biodiversity Value (formerly critical habitat) for Division 5.1 activities (amongst other types of development).

Under the BC Act, an assessment of significance must be completed to determine the significance of potential impacts to threatened species, populations and/or communities or their habitat. A test of significance has been undertaken for the proposal. It is included as Appendix A. It demonstrates that the preparation of a Species Impact Statement (SIS) based on the provisions of the BC Act and FM Act is not required for this proposal. Section 3.7 discusses the potential impacts of the proposal on threatened species, populations and/or communities or their habitat. Appendix B provides a detailed assessment of the potential impacts.

Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 (POEO Act) focuses on the 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 during the preparation 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.'

Schedule 1 of the POEO Act lists activities for which an Environment Protection Licence is required. Part 1, Clause 19 lists extractive activities as a scheduled activity. The activities to which this clause applies are declared to be scheduled activities if they involve the extraction or processing of more than 30,000m^3 of extractive materials per year for maintenance dredging of a navigation channel for vessels carried out by or on behalf of a public authority.

Comments: Selected sediment sampling has been carried out in association with Swansea Channel dredging and at the related stockpile sites over the past 12 years (RHDHV 2014). All concentrations of potential contaminants detected were well below environmental and health investigation levels where they are specified in relevant guidelines. The results confirm that material previously dredged from the channel has been clean marine sand. There have been no changes to the channel which would result in any material difference to the sediment quality. The safeguards proposed in Chapter 3 would ensure that the proposal does not result in water pollution.

No environmental protection license would be required for the proposal as the extracted material would be less than 30,000m^3 per year.

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.

Comments: 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 TfNSW (Maritime).

National Parks and Wildlife Act 1974

The National Parks and Wildlife Act 1974 (NPW Act) provides for the protection of Aboriginal heritage values, national parks and native flora and fauna. The Act makes it an offence to harm Aboriginal objects, places, or sites without approval. An Aboriginal Heritage Impact Permit (AHIP) will not be needed for the proposal as it is not expected to disturb any known items, and this is discussed further in Section 3.5. No national parks would be affected and with the implementation of the proposed safeguards, the proposal is unlikely to harm any native flora or fauna.

Heritage Act 1977

The Heritage Act 1977 provides for the protection or conservation of buildings, works, maritime heritage (wrecks), archaeological relics and places of heritage value through their listing on various State and local registers. The Act makes it an offence to harm any non-Aboriginal heritage values without approval. Although a number of heritage items are listed within close proximity to the dredging footprint, with the implementation of the proposed safeguards, the proposal is unlikely to impact on any item of local, State or Commonwealth heritage value. This is discussed further in Section 3.6.

Crown Land Management Act 2016

The Crown Land Management CLM Act 2016 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 purpose that the Minister thinks fit.

It is anticipated that TfNSW will apply for a short-term licence over the dredging and deposition areas to allow the proposal to proceed. This would be the area of the proposal below the mean high-water mark and on Elizabeth Island in accordance with Figure 1.

The objects of the CLM Act are:

(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.

Comment: 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 for the proposal. 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 maintain and manage an important community asset in such a way that both the land and its resources are sustained in perpetuity.

State Environmental Planning Policy (Resilience and Hazards) 2021

Chapter 2 – Coastal Management: The aim of this Chapter is to promote an integrated and coordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the Coastal Management Act 2016, including the management objectives for each coastal management area.

Part 2.2, Division 1 of Chapter 2 provides development controls for areas included on the NSW Government's Coastal Wetlands and Littoral Rainforests Area map. There are no mapped littoral rainforests within, or in proximity to, the dredging footprint, however there are mapped coastal wetlands in proximity to the dredging footprint as shown in Figure 2-4 below.

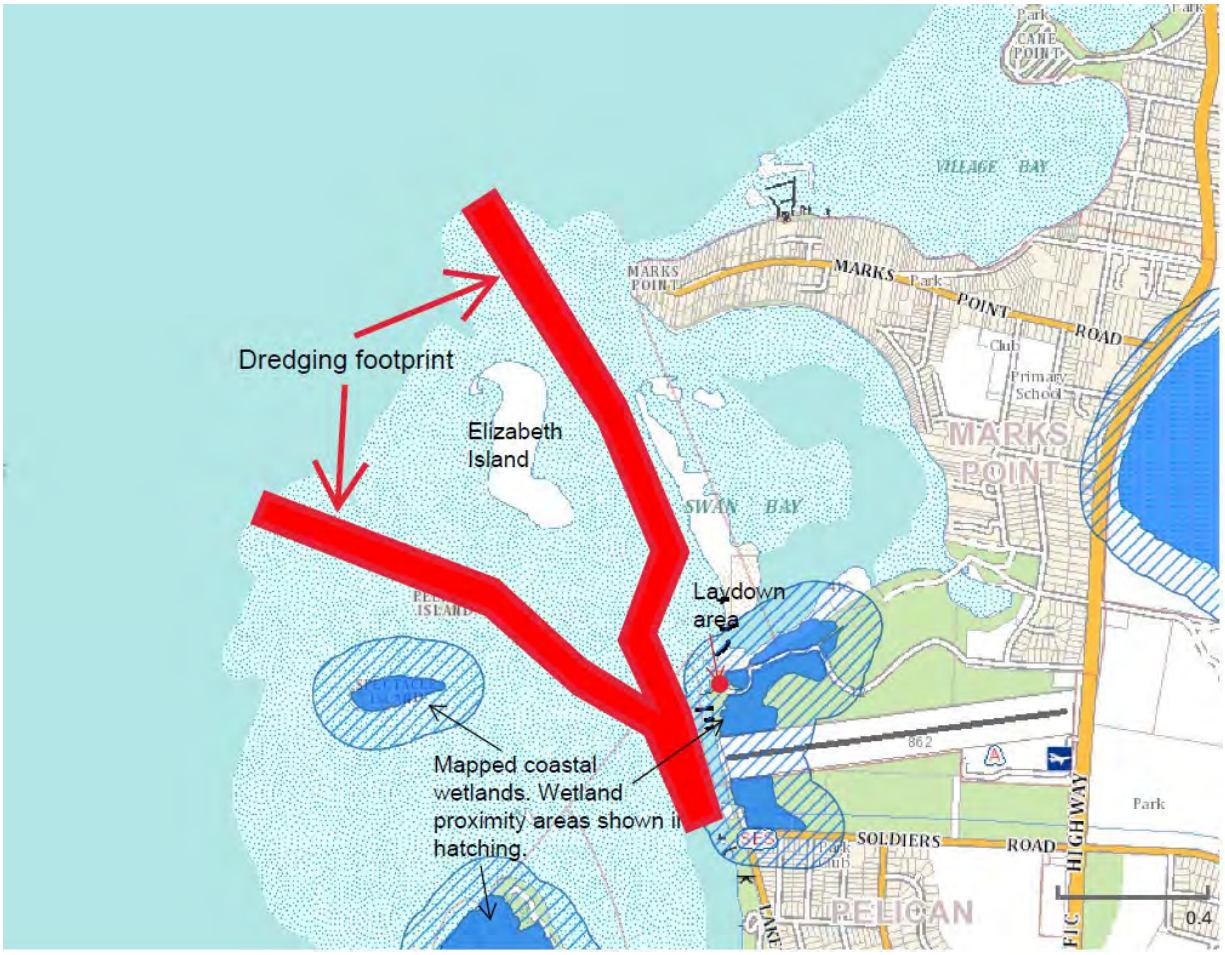

Figure 2-4 Mapped Coastal wetland areas (shown in blue). Blue hatched areas show mapped coastal wetland proximity areas.

Clause 2.8 of the SEPP states that:

Development consent must not be granted to development on land identified as "proximity area for coastal wetlands" or "proximity area for littoral rainforest" on the Coastal Wetlands and Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on—

(a) the biophysical, hydrological, or ecological integrity of the adjacent coastal wetland or littoral rainforest, or

(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

Although the proposal is permissible without development consent pursuant to the *Transport and Infrastructure SEPP,* the proposal is unlikely to have a significant impact upon the biophysical, hydrological, or ecological integrity of the adjacent coastal wetland, or the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland, with the implementation of the safeguards proposed in this REF.

Swansea Channel is in the NSW Coastal Zone and is mapped as being within the Coastal Environment Area. A small area of Elizabeth Island is located within the Coastal Use Area. Although development consent is not required for the proposal, the development controls for those areas are considered below as the proposal would be undertaken in a sensitive coastal location.

Clause 2.10 Development on land within the coastal environment area

Consideration / control	Comment
(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,	The proposal area is within an active coastal environment that is likely to have a high level of integrity and resilience.
(b) coastal environmental values and natural coastal processes,	The area is of high coastal environmental value with dynamic natural coastal processes.
(c) the water quality of the marine estate	The local water quality is high.
(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands, and rock platforms,	The dredging footprint will avoid areas of marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands, and rock platforms. The deposition area will be located in an area infested with Bitou Bush.
(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,	There will be temporary changes to the use of public open space at Marks Point boat ramp, however access will still be available for pedestrians and vehicles.
(f) Aboriginal cultural heritage, practices, and places,	The proposal is unlikely to impact on any Aboriginal cultural heritage, practice, or place.
(g) the use of the surf zone.	The proposal does not affect the surf zone.

Clause 2.11 Development on land within the coastal use area

Consideration / control	Comment
(a) existing, safe access to and along the foreshore, beach, headland, or rock platform for members of the public, including persons with a disability,	There will be temporary changes to the use of public open space at Marks Point boat ramp, however access will still be available for pedestrians and vehicles.
(b) overshadowing, wind funnelling and the loss of views from public places to foreshores,	The proposal would not result in any overshadowing, wind funnelling or the loss of views from public places to any foreshore.
(c) the visual amenity and scenic qualities of the coast, including coastal headlands,	The proposal would have a long-term beneficial impact on the visual amenity and scenic quality of Lake Macquarie.
(d) Aboriginal cultural heritage, practices, and places,	The proposal is unlikely to impact on any Aboriginal cultural heritage, practice, or place.
(e) cultural and built heritage.	The proposal would be unlikely to affect cultural or built heritage.

Lake Macquarie Local Environmental Plan 2014

The Proposal is located in the W1 Natural Waterways zone and on unzoned land (Elizabeth Island). The objectives of the W1 zone are:

- To protect the ecological and scenic values of natural waterways.
- To prevent development that would have an adverse effect on the natural values of waterways in this zone.
- To provide for sustainable fishing industries and recreational fishing.
- To provide for the recreational use of Lake Macquarie and its waterways as an important environmental, social and economic asset, including maintenance or enhancement of public navigation channels to a depth suitable for yachting and other boating activities.

The laydown and launch area are located within the C2 zone. The objectives of the C2 zone are:

- To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.
- To prevent development that could destroy, damage or otherwise have an adverse effect on those values.
- To conserve, enhance and manage corridors to facilitate species movement, dispersal and interchange of genetic material.
- To encourage activities that meet conservation objectives.
- To enhance and manage areas affected by coastal processes.

The proposal is consistent with the objectives of the W1 and C2 zones as it will protect and enhance the Swansea channel and the Lake Macquarie foreshore for recreational purposes. The proposal involves the maintenance and enhancement of a public navigation channel to create a depth suitable for yachting and other boating activities and assists in managing an area affected by coastal processes.

The proposal is permissible without development consent pursuant to the *Transport and Infrastructure SEPP*. Therefore, the consent requirements of the LEP do not apply and the Proposal may be determined under Division 5.1 of the EP&A Act.

Environment Protection and Biodiversity Conservation 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 (MNES) or the environment of Commonwealth land'. These are considered in Chapter 4 and Section 3.7 of this REF and in Appendix A.

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

2.4 Community and agency consultation

2.4.1 SEPP (Transport and Infrastructure) consultation

Part 2.2 of the *SEPP (Transport and Infrastructure)* contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. This is detailed below:

Table 2-3: Consultation required with Council

Is consultation with Council required under sections 2.10 - 2.12 and 2.14 of the SEPP (Transport and Infrastructure)?		
Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	Yes ☐	No ☒
Are the works likely to generate traffic to an extent that will strain the capacity of the existing road system in a local government area?	Yes ☐	No ☒
Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system?	Yes ☐	No ☒
Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water?	Yes ☐	No ☒
Will the works 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, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow? Although the laydown area is located within a public car park, it has been positioned at the edge of the car park away from the pedestrian track, in order to avoid impacts to pedestrian and vehicle paths. A permit for the use of the car park will be obtained from Lake Macquarie City Council prior to the commencement of the proposal.	Yes ☐	No ☒

Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes ☐	No ☒
Is there a local heritage item (that is not also a state heritage item) or a heritage conservation area in the study area for the works?	Yes ☐	No ☒
Is the proposal within the coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	Yes ☐	No ☒
Are the works located on flood liable land? If so, will the works change flooding patterns to more than a minor extent?	Yes ☐	No ☒

Table 2-4: Consultation with other public authorities

Is consultation with a public authority (other than Council) required under sections 2.13, 2.15 and 2.16 of the SEPP (Transport and Infrastructure)?		
Are the works located on flood liable land? (to any extent) (SEPP (Transport and Infrastructure) s2.13) If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance? 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 Floodplain Development Manual: the management of flood liable land (nsw.gov.au).	Yes ☐	No ☒
Are the works adjacent to a national park, nature reserve or other area reserved under the National Parks and Wildlife Act 1974, or on land acquired under that Act?	Yes ☐	No ☒
Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	Yes ☐	No ☒
Do the works include a fixed or floating structure in or over navigable waters? NSW Maritime is the relevant authority for approval of works on structures in, on or over the bed of any waters under the *Ports and Maritime Administration Act 1995*. NSW Maritime (North) has advised that it has no objections to the commencement of the proposal and has provided an approval letter which is included in Appendix C:	Yes ☒	No ☐
Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	Yes ☐	No ☒
Would the works 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 Springs Observatory)	Yes ☐	No ☒
Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	Yes ☐	No ☒
Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	Yes ☐	No ☒

Table 2-5: Notification of council and occupiers of adjoining land

Do Council and occupiers of adjoining land need to be notified under section 2.110 of the SEPP (Transport and Infrastructure)?		
Does the proposal include a car park intended for the use by commuters using regular bus services?	Yes ☐	No ☒
Does the proposal include a bus depot?	Yes ☐	No ☒
Does the proposal include a permanent road maintenance depot or associated infrastructure, such as garages, sheds, tool houses, storage yards, training facilities and workers amenities?	Yes ☐	No ☒

2.4.2 Other agency and community consultation

The following agencies were contacted in late 2022 to seek their comments on the proposal and any concerns or issues that needed to be addressed in this REF:

- NSW Department of Planning and Environment – Biodiversity and Conservation Division
- NSW Department of Primary Industries - Fisheries
- NSW Environment Protection Authority
- Lake Macquarie City Council
- Transport for NSW - Maritime Operations
- NSW Crown Lands

In addition, an online meeting was held with agencies in early 2023 to update them on the amended proposal and to seek confirmation of issues to be considered in the REF. Consultation activities are summarised in Table 2-6 below.

Table 2-6 Consultation activities undertaken

Agency	Issues raised	Response
NSW Department of Planning and Environment – Biodiversity and Conservation Division. Response received 14 November 2022.	Concerned about the timing of the proposed dredging (November-December) coinciding with the breeding of Little Tern (*Sternula albifrons*) and Pied Oystercatcher (*Haematopus longirostris*) both species listed as 'endangered' under the Biodiversity Conservation Act 2016. Little Terns have been recorded breeding between October and March, and Pied Oystercatchers between August and January.	The dredging will be undertaken outside of the known breeding season of both of these species where possible and negative impacts are not anticipated. A Shorebird Management Plan would be prepared to minimise impacts on these species. The proposal would aim to improve habitat for nesting shorebirds by smothering Bitou Bush on Elizabeth Island. Addressed further in Section 3.7
	Concerned about the location of two of the proposed deposition sites: (a) the southern end of Spoil Island foreshore, an historical nesting site for Little Terns and Pied Oystercatchers, (b) the southern end of Elizabeth Island, an historical nesting site for Little Terns and a feeding and roosting site at low tide for shorebirds of conservation importance.	Where possible, dredging will be undertaken outside of the known breeding season of both of these species. Spoil island will not be used for the proposal. Safeguards would be in place to protect shorebirds during the proposed dredging operations. Addressed further in Section 3.7.
	Key legislation should be addressed in the REF.	Key legislation is addressed in Chapter 2 of this REF.

Agency	Issues raised	Response
	Recommendations and actions set out in the certified Lake Macquarie Coastal Zone Management Plan and the draft Lake Macquarie Coastal Management Program should be addressed.	The proposal is consistent with the CZMP and draft CMP. Addressed in Chapter 2 of this REF.
	Current records of threatened biodiversity should be used for the REF.	Current records of threatened biodiversity have been used for this REF. Addressed further in Section 3.7 and Appendix B.
	If a significant impact on threatened biodiversity is likely an EIA and SIS must be prepared.	No significant impacts on threatened biodiversity are likely. Addressed further in Section 3.7 and Appendix B.
	The REF should consider the factors in Cl.171(2), especially in relation to coastal processes, heritage, infrastructure, social matters, and economic benefits.	The Cl.171(2) assessment in Chapter 4 considers these matters.
	The REF should consider: 1. Sustainable Framework for Navigation in Swansea Channel in the design of a dredging regime. 2. Consultation with Crown Lands and Lake Macquarie City Council to consider how Action T 3-1, P4 from the Lake Macquarie CZMP has been implemented in the past, the success of the action, and its contribution to the design of the proposed dredging regime. 3. BCD recommends that the updated REF considers the feasibility of a sand slug configuration placement described in Action A3.9 from the draft Lake Macquarie CMP in the long-term design of the proposed dredging regime. 4. Based on Actions C4.1-4.5 from the draft Lake Macquarie CMP, BCD recommends that the updated REF considers the opportunities for dredged sand to be utilised in sand nourishment at priority locations, to assist in protection of the Little Tern breeding sites on the islands within Swansea Channel where spoil is proposed to be placed.	This proposal comprises minor emergency maintenance dredging to allow the safe passage of larger vessels which is in line with the dredging that has been undertaken in the channel for several years. A broader strategic framework for the long-term dredging and management of Swansea Channel is currently being prepared with a Project REF to be developed to support the long-term dredging campaign. This REF will include further consultation with relevant stakeholders and consider beach nourishment options as identified in the draft Lake Macquarie CMP.
	The Proposal should meet the requirements for water quality management as described in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality.	The water quality requirements would be addressed in the water quality management plan for the proposal. Water quality is addressed in detail in Section 3.2 of this REF.
NSW Department of Primary Industries – Fisheries. Response received 5 May 2023.	The REF should address impacts on marine vegetation and threatened species. Provided that no impacts are identified DPI Fisheries does not object to the proposal.	Impacts can be adequately mitigated or avoided with the safeguards recommended in this REF (refer to Section 3.7) and the Aquatic Ecology Assessment at Appendix B.
EPA	Extractive activities, such as dredging, are scheduled activities if they involve the extraction of more than 30 000 cubic metres of extractive materials per year. Based on the information provided, this campaign is not considered a scheduled activity and as such does not require and Environment Protection Licence.	Noted. The proposal will not involve the extraction of more than 30,000m^3 of sand per year.

Agency	Issues raised	Response
	All activities must be conducted in a manner that does not cause pollution of waters. Additionally, in carrying out the Review of Environmental Factors (REF), you should refer to any relevant EPA guidelines and industry codes of practice to ensure it is sufficiently comprehensive and detailed.	The proposed safeguards are likely to be adequate for minimising pollution. This REF outlines the relevant standards and guidelines where necessary.
Lake Macquarie City Council	The proposed sand placement at Elizabeth Island lacks consistency with the CZMP. It remains Council's preference that dredged sand (or a portion of the dredging spoil) be used for nourishment at Blacksmiths Beach with the current priority location being adjacent to Maneela Street.	This campaign comprises minor emergency maintenance dredging in line with the dredging that has been undertaken in the channel for several years. A broader strategic framework for the long-term dredging and management of Swansea Channel is currently being prepared, which will align with actions in the CZMP and draft CMP wherever possible. TfNSW will be working closely with LMCC to ensure alignment and beach nourishment of priority locations.
	No spoil should be placed at Elizabeth Island during Little Tern breeding season	The dredging will be undertaken outside of the known breeding season of the Little Tern where possible. A Shorebird Management Plan would be prepared to minimise the impacts on this species. The proposal would aim to improve habitat for nesting shorebirds by smothering Bitou Bush on Elizabeth Island. Addressed further in Section 3.7
	Hazards are posed by sand placement that results in steep batters.	Spoil placement would be undertaken that does not result in steep batters.
	A licence would be required for use of any Council owned or managed land or assets.	Noted and this requirement is outlined in Section 2.1.4
	TfNSW should prepare and implement a communication and engagement strategy for the project and commence implementation as soon as possible. Stakeholders in this strategy should include the Mayor and Councillors, the Lake Macquarie Aquatic Services Committee, and Lake Macquarie Coastal Zone Management Committee.	The requirement for a communication and engagement strategy has been included in Chapter 3 of this REF. However, a Project REF will be developed to support the long-term dredging campaign. This REF will include further consultation with relevant stakeholders.
	Consideration should be given to address the shoaling in the air-force channel.	The dredging footprint has been amended to include the airforce channel.
TfNSW – Maritime Operations	No objections to the proposed activity. Approval is given subject to a set of conditions.	The conditions have been included in Chapter 3 of this REF and will be made available to the dredge contractor prior to the commencement of works.
NSW Crown Lands	A short-term Crown Land Licence is the recommended approach.	Noted and this requirement is outlined in Section 2.4.1

3. Environmental assessment

This section provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environmental potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in section 171 of the *Environmental Planning and Assessment Regulation 2021*.

The matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) are also considered in section 4. Site-specific safeguards are provided to ameliorate the identified potential impacts.

3.1 Soils and Sediments

Table 3-1: Sediments

Description of existing environmental and potential impacts		
Are there any known occurrences of salinity or acid sulfate soils in the area? ASS are likely to be present in the channel, however the proposal is to dredge mobile, clean marine sands only. No exposure of ASS is likely. Water quality monitoring is proposed to ensure that no ASS is placed on Elizabeth Island. Further detail is provided at the end of Table 3-1.	Yes ☒	No ☐
Does the proposal involve the disturbance of large areas (e.g., >2ha) for earthworks?	Yes ☐	No ☒
Does the site have constraints for erosion and sedimentation controls such as steep gradients or narrow corridors? Works will be contained within the aquatic environment with the exception of the laydown area within the Marks Point boat ramp car park and the sand placement area on Elizabeth Island. No steep gradients or narrow corridors are present at the laydown area or on Elizabeth Island. No excavation or ground disturbing works would be required at the laydown area or sand placement area. Sand bund walls would be created on Elizabeth Island to facilitate the de-watering of the sand and seawater mix to prevent the mobilisation of sand into sensitive receiving environments.	Yes ☐	No ☒
Are there any sensitive receiving environments that are located in or nearby the likely proposal area or that would likely receive stormwater discharge from the proposal? The proposal will not result in stormwater discharge, however there are sensitive receiving marine environments that would potentially be impacted by the proposal, most notably seagrasses and mangroves. It is proposed that buffer areas be established to prevent direct disturbance of seagrass by the dredging works, and that water quality monitoring be undertaken to prevent non-direct impacts such turbidity resulting in seagrass and mangrove smothering. The safeguards proposed below will minimise any potential impacts.	Yes ☒	No ☐
Is there any evidence within or nearby the likely footprint of potential contamination?	Yes ☐	No ☒
Is the likely proposal footprint in or nearby highly sloping landform?	Yes ☐	No ☒
Is the proposal likely to result in more than 2.5ha (area) of exposed soil?	Yes ☐	No ☒
Acid sulphate soils are located in low-lying areas such as coastal wetlands and floodplains. As such Swansea Channel is included in the Draft Lake Macquarie LEP Acid Sulphate Soils Map. Potential impacts of PASS include leaching from the sand placement area into the nearby environment resulting in acidification of waterways, fish kills, habitat destruction, geotechnical instability (soil erosion/subsidence, aquifer clogging) and aggressivity to structures/structural damage to steel and concrete infrastructure. Acid sulphate soils testing was undertaken at the Elizabeth Island sand placement area in 2014 (RHDHV, 2014). Field screening tests for pH were all higher than 3 (around 5.5 to 7). Most of the sites tested in 2014 did not have acid sulphate soils present, however three sites in the southern section of the channel and the sites at Elizabeth Island had a moderate reaction that may indicate Potential Acid Sulphate Soils (PASS). Samples from the Elizabeth Island sites underwent		

laboratory analysis. The net acidity results indicated that the samples did not contain Actual or Potential Acid Sulfate Soils. Safeguards have been included below in the event that PASS is suspected.

Other potential impacts on sediments may include the compaction of sand due to excavator movements in and around Elizabeth Island. This can limit the ability to support vegetation. Excavator movements in and around Elizabeth Island would be limited to the sand placement area, with the excavator primarily working from the top of the bund wall.

Safeguards are provided below for the management of impacts associated with soils and sediments.

Safeguards

Safeguards to be implemented are:

E1. Potential or actual acid sulphate soils would be managed in accordance with the Roads and Maritime Services Guidelines for the Management of Acid Sulphate Materials 2005.

E2. Sand stockpiles would be limited in height to 6m and batter slopes no steeper than 1 in 3 (vertical to horizontal) to prevent collapse of sand stockpiles.

E3. Erosion and sediment control measures are to be implemented and maintained to:

- Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets;
- Reduce water velocity and capture sediment on site;
- Divert clean water around the spoil site where practical;

in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book).

E4. Erosion and sediment control measures are not to be removed until the dredging campaign is complete and areas are stabilised.

E5. Erosion and sedimentation controls are to be checked and maintained on a regular basis and records kept and provided on request.

E6. Excavator movements in and around Elizabeth Island would be limited where practical, with sensitive areas fenced to prevent encroachment into native vegetation and potential shorebird nesting sites.

3.2 Water quality

Table 3-2: Water quality

Description of existing environmental and potential impacts		
Is the proposal located within, adjacent to or near a waterway? The proposal is located within the Swansea Channel, which is the ocean entrance to Lake Macquarie.	Yes ☒	No ☐
Is the location known to flood or be prone to water logging?	Yes ☐	No ☒
Is the proposal located within or immediately adjacent to the area managed by WaterNSW covered by chapter 8 of State Environmental Planning Policy (Biodiversity and Conservation) 2021 (SEPP (Biodiversity and Conservation))? Note: See map here - Sydney drinking water catchment map.	Yes ☐	No ☒
Would the proposal be undertaken on a bridge or ferry?	Yes ☐	No ☒
Is the proposal likely to require the extraction of water from a local water course (not mains)?	Yes ☐	No ☒
The material proposed to be dredged from the channel is known to be clean marine sand and is not known to be contaminated, nor does it contain acid sulphate soils, based on past testing regimes.		

There may be some localised suspension of sand at the cutter head during dredging, but this would settle out of the water column quickly due to the size of the sediment grains and the cleanliness of the dredged material. Development of turbidity plumes has not occurred in past dredging campaigns in the channel as cutter suction dredges do not typically create plumes. Silt curtains are not a suitable form of turbidity control for this proposal as they are not suited to water bodies with strong currents, such as those experienced in Swansea Channel.

Although turbidity plumes are not expected to occur, visual monitoring of turbidity plumes at the dredge site is recommended and dredging would cease if plumes do occur. Although the dredged material is expected to comprise only clean marine sands, water quality monitoring will occur daily within the dewatering area to measure turbidity using nephelometric turbidity units (NTU) to provide a measure of turbidity in real-time. The WQMP for the proposal will set the threshold for turbidity levels. When the thresholds are reached, dredging operations would be suspended until the turbidity is reduced to acceptable levels.

There is the potential for accidental minor fuel and oil spills. Visual monitoring would also consider signs for spillage of fuel/oil and emergency spill response kits would be used to contain any spills. In addition, a bund would be in place in any areas used to hold fuel and oil within the contractor's laydown area to prevent spills affecting adjacent foreshore and marine habitats.

Potential direct impacts of sand placement on Elizabeth Island could include erosion, sediment and leachate control and impacts on water quality at sand placement areas. There would also be a minor risk of fuel spills on Elizabeth Island from the excavator.

Safeguards are provided below for the management of water quality impacts.

Safeguards

Safeguards to be implemented are:

W1. A Water Quality Management Plan (WQMP) would be developed to detail the monitoring required for the proposal.

W2. The sand placement area would be prepared and maintained throughout dredging operations to prevent the discharge of turbid water into nearby estuarine and/or coastal waters. Establishment of bunds, settlement ponds and silt fencing at the material placement areas would be implemented if required to manage the discharge water in a controlled manner, and an excavator would be present to manage bund walls.

W3. Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis at the dredge site to identify any potential spills. Water quality monitoring will occur daily within the dewatering area to measure turbidity using nephelometric turbidity units (NTU) to provide a measure of turbidity in real-time. If turbidity thresholds are reached, dredging operations would be suspended until the turbidity is reduced to acceptable levels. A dredge log would be maintained which would include a record of visual observations and NTU monitoring results, as well as any measures put in place to reduce turbidity.

W4. Vessels (including barges) are only to be used at suitable tides when no less than 600mm clearance is available between the underside of the vessel and the bed of the waterway.

W5. Refuelling of plant and equipment and storage of hazardous materials on barges is to occur within a double-bunded area.

W6. An emergency spill kit is to be kept on site (at the laydown area) and on the dredge at all times (specific for working within the marine environment) and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances at the work site.

W7. All workers will be advised of the location of the spill kit and trained in its use.

W8. If an incident (e.g. spill) occurs, the *Roads and Maritime Services Environmental Incident Classification and Reporting Procedure* is to be followed and the TfNSW Contract Manager notified as soon as practicable.

W9. Emergency contact details will be kept in an easily accessible location on vehicles, vessels, plant and site office. All workers will be advised of these contact details and procedures, as well as the location of the spill kits. All workers would be trained in the use of the spill kits.

W10. Vehicles, vessels and plant must be properly maintained and regularly inspected for fluid leaks and must be throughly cleaned and maintained prior to being used.

W11. No vehicle or vessel wash-down would occur on-site.

W12. Appropriate site and project inductions/training detailing potential water quality impacts and relevant construction measures and spill and emergency response procedures to be used.

W13. All fuels, chemicals and liquids are to be stored in an impervious bunded area a minimum of 50 metres away from:

- Rivers, creeks or any areas of concentrated water flow.
- Flooded or poorly drained areas.
- Slopes above 10%.

W14. In the event of a maritime spill, the incident emergency plan would be implemented in accordance with Sydney Ports Corporation's response to shipping incidents and emergencies outlined in the *NSW State Waters Marine Oil and Chemical Spill Contingency Plan* (NSW RMS, 2016).

W15. In the event that the excavator is kept on Elizabeth Isand outside of working hours it is to be positioned away from sensitive areas such as receiving waters and native vegetation.

3.3 Noise and vibration

Table 3-3: Noise and vibration

Description of existing environmental and potential impacts		
Are there any residential properties or other noise sensitive areas near the location of the proposal that may be affected by the work (i.e., church, school, hospital)? The closest receivers to the laydown area at the Marks Point boat ramp are residences located 415m south in the residential area of Pelican. The dredge would not operate within 170m of any residential receiver. The nearest residential receivers would be located approximately 170m to the southeast of the dredge footprint along Soldiers Road at Pelican. The nearest residential receivers to Elizabeth Island, where the excavator would be operating, are at Marks Point approximately 390m to the northeast. The TfNSW Noise Estimator Tool (Appendix E) has been used to assess the potential impacts of the proposal. Given the distance to receivers, the Tool indicates that potential impacts are likely to be minor and that only standard safeguards are required.	Yes ☒	No ☐
Is the proposal going to be undertaken only during standard working hours? Standard working hours: • Monday-Friday: 7:00am to 6.00pm • Saturday: 8.00am to 1.00pm • Sunday and Public Holidays: no work Where possible works will be undertaken only during standard working hours, however there may be times when local conditions require out of hours work to be undertaken. If this is required, a Noise Management Plan would be prepared to address the out of hours works.	Yes ☒	No ☐
Is any explosive blasting required for the proposal?	Yes ☐	No ☒
Would construction noise or vibration from the proposal affect sensitive receivers?	Yes ☐	No ☒
Would the operation of the proposal alter the noise environment for sensitive receivers? This might include, but not be limited to, altering the line or level of an existing carriageway, changing traffic flow, adding extra lanes, increasing traffic volume, increasing the number of heavy vehicles, removing obstacles that provide shielding including changing the angle of view of the traffic, changing the type of pavement, increasing traffic speeds by more than 10km/hour, or installing audio-tactile line markings.	Yes ☐	No ☒
Would the proposal result in vibration being experienced by any surrounding properties or infrastructure during operation?	Yes ☐	No ☒

The closest receptors to the inner channel where dredging would take place are residences at Marks Point which are a minimum 170 metres distance from the dredging area, 390m from the excavator on Elizabeth Island and 415m from the laydown area in the Marks Point bat ramp car park.

The background noise environment is likely to be typical of an inner suburban area, with local traffic, watercraft noise, commercial noise and to a small extent, ocean noise.

The noise management levels (NMLs) adopted for the proposal for standard and out of hours work periods for residential receivers are 55dBA (LAeq) for daytime, 50dBA (Laeq) for evening and 45dBA for nightime periods. These NMLs have been selected based off previous noise assessments completed as part of the REF in 2014 (RHDHV 2014).

RHDHV (2014) assessed the dredging proposal based upon a sound power level for the dredge of 108dBA based on readings for a medium-sized cutter suction dredge (400mm pipe diameter). That assessment concluded that dredging could be undertaken without unacceptable impacts on residents to the west of Swan Bay during day, evening and night. This proposal will aim to dredge only during standard working hours.

Consistent with the 2014 REF, noise is not expected to be a nuisance due to large distances between the residential areas and proposed dredge areas and the short duration of the dredging campaigns. In addition, residents have experienced dredging on Swansea Channel over the past two decades and are used to the sound of the dredge, as well as boat engines and other watercraft.

An additional noise assessment was completed using the TfNSW Noise Estimator Tool to verify the findings of the noise assessment completed as part of the REF in 2014 (RHDHV 2014) and to determine if any additional mitigation measures would be required for the proposal. The assessment used the Estimator (Individual Plant) with an R3 Noise Area Category and a Representiative Distance of 170 metres. As no dredge plant was available in the TfNSW Noise Estimator Tool, a delivery truck with a similar sound power level was used as a substitutue. The results are included in Appendix E. The results indicate that works during standard hours would not result in any increase in noise levels above NMLs at surrounding recievers. It is only proposed to undertake works during standard working hours. No additional mitigation measures would be required in addition to those provided below.

No noise impacts from the laydown area are anticiated given that this area would be used for storage only. There would be some minor noise impacts associated with deliveries of plant and equipment to the boat ramp, however these would be limited to short periods (e.g 4 hours) and would be consistent with the existing noise environment (vehicles, trailors, boats etc).

It is also unlikely that any vibration from the proposal would be an issue with residential recievers as there are no activities associated with the proposal that would create vibration.

Safeguards

Safeguards to be implemented are:

N1. Stationary noise sources must be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS2436:2010 lists materials suitable for shielding.

N2.Loading and unloading of materials/deliveries is to occur as far away as possible from sensitive receivers.

N3. Dedicated loading/unloading areas are to be shielded if close to sensitive receivers.

N4. The laydown area is to be located away from sensitive receivers.

N5. Traffic flow, parking and loading/unloading areas are to be planned to minimise reversing movements within the laydown area.

N6. Works are to be undertaken within standard working hours wherever possible. If works within standard working hours is not possible due to tidal conditions etc, a noise management plan would be prepared and must include measures to minimise noise impacts. Noise impacts are to be minimised in accordance with the TfNSW Noise Estimator Tool.

N7. The community must be notified of all work outside standard hours which have 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 Construction Noise and Vibration Guideline*.

3.4 Air quality

Table 3-4: Air quality

Description of existing environmental and potential impacts		
Is the proposal likely to result in large areas (>2ha) of exposed soils?	Yes ☐	No ☒
Are there any dust-sensitive receivers located within the vicinity of the proposal during the construction period?	Yes ☐	No ☒
Is there likely to be an emission to air during construction? The dredge runs off diesel and emissions would be gradually released when the dredge is operating. The dredge would not operate within 170m of any residential receiver and is not expected to generate any more emissions than many of the recreational and government vessels that use the channel. The safeguards listed below would mitigate any potential impacts.	Yes ☒	No ☐
Dredged material can ocassionally contain decomposing organic material such as seaweed which can produce an odour when exposed to air. As the sands within the channel are highly mobile, this is unlikely, however there may be some exposed organic material at the placement site at Elizabeth Island. It is unlikely that this would cause nuisance as Elizabeth Island is located at a sufficient distance (greater than 170m) from any residential properties. There is also the potential for the generation of windblown sediment from the disposal site if unfavourable wind conditions are experienced during the placement acitivity. However, given the dredge sediment is delivered to these sites as wet sand, the generation of windblown sediment would be minimal. Overall, negligible air quality impacts are expected from the proposal provided the safeguards listed below are implemented during works.		

Safeguards

Safeguards to be implemented are:

A1. All plant and equipment is to be maintained in good working order according to the manufacturer's instructions. Where plant or equipment is generating excessive fumes, it would be switched off and repaired prior to starting up again.

A2. Works are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.

3.5 Aboriginal heritage

Table 3-5: Aboriginal heritage

Description of existing environmental and potential impacts		
Would the proposal involve disturbance in any area that has not been subject to previous ground disturbances?	Yes ☐	No ☒
Has an online Aboriginal Heritage Information Management System (AHIMS) search been completed? A basic AHIMS search has been undertaken and is included at Appendix D.	Yes ☒	No ☐
Is there potential for the proposal to impact on any items of Aboriginal heritage?	Yes ☐	No ☒
Would the proposal involve the removal of mature native trees?]	Yes ☐	No ☒
Is the proposal consistent with the requirements of the *Roads and Maritime Procedure for Aboriginal cultural heritage consultation and investigation* (PACHCI)?	Yes ☒	No ☐

A stage 1 PACHCI assessment was completed on 25/03/23 and sent to the relevant TfNSW Aboriginal Community and Heritage Partner who advised that: The proposal, as described in the Stage 1 assessment checklist, was assessed as being unlikely to have an impact on Aboriginal cultural heritage. The assessment is based on the following due diligence considerations: • The proposal is within the Swansea channel and an Island where no impacts to Aboriginal cultural heritage are expected. • The proposal is unlikely to harm known Aboriginal objects or places (AHIMS site 45-7-0229). • The AHIMS search indicated that there is one recorded Aboriginal site within the Study Area. • The Study Area does 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 Roads and Maritime Services' procedure, however, the cultural heritage potential of the Study Area appears to be unlikely due to the proposal being carried out in the channel and on an Island where sand dredging spoil has been deposited previously. • There is an absence of sandstone rock outcrops likely to contain Aboriginal art. The AHIMS search results and PACHCI assessment are included in Appendix D.		

Safeguards

Safeguards to be implemented are:

AH1. If the scope of the proposal changes the relevant Aboriginal Community and Heritage Partner and Environmental Advisor must be contacted to determine whether the changed scope can proceed without further cultural heritage investigations.

AH2. If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the proposal, all works in the vicinity of the find must cease. The steps outlined in the *TfNSW Unexpected Heritage Items Procedure* must be followed.

3.6 Non-Aboriginal heritage

Table 3-6: Non-Aboriginal heritage

Description of existing environmental and potential impacts		
Have online heritage database searches been completed? • Transport (including legacy Roads and Maritime) section 170 register. • NSW Heritage database. • Commonwealth Heritage List, established under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). • Australian Heritage Places Inventory. • Local Environmental Plan(s) heritage items.	Yes ☒	No ☐
Are there any items of non-Aboriginal heritage or heritage conservation areas listed on relevant heritage databases/registers that are located within the vicinity of the proposal? There are 3 items of local significance within proximity to the Proposal. All of the items are on land and none of the items are likely to be affected as they are all are outside of the proposal footprint.	Yes ☒	No ☐
Is the proposal likely to impact trees that form part of a heritage listing or have other heritage value?	Yes ☐	No ☒
Is the proposal likely to occur in or near features that indicate potential archaeological remains?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

H1. 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 Roads and Maritime Services Standard Management Procedure: Unexpected Heritage Items must be followed. Roads and Maritime Services Senior Environment Specialist - Heritage must be contacted immediately.

3.7 Biodiversity

Table 3-7: Biodiversity

Description of existing environmental and potential impacts		
Have relevant database searches been carried out? The following databases were searched: • Bionet, Atlas of NSW Wildlife (last 20 years) • Atlas of Living Australia - Selected species • Birdata (Birdlife Australia) • eBird (The Cornell Lab of Ornithology) • NSW DPI Fisheries Threatened species lists (NSW DPI 2022b) • EPBC Act Protected Matters Report tool Mapping of existing aquatic ecological features was reviewed using the following online tools: • Fisheries NSW Spatial Data Portal – Mapping of Estuarine Macrophytes, Aquaculture, Marine • Protected Areas, and Coastal Management SEPP layers. • Biodiversity Values Map and Threshold Tool – Biodiversity values. • Spatial Information Exchange (aerial photography analysis) • Google Earth Pro (aerial photography analysis of historical imagery) The Lake Macquarie Vegetation (2022) mapping was also reviewed.	Yes ☒	No ☐
Did the database searches identify any endangered ecological communities, threatened flora and/or threatened or protected fauna, or migratory species in or within the vicinity of the proposed works? Both Commonwealth and State listed matters must be considered. An Aquatic Ecology Assessment (AEA) was prepared to identify and consider 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 (refer to Appendix B). Searches of the Bionet database identified sightings data for 14 items listings under the BC Act within a 5 km radius of the Study Area. These included: • 11 threatened marine birds and/or shorebirds, • 1 threatened marine mammal; and • 3 threatened marine reptiles. Specific to the state endangered Little Tern, known to nest on Elizabeth Island (refer to Figure 3-3) in recent years, additional database searches were undertaken to source any recorded nesting observations. Three shark species and three species of fish listed under the FM Act may also occur within 5km of the Study Area. The EPBC Protected Matters Report Search identified the following MNES relevant to the proposal (i.e., marine/estuarine species or those that use marine/estuarine habitat) within 5 km radius of the Study Area: • 87 listed threatened species. • 73 listed migratory species. • 6 Threatened Ecological Communities (TEC). In addition to the above, the EPBC Protected Matters Report Search identified 108 protected marine species that include certain species of fish, along with some marine birds, reptiles, and mammals. A total of 13 marine mammals were identified as part of protected listings for cetaceans. Of the Commonwealth listed threatened and/or migratory species, the following were identified for consideration as part of this assessment: • 36 marine birds and shorebirds,	Yes ☒	No ☐

• 9 marine mammals, • 5 marine turtles, • 9 sharks and rays, • 4 fish; and • 1 TEC. In total 67 marine birds and shorebirds (including waders), 9 marine mammals, 5 marine reptiles, 9 sharks and rays, and 4 fish considered threatened and/or migratory species were identified to require further consideration in the AEA. A summary of all threatened and migratory species considered as part of this assessment, along with consideration of their likelihood of occurrence within the Study Area and potential to be impacted, is provided in Appendix B of this REF.		
Does the proposal involve pruning, trimming or removal of any tree/s?	Yes ☐	No ☒
Is the proposal likely to impact nationally listed threatened species, ecological communities, or migratory species? ***Posidonia australis*** The findings of a 7-Part Test for the Endangered *Posidonia australis* Population in Lake Macquarie listed under the FM Act concluded that the proposed dredging works are not expected to result in any removal of the mapped *P. australis* population in Lake Macquarie (refer to Figure 3-1). The implementation of a 10m buffer to dredging (refer to Figure 3-4) will provide additional protection for *P. australis* in close proximity to the dredging works. Given this, any disturbances associated with the proposal are unlikely to affect the viability and long term survival of the Lake Macquarie population of *P. australis*. The findings of the Impact Assessment Criteria for the Endangered *P. australis* Ecological Community under the EPBC Act found that the proposed dredging is not expected to remove any areas of mapped *P. australis*. Impacts will be confined to habitat disturbance such as sedimentation and elevated turbidity. These impacts have some potential to favour growth of undesirable species that can out-compete slow growing seagrasses such as *P. australis*. The application of a 10m buffer (refer to Figure 3-4) between any mapped *P. australis* and areas to be dredged should adequately avoid direct disturbances to *P. australis* such that it is not considered to be representative of a significant impact on the environment under the EPBC Act and as such a referral to DCCEEW would not be required. **Threatened Shorebirds** The findings of 5-Part Test for Threatened Shorebirds listed under the BC Act included the Endangered Pied Oystercatcher (*Haematopus longirostris*) and the Endangered Little Tern (*Sternula albifrons*). This assessment found that it is important that nesting areas (refer to Figure 3-3) be avoided during the breeding season for the Little Tern (i.e., October through to February) due to the potential significance of the sites for breeding within the locality. A number of mitigation measures to prevent direct and indirect impacts of dredging on nesting success of the Little Tern and Pied Oystercatcher have been outlined in the safeguards below. Assuming that direct disturbances of Little Tern breeding habitat can be avoided during the breeding season, and provided the appropriate mitigation measures are formulated and implemented, the proposal is not considered likely to result in a significant impact on viable local breeding populations of either species. The Impact Assessment Criteria for Threatened and or Migratory Shorebirds has been applied to the Little Tern (*S. albifrons*), listed as a protected migratory species under the EPBC Act. This assessment found that assuming that direct disturbances of Little Tern breeding habitat can be avoided during the breeding season, and provided the recommended mitigation measures are implemented, the proposal is not considered likely to result in a significant impact on viable local breeding populations of either species and as such a referral to DCCEEW would not be required. **White's Seahorse** The findings of the 7-Part Test for the Endangered White's Seahorse (*Hippocampus whitei*) listed under the FM Act concluded that there is only marginal habitat (*Zostera* and *Halophila* seagrass beds) within and around the Study Area, and that there is other preferred habitat (*Posidonia australis*, jetties/pylons) outside of the Dredging Site. As a result, any local population of this species is unlikely to be significantly affected by the dredging and sand placement. Some temporary minor disturbances to marginal habitat for White's Seahorse may occur at times during dredging works and/or after proposal completion if onshore sand piles erode into nearshore waters. These disturbances would, however, be minimal at a population level.	Yes ☒	No ☐

The findings of the Impact Assessment Criteria for the Endangered White's Seahorse (*H. whitei*) listed under the EPBC Act found that it is unlikely that the White's Seahorse population that may colonise the marginal habitat (*Zostera* and *Halophila* seagrass beds) within and around the Study Area, and other preferred habitat (*P. australis*, jetties/pylons) in the vicinity of the Dredging Site and in Swan Bay beyond the Study Area, would be impacted by the dredging and sand placement operations. Some temporary minor disturbances to White's Seahorse individuals or habitat may occur at times during dredging works and/or after proposal completion if onshore sand piles erode into nearshore waters. These disturbances would, however, be minimal at a population level and confined to marginal habitats associated with *Zostera* and *Halophila* seagrass beds.		
Would the proposal require the removal of any other vegetation? **Mangroves and Saltmarsh Communities** Some mangrove stands occur on the central stretches of Elizabeth Island, along or in close proximity to, the shoreline (refer to Figure 3-2). These areas will need to be avoided and appropriate buffers provided to sand transfer and stockpiling operations. Mangroves also occur along the majority of the shoreline of the central and northern sections of Spoil Island, adjacent to the proposed dredging works, while some stands of Coastal Saltmarsh occur behind the mangroves on the northern side of Spoil Island. The Saltmarsh is also likely to align with the Coastal Saltmarsh EEC listed under the BC Act. These areas are not expected to be directly impacted by water-based dredging works in the Main Channel. **Seagrasses** In terms of other seagrass species, the main potential impacts from the proposed dredging activities and/or sand transfer/stockpiling operations relates to the presence of patchy *Zostera sp*. and *Halophila sp*.seagrass beds in the vicinity (i.e., <5 m) of the Dredging Site and Sand Placement Site (refer to Figure 3-2). Whilst there is no seagrass present directly within the dredging footprint, there is the potential for physical disturbance caused by subsidence/slumping of sediment and seabed down the slopes of the dredged areas. Adequate buffer zones will be implemented as outlined in the safeguards below to mitigate the risk of disturbance (refer to Figure 3-4). There is potential for turbid water and mobilised sediments from dredging activities to disperse towards the strip of patchy *Zostera sp*. and *Halophila sp*. seagrass beds present in shallow nearshore waters along the western shore of Spoil Island. It is considered unlikely that the very temporary reductions in water-quality and mobilisation of sediments emanating from dredging operations would lead to any light attenuation or sedimentation issues for those nearby seagrass beds. There is also the potential for weather-facilitated erosion of the stockpiles of sand at the Elizabeth Island Sand Placement Sites to cause influxes of turbid, sediment-laden runoff into the Zostera sp. / Halophila sp. seagrass beds that fringe the shoreline of Elizabeth Island. With large quantities of sand to be deposited, there is potential for creation of unstable slopes, which may exacerbate the risk of such erosion events. Appropriate mitigation measures have been outlined in the safeguards below to mitigate this risk. **Terrestrial vegetation** It is not proposed to remove any native vegetation for the proposal. The sand placement would result in the smothering of Bitou Bush, an invasive environmental weed which has infested Elizabeth Island. Native vegetation on the fringes of Elizabeth Island would be protected with fencing to ensure that no native vegetation is removed or disturbed (refer to Figure 3-2). The laydown area is proposed in a small section of the Marks Point boat ramp car park, where the existing hardstand area would be used, and no vegetation would need to be removed.	Yes ☐	No ☒
Would the proposal require the removal of any tree hollows?	Yes ☐	No ☒
Are there any known areas of outstanding biodiversity value or areas mapped as 'littoral rainforest' or 'coastal wetland' under chapter 2 of SEPP (Resilience and Hazards) in or within the vicinity of the proposed work? Areas mapped as coastal wetlands occur within the vicinity of the proposal, outside of the dredging footprint as shown in Figure 2-4. No works are proposed within any mapped coastal wetland area, though the dredging footprint slightly encroaches on the mapped coastal wetland proximity area	Yes ☒	No ☐

near the Marks Point boat ramp. The encroachment is not likely to have any impact on the matters for consideration in the SEPP, and development consent is not required. There are no mapped littoral rainforest areas within, or within the vicinity of, the proposal. There are no known areas of outstanding biodiversity value in, or within the vicinity of, the proposed works.		
Would the proposal provide any additional barriers to the movement of wildlife?	Yes ☐	No ☒
Would the proposal disturb any natural waterways or aquatic habitat? The proposal would be undertaken within the Swansea channel, a trained entrance connecting Lake Macquarie with the ocean. The dredging area consists of clean marine sands that form shallow (<2 m depth) shoaling banks particularly from Elizabeth Island southeast across the main channel towards the southern entrance to Swan Bay or slightly deeper (>2 m) areas along most of the lengths of both channel arms. The AEA at Appendix B and Figure 3-2 shows significant areas of *Zostera sp*. seagrass beds and mangrove stands, along with some smaller areas of *Posidonia australis* and saltmarsh communities in the vicinity of the dredging footprint (but outside of it). Whilst there is significant aquatic habitat in the vicinity of the Study Area, the dredging operations do not directly encroach upon any aquatic habitat. The safeguards proposed in this REF are likely to be adequate for mitigating any potential indirect impacts on aquatic habitat.	Yes ☒	No ☐
Would the proposal impact (directly or indirectly) any potential microbat roosting or breeding habitat such as on bridges and culverts?	Yes ☐	No ☒
In total 67 marine birds and shorebirds (including waders), nine marine mammals, five marine reptiles, nine sharks and rays and four fish, which are considered threatened and/or migratory species were identified to require detailed consideration. The potential impacts on these have been considered in the AEA included in Appendix B of this REF. The site investigations undertaken for the AEA also identified important shorebird habitat, including potential nesting habitat for the Little Tern and Pied Oystercatcher to occur nearby and on Elizabeth Island, where sand is proposed to be placed. Protected seagrasses also occur in close proximity to the sand placement sites and the proposed dredging footprint. Direct impacts from the proposal will include the removal of a quantity of seabed material – primarily clean marine sandy substrate – resulting in the loss of invertebrate infauna and possibly some sessile or slow-moving epibenthic invertebrates that inhabit that seabed material. The dredging is currently proposed to extend to the edge of the existing seagrass beds just off the western shore of Spoil Island. Dredging in such close proximity to those beds poses a risk of some physical disturbance and/or removal. Thus, ensuring avoidance of any seagrass from direct disturbance through dredging design modification to include a 10m buffer will need to be adopted to adequately avoid any potential harm (refer to Figure 3-4). The proposal is also expected to result in short-term impacts on water quality in the form of elevated levels of turbidity, with associated mobilisation of seabed particulates and subsequent sedimentation during dredging activities. This introduces some potential for minor and indirect, temporary physical disturbances to seagrass beds. Other potential disturbances to seagrass beds in shallow waters adjacent to the sand placement sites include crushing due to physical contact by the sand slurry transfer pipeline, and the risk of erosion of the sand piles and runoff of sediment-laden water onto those seagrass beds. The sand placed on the islands adjacent to the Swansea Channel as a result of historical dredging spanning over 35 years has created desirable nesting opportunities for some beach nesting threatened shorebird species, on the dry open deposited sand surface (refer to Figure 3-3). Due to the highly vegetated nature of these islands in their natural state, they were unlikely to have been suitable for such nesting prior to the commencement of dredging works. This habitat is also only temporary for a few years before Bitou Bush, Acacias and other colonising vegetation emerge over the deposited sand. Hence, suitability is also only maintained by the ongoing dredging works and sand placement. Proposed sand placement associated with the dredging works has the potential for direct and indirect impacts on potential Little Tern breeding locations as well as potential Pied Oystercatcher breeding locations on and adjacent to previous sand placement areas. These impacts have the potential to be both positive through improvement and creation of habitat, whilst also negative through disturbance during breeding and to the habitat for breeding that the sand provides. Given the potential significance of the site to breeding within the locality, by the Little Tern especially, avoidance of any works, including sand placement, on Elizabeth Island during breeding season will be required without the implementation of a suitable management plan with adequate controls to prevent any disturbance to breeding shorebirds.		

Safeguards

Safeguards to be implemented are:

F1. There is to be no disturbance or damage to threatened species or areas of outstanding value.

F2. If unexpected, threatened fauna or flora species are discovered, stop works immediately and follow the *Roads and Maritime Services Unexpected Threatened Species Find Procedure*.

F3. Declared noxious weeds are to be managed according to requirements under the Biosecurity Act, 2015 and *Guide 6 (Weed Management) of the Roads and Maritime Services Biodiversity Guidelines 2011*.

F4. Fauna handling must be carried out in accordance with the requirements of the *Roads and Maritime Services Biodiversity Guidelines - Guide 9 (Fauna Handling)*.

F5. Works are not to create an ongoing barrier to the movement of wildlife.

F6. All activities are to be carried out to avoid spreading marine pests including:

- Removal of weeds, animals or sediment from equipment and disposal to an appropriate waste receptacle or facility.
- Disposal of sewage and bilge water at an approved pump out facility.

F7. A Shorebird Management Plan (SMP) would be prepared prior to the commencement of the works to manage the works within potential shorebird nesting areas. The Shorebird Management Plan must be prepared by a suitably qualified ecologist and is to contain specific actions to avoid direct impacts to breeding birds, minimise disturbance to any shorebirds present during works and ensure that the completion of works leaves the deposit sites in a condition suitable for future nesting opportunities for the Little Tern and Pied Oystercatcher.

F8. The placement of sand on Elizabeth Island will be avoided during the Little Tern (Oct-Feb) and Pied Oystercatcher (Aug-Jan) breeding/nesting season wherever possible. Where any works that require access to Elizabeth Island cannot be avoided during breeding/nesting season for these species, the Shorebird Management Plan (SMP) will need to be implemented to ensure a significant impact does not occur.

F9. Sand placement would be undertaken in a manner to improve habitat for future use by the Little Tern. This should include removal of, and/or placement of sand in a manner that completely smoothers the exotic Bitou Bush Scrub, which is currently colonising areas along the shoreline. Details regarding improvements for creation of shorebird habitat will be provided in the SMP.

F10. A Buffer of 10m between the mapped seagrasses and dredging footprint (including associated batters), dredge pipe routes to Elizabeth Island and sand placement area would be implemented.

F11. There is to be no mooring or beaching of vessels within any seagrass areas.

F12. Access, landing, and excavator-track locations on Elizabeth Island would be positioned outside of established native shoreline vegetation (Banksia Scrub and Swamp Oak Forest).

F13. Dredge sand pipes sending the sand ashore would be securely positioned over sand, with a clearance of at least 5m to the edges of any nearby seagrass beds.

F14. A buffer of 10m between any native canopy forming vegetation communities and sand placement areas (including stock piling) would be implemented.

F15. Hydrocarbon-based products would be stored in the storage container in the laydown area only.

F16. Excavator operation on Elizabeth Island would be strictly confined to clearly defined access points to and from the Island and outside of the buffer areas (refer to Figure 3-4).

F17. All equipment to be brought onto Elizabeth Island must be thoroughly cleaned and free of any soil, to avoid the introduction of additional exotic weeds.

F18. Dredge pipes should be positioned between the shore and stockpile/deposition site following a route that avoids any native vegetation (refer to Figure 3-4).

F19. Where dewatering of dredged material occurs, adequate sediment and erosion-control structures will be erected to minimise sedimentation on adjacent intertidal and subtidal habitats.

F20. Where avoidance of seagrass beds is not possible with the pipeline, the dredge pipes will need to be floated above or, in very shallow or intertidal areas, propped up to avoid seabed contact.

F21. Sediment-control fencing would be erected and maintained on the lower slope between the Sand Placement Sites and shoreline, in accordance with the 'Blue Book' (Landcom 2004).

F22. All machinery would 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. All staff are to be made aware of the location of the spill kit and trained in its use.

F23. Environmental controls such as sediment and erosion controls, as well as the position of dredge pipes, should be inspected weekly by an independent consultant or TfNSW environmental staff.

Figure 3-1 Threatened Ecological Communities in the Study Area. Source: H2O Consulting Group 2023.

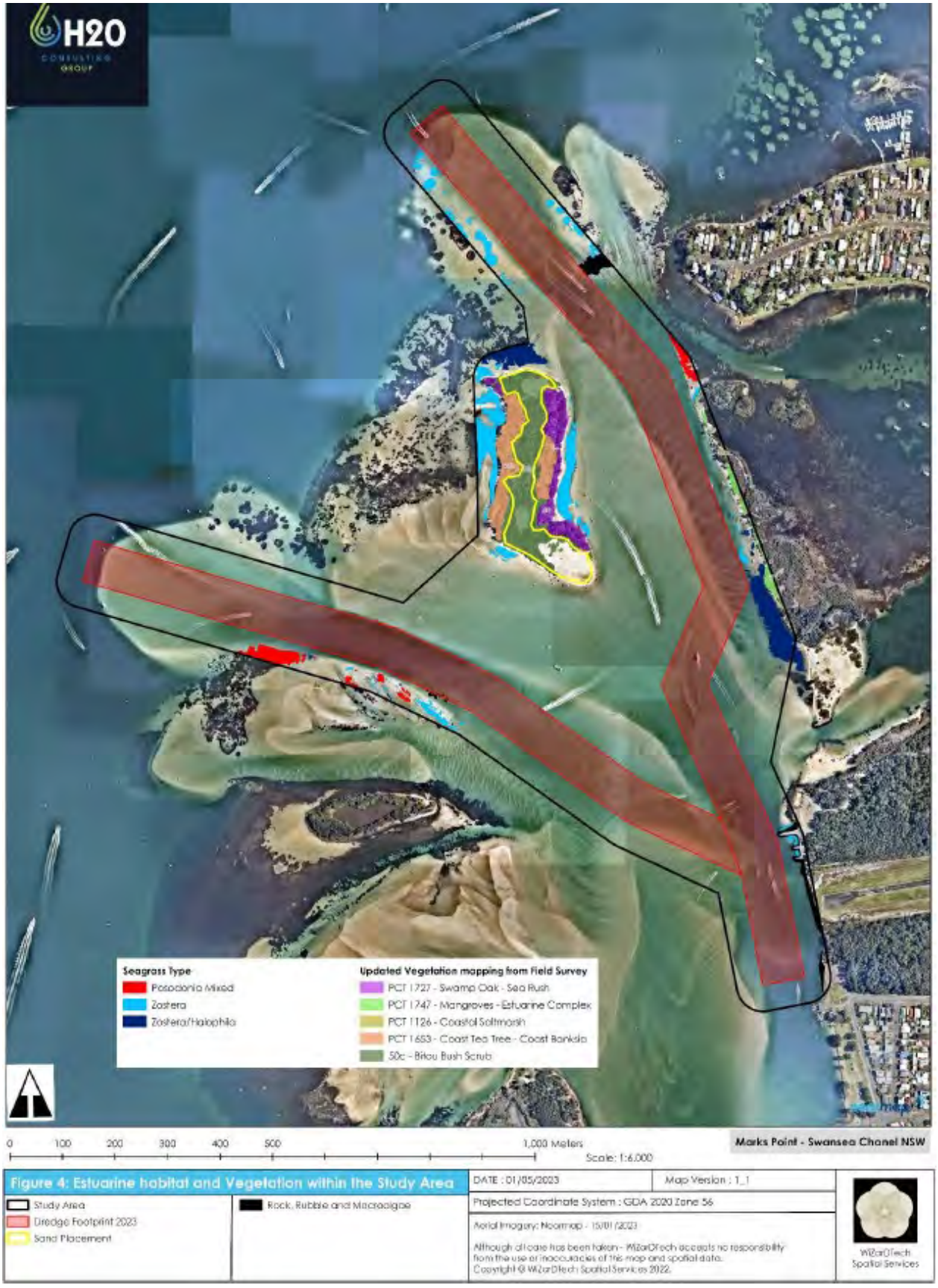

Figure 3-2 Estuarine habitat and vegetation within the study area. H2O Consulting Group 2023.

Figure 3-3 Shorebird habitat within the Study Area. H2O Consulting Group 2023.

Figure 3-4 Buffer zones to avoid and minimise impacts to seagrasses in the Study Area. H2O Consulting Group 2023.

3.8 Traffic and transport

Table 3-8: Traffic and transport

Description of existing environmental and potential impacts		
Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during construction?	Yes ☐	No ☒
Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation?	Yes ☐	No ☒
Is the proposal likely to affect any other transport nodes or transport infrastructure (e.g., bus stops, bus routes) in the surrounding area? Or result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation?	Yes ☐	No ☒
Traffic disruption issues are likely to be limited to a small amount of disruption to maritime traffic whilst the dredge is in operation and anchored in the channel outside of working hours. These would include standard safety requirements as required by the Maritime Approval (Appendix C) to prevent collisions and navigation hazards. As the channel is relatively wide, this impact is likely to be minor and short-term. It is likely that not more than one parking space would be used for the laydown area. This will be discussed with Lake Macquarie City Council as part of the permit to use the Marks Point boat ramp car park for the laydown area. In the longer term the proposal will result in a beneficial impact on maritime traffic and transport as the proposal will result in improved navigation within the channel.		

Safeguards

Safeguards to be implemented are:

T1. Where possible, current vessel movements and public accesses to the waterway and foreshore are to be maintained during works. Any disturbance is to be minimised as much as practicable.

T2. A permit would be sought from Lake Macquarie City Council to use a part of the Marks Point boat ramp car park for the laydown area. Where possible, full pedestrian and vehicle access will be maintained.

T3. The following conditions have been provided with the approval under the *Marine Safety Regulation 2016* and must be implemented during works:

- All work vessels must comply with the Marine Safety (Domestic Commercial Vessel) National Law Act 2012, the Marine Safety Act 1998, and all relevant subordinate legislation.
- All work vessels must exhibit lights and shapes in accordance with the International Regulations for Preventing Collisions at Sea 1972 (COLREGs).
- Prior to the commencement of any work, the development and implementation of a Vessel Traffic Management Plan (VTMP) must be undertaken by the contractor in consultation with the local Boating Safety Officer.
- All pipes and associated equipment which will restrict or vary existing navigation conditions must 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.
- It is the contractor's responsibility to supply, install, maintain, and remove all navigation aids that are required by the VTMP over the duration of the works, which may include:
    a) Navigation channel lateral marks,
    b) Channel blocked/closed signals,
    c) Navigation marks or signage required by NSW Maritime to ensure the safe and
    d) efficient operation of the navigation channel or channels through or around the works, and
    e) Temporary removal, relocation, or covering of any existing contradictory or superfluous signs, buoyage, or navigation marks.

- The dredge Master shall maintain a radio listening watch on VHF channel 16 at all times.
- Any marine pollution resulting from a work vessel must be reported to TfNSW by phoning 13 12 36, along with notifying the Senior Boating Safety Officer.
- Notification shall be provided to NSW Maritime if the proposal duration will likely extend beyond the above mentioned date.
- All item(s) including vessel, plant, machinery, and auxiliary equipment must be removed from NSW State waters on completion of the works unless they otherwise hold an appropriate licence.

3.9 Socio-economic

Table 3-9: Socio-economic

Description of existing environmental and potential impacts		
Is the proposal likely to impact local business?	Yes ☐	No ☒
Is the proposal likely to require any property acquisition?	Yes ☐	No ☒
Is the proposal likely to alter any access for properties (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to alter any on-street parking arrangements (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to change pedestrian movements or pedestrian access (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to impact on any items or places of social value to the community (either temporarily or permanently)? The impacts will be positive as the community place high value on the channel for access to Lake Macquarie. The Proposal will improve access to the lake.	Yes ☒	No ☐
Is the proposal likely to reduce or change visibility of any businesses, farms, tourist attractions or the like (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to impact trees planted by a community group, Landcare group or by council or a tree that is a memorial or part of a memorial group e.g., has a plaque?	Yes ☐	No ☒
Is the proposal likely to impact trees that form part of a streetscape, an avenue or roadside planting?	Yes ☐	No ☒
There would be short term negative impacts associated with reduced amenity and slightly restricted access for boaters both within the channel and on Elizabeth Island during works. As the proposal is being undertaken for a long-term community benefit it is likely that the community would tolerate the short-term disruption. Signs and fencing would be in place to restrict access during sand placement on Elizabeth island. As the launch of the dredge would likely be undertaken over a period of less than 4 hours it is unlikely that it would result in any negative socio-economic impact. There may be some community concern associated with the reduced ability for boaters to access Elizabeth Island during the dredging operations, however the temporary short-term loss is likely to be well tolerated because of the long term beneficial impacts for both the island and the navigationchannel. The proposal, when complete, would have a highly beneficial socio-economic impact as it will improve the use of a valued local recreational resource. The local tourism market would likely improve, and indirectly have a positive benefit on other businesses.		

Safeguards

Safeguards to be implemented are:

C1. A communication and engagement strategy for the proposal would be prepared and implemented prior to the commencement of works. Stakeholders in this strategy would include the Lake Macquarie City Mayor and Councillors, the Lake Macquarie Aquatic Services Committee, and Lake Macquarie Coastal Zone Management Committee.

C2. All complaints are to be recorded on a complaints register and attended to promptly.

C3. Notification is to be given to affected community members prior to the proposal taking place. Notification should be a minimum of 7 calendar days prior to the start of works. The notification is to include:

- Details of the proposal
- The duration of works and working hours.
- Any changed traffic or access arrangements.
- How to lodge a complaint or obtain more information.
- Contact name and details of the project manager.

3.10 Landscape character and visual amenity

Table 3-10: Landscape character and visual amenity

Description of existing environmental and potential impacts		
Is the proposed work over or near an important physical or cultural element or landscape? (For example, heritage items and areas, distinctive or historic built form, National Parks, conservation areas, scenic highways etc.)? The proposal would be located on a natural waterway with high visual amenity and importance.	Yes ☒	No ☐
Would the proposal obstruct or intrude upon the character or views of a valued landscape or urban area? For example, locally significant topography, a rural landscape or a park, a river, lake, or the ocean or a historic or distinctive townscape or landmark?	Yes ☐	No ☒
Would the proposal require the removal of mature trees or stands of vegetation, either native or introduced?	Yes ☐	No ☒
Would the proposal result in large areas of shotcrete visible from the road or adjacent properties?	Yes ☐	No ☒
Would the proposal involve new noise walls or visible changes to existing noise walls?	Yes ☐	No ☒
Would the proposal involve the removal or reuse of large areas of road corridor, landscape, either verges or medians?	Yes ☐	No ☒
Would the proposal involve substantial changes to the appearance of a bridge (including piers, girders, abutments, and parapets) that are visible from the road or residential areas?	Yes ☐	No ☒
If involving lighting, would the proposal create unwanted light spillage on residential properties at night (in construction or operation)? It is not intended that the dredge would operate at night. If required to work outside of standard working hours, the dredge would have a lighting system that results in minimal light spill.	Yes ☐	No ☒
Would any new structures or features to be constructed result in over shadowing to adjoining properties or areas?	Yes ☐	No ☒
The proposal would be undertaken in a busy recreational waterway, where dredges have been operating for several years, and watercraft are prominent. It is unlikely that the dredge would be noticeable to the majority of the community, or cause concern, particularly as the dredging has been supported by the majority of the community. Although the deposition component of the proposal would result in a slightly larger sand area on Elizabeth Island, this is unlikely to be noticeable against the backdrop of the foreshore, lake and channel.		

There may be some short-term minor visual impacts associated with the storage of materials at the laydown area. The laydown area would be located within a car park with areas of gravel and hardstand. The laydown area would be located at the edge of the carpark in an area of moderate visual amenity. The laydown area would be screened from the waterway and would only be noticeable to users of the carpark. Amenity and visual impacts associuated with the laydown area would be temporary and are expected to be low.

Safeguards

Safeguards to be implemented are:

V1. Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.

3.11 Waste

Table 3-11: Waste

Description of existing environmental and potential impacts		
Is the proposal likely to generate >200 tonnes of waste material (contaminated and /or non-contaminated material)?	Yes ☐	No ☒
Is the proposal likely to require a licence from the EPA? The proposal will not result in the removal of dredged material above the threshold criteria of 30,000m^3 per year for an Environment Protection Licence (EPL).	Yes ☐	No ☒
Is the proposal likely to require the removal of asbestos?	Yes ☐	No ☒
It is not expected that there would be any waste generated by the proposal as all dredged sand would be relocated to Elizabeth Island in accordance with resource recovery exemptions.		

Safeguards

Safeguards to be implemented are:

M1. The laydown area would be maintained in a tidy condition at all times during the proposal. At the completion of the proposal, the laydown area would be re-instated to its former condition.

M2. All wastewater from vessels is to be discharged at an approved vessel wastewater disposal facility. No vessel wastewater is to be discharged (i.e. pumped out) directly into the water or onto any land adjacent.

M3. The volume of material dredged from the channel would be less than 30,000m^3 per year.

4. Consideration of State and Commonwealth environmental factors

4.1 Environmental Planning and Assessment Regulation 2021 factors

The following factors, listed in section 171(2) of the Environmental Planning and Assessment Regulation 2021, have been considered to assess the likely impacts of the proposal on the natural and built environment. This consideration is required to comply with sections 5.5 and 5.7 of the EP&A Act.

Table 4-1: Consideration of section 171 of the EP&A Regulation factors

Environmental factor		Impact
a)	Any environmental impact on a community? The proposal may cause minor short-term disruption to the community, such as navigation delays and loss of amenity, however the potential impacts would be minimised with the implementation of the safeguards detailed in this REF. The proposal would have a positive environmental impact on the community in the long-term and lake users would benefit from safer conditions and improved access to the channel.	Short-term negative, long-term positive.
b)	Any transformation of a locality? The proposal would not transform the locality, as works would generally be the same as the dredging works that have been undertaken in the channel in the past.	Nil
c)	Any environmental impact on the ecosystems of a locality? The proposal would have potential environmental impacts on the ecosystems of Lake Macquarie as addressed in chapter 3 of this REF. The primary impacts are likely to be related to water quality, however any potential impacts would be minimised with the implementation of the safeguards given in Section 3 of this REF. Long term, the proposal would assist with containing the Elizabeth Island bitou bush infestation, create additional shorebird nesting habitat and create a more useable and safe waterway.	Minor short-term negative, long-term positive.
d)	Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The proposal would have a minor impact on the aesthetic, recreational, and environmental quality of the locality due to reduced amenity associated with the presence of the dredge and restricted access areas. There may also be short term water quality impacts associated with turbidity and sand placement, however these can be adequately managed with safeguards. The proposal would benefit the locality in the long-term as discussed in chapter 3 of this REF. The beneficial impacts relate to the improved access to the lake and the improved habitat on Elizabeth Island.	Short-term negative, long-term positive.
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? There would be no harm to any items of significance.	Nil
f)	Any impact on habitat of any protected animals (within the meaning of the *Biodiversity Conservation Act 2016*)? The proposal would not have any impact on the habitat of any protected animals due to the limited scope of works for the proposed activities and the implementation of the safeguards given in Section 3 of this REF.	Nil
g)	Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?	Nil

Environmental factor		Impact
	The proposal would not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air due to the limited scope of works for the proposed activities and the implementation of the safeguards given in Section 3 of this REF.	
h)	Any long-term effects on the environment? The proposal would have positive long-term effects on the environment due to improved safety for the boating community. There are no anticipated negative long-term effects on the environment from the maintenance works due to the limited scope of these works and the implementation of the safeguards given in Section 3 of this REF.	Positive
i)	Any degradation of the quality of the environment? The proposal would potentially degrade the quality of the environment in the short-term, however the potential impacts would be minimised with the implementation of the safeguards given in Section 3 of this REF.	Short-term negative, long-term nil
j)	Any risk to the safety of the environment? The proposal would have minimal risk to the safety of the environment due to the limited scope of works for the maintenance activities covered in this REF, and the potential impacts would be minimised with the implementation of the safeguards given in Section 3 in this REF.	Minimal
k)	Any reduction in the range of beneficial uses of the environment? There would be a short-term, minor reduction in the beneficial uses of the environment due to the minor and temporary disruption associated with the presence of the dredge in the channel and restricted access to Elizabeth Island. There may be very minor and temporary impacts associated with the launch of the dredge and the use of the car park for the laydown area. There would be a long-term improvement in the range of beneficial uses of the environment as a result of the proposal due to a safer and more accessible channel and increased habitat provision on Elizabeth Island.	Short-term negative, long-term positive
l)	Any pollution of the environment? The proposal would potentially cause pollution of the environment; however the potential impacts would be minimised with the implementation of the safeguards given in Section 3 of this REF.	Minimal
m)	Any environmental problems associated with the disposal of waste? No environmental problems are anticipated for the disposal of waste as no waste is likely to be produced by the proposal. The dredged material has historically comprised clean marine sands (VENM) and contamination testing (RHDHV, 2014) demonstrates that all concentrations of potential contaminants detected were well below environmental and health investigations levels where they are specified in relevant guidelines. The results confirm that material previously dredged from the channel and material currently within the channel is clean marine sand. This is discussed in section 3.2 of this REF.	Nil
n)	Any increased demands on resources, natural or otherwise which are, or are likely to become, in short supply? The proposal would not require resources that are in short supply.	Nil
o)	Any cumulative environmental effect with other existing or likely future activities? The proposal would have positive cumulative impacts with other future dredging activities to ensure a strategic approach to managing coastal hazards and processes.	Positive
p)	Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The purpose of the proposal is to address coastal processes and hazards which are being exacerbated by climate change conditions.	Positive
q)	Any impact on applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1?	Nil

Environmental factor		Impact
	The proposal does not have any impact on strategic planning matters referred to in Division 3.1 of the Act.	
r)	Any impact on other relevant environmental factors? In considering the potential impacts of this proposal all relevant environmental factors have been considered, and with the implementation of the safeguards environmental impacts are likely to be minimal.	Minimal

4.2 Matters of National Environmental Significance

Table 4-2: Matters of national environmental significance

Environmental 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 (often called 'Ramsar' wetlands)? The proposal would not be undertaken in close proximity to a RAMSAR wetland.	Nil
d)	Any impact on nationally threatened species, ecological communities or migratory species? The aquatic biodiversity assessment undertaken for the proposal (Appendix B) concludes that the proposal is unlikely to have an impact on nationally threatened species, ecological communities or migratory species.	Nil
e)	Any impact on a Commonwealth marine area? There are no Commonwealth marine areas in proximity to the proposal.	Nil
f)	Does the proposal involve a nuclear action (including uranium mining)? The proposal includes maintenance dredging and sand placement.	Nil
Additionally, any impact (direct or indirect) on the environment of Commonwealth land? There would be no indirect impacts on Commonwealth land.		Nil

5. Summary of safeguards and environmental management measures

This section provides a summary of the site-specific environmental safeguards and management measures identified in described in chapters 3 and 4 of this REF. These safeguards will be implemented to reduce potential environmental impacts throughout construction and operation. A framework for managing the potential impacts is provided with reference to environmental management plans and relevant TfNSW QA specifications. Any potential license and/or approval requirements required prior to construction are also listed.

Table 5-1: Summary of site-specific safeguards for proposed work

Factor	Impact
Soils and sediments	E1. Potential or actual acid sulphate soils would be managed in accordance with the Roads and Maritime Services Guidelines for the Management of Acid Sulphate Materials 2005. E2. Sand stockpiles would be limited in height to 6m and batter slopes no steeper than 1 in 3 (vertical to horizontal) to prevent collapse of sand stockpiles. E3. Erosion and sediment control measures are to be implemented and maintained to: • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets; • Reduce water velocity and capture sediment on site; • Divert clean water around the spoil site where practical; in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book). E4. Erosion and sediment control measures are not to be removed until the dredging campaign is complete and areas are stabilised. E5. Erosion and sedimentation controls are to be checked and maintained on a regular basis and records kept and provided on request. E6. Excavator movements in and around Elizabeth Island would be limited where practical, with sensitive areas fenced to prevent encroachment into native vegetation and potential shorebird nesting sites.
Water quality	W1. A Water Quality Management Plan (WQMP) would be developed to detail the monitoring required for the proposal. W2. The sand placement area would be prepared and maintained throughout dredging operations to prevent the discharge of turbid water into nearby estuarine and/or coastal waters. Establishment of bunds, settlement ponds and silt fencing at the material placement areas would be implemented if required to manage the discharge water in a controlled manner, and an excavator would be present to manage bund walls. W3. Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis at the dredge site to identify any potential spills. Water quality monitoring will occur daily within the dewatering area to measure turbidity using nephelometric turbidity units (NTU) to provide a measure of turbidity in real-time. If turbidity thresholds are reached, dredging operations would be suspended until the turbidity is reduced to acceptable levels. A dredge log would be maintained which would include a record of visual observations and NTU monitoring results, as well as any measures put in place to reduce turbidity. W4. Vessels (including barges) are only to be used at suitable tides when no less than 600mm clearance is available between the underside of the vessel and the bed of the waterway. W5. Refuelling of plant and equipment and storage of hazardous materials on barges is to occur within a double-bunded area.

	W6. An emergency spill kit is to be kept on site (at the laydown area) and on the dredge at all times (specific for working within the marine environment) and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances at the work site. W7. All workers will be advised of the location of the spill kit and trained in its use. W8. If an incident (e.g. spill) occurs, the *Roads and Maritime Services Environmental Incident Classification and Reporting Procedure* is to be followed and the TfNSW Contract Manager notified as soon as practicable. W9. Emergency contact details will be kept in an easily accessible location on vehicles, vessels, plant and site office. All workers will be advised of these contact details and procedures, as well as the location of the spill kits. All workers would be trained in the use of the spill kits. W10. Vehicles, vessels and plant must be properly maintained and regularly inspected for fluid leaks and must be throughly cleaned and maintained prior to being used. W11. No vehicle or vessel wash-down would occur on-site. W12. Appropriate site and project inductions/training detailing potential water quality impacts and relevant construction measures and spill and emergency response procedures to be used. W13. All fuels, chemicals and liquids are to be stored in an impervious bunded area a minimum of 50 metres away from: • Rivers, creeks or any areas of concentrated water flow. • Flooded or poorly drained areas. • Slopes above 10%. W14. In the event of a maritime spill, the incident emergency plan would be implemented in accordance with Sydney Ports Corporation's response to shipping incidents and emergencies outlined in the *NSW State Waters Marine Oil and Chemical Spill Contingency Plan* (NSW RMS, 2016). W15. In the event that the excavator is kept on Elizabeth Isand outside of working hours it is to be positioned away from sensitive areas such as receiving waters and native vegetation.
Noise and vibration	N1. Stationary noise sources must be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS2436:2010 lists materials suitable for shielding. N2.Loading and unloading of materials/deliveries is to occur as far away as possible from sensitive receivers. N3. Dedicated loading/unloading areas are to be shielded if close to sensitive receivers. N4. The laydown area is to be located away from sensitive receivers. N5. Traffic flow, parking and loading/unloading areas are to be planned to minimise reversing movements within the laydown area. N6. Works are to be undertaken within standard working hours wherever possible. If works within standard working hours is not possible due to tidal conditions etc, a noise management plan would be prepared and must include measures to minimise noise impacts. Noise impacts are to be minimised in accordance with the TfNSW Noise Estimator Tool. N7. The community must be notified of all work outside standard hours which have 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 Construction Noise and Vibration Guideline*.
Air quality	A1. All plant and equipment is to be maintained in good working order according to the manufacturer's instructions. Where plant or equipment is generating excessive fumes, it would be switched off and repaired prior to starting up again. A2. Works are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.

Aboriginal heritage	AH1. If the scope of the proposal changes the relevant Aboriginal Community and Heritage Partner and Environmental Advisor must be contacted to determine whether the changed scope can proceed without further cultural heritage investigations. AH2. If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the proposal, all works in the vicinity of the find must cease. The steps outlined in the *TfNSW Unexpected Heritage Items Procedure* must be followed.
Non-Aboriginal heritage	H1. If unexpected heritage items are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the *Roads and Maritime Services Standard Management Procedure: Unexpected Heritage Items* must be followed. Roads and Maritime Services Senior Environment Specialist - Heritage must be contacted immediately.
Biodiversity	F1. There is to be no disturbance or damage to threatened species or areas of outstanding value. F2. If unexpected, threatened fauna or flora species are discovered, stop works immediately and follow the *Roads and Maritime Services Unexpected Threatened Species Find Procedure*. F3. Declared noxious weeds are to be managed according to requirements under the Biosecurity Act, 2015 and *Guide 6 (Weed Management) of the Roads and Maritime Services Biodiversity Guidelines 2011.* F4. Fauna handling must be carried out in accordance with the requirements of the *Roads and Maritime Services Biodiversity Guidelines - Guide 9 (Fauna Handling)*. F5. Works are not to create an ongoing barrier to the movement of wildlife. F6. All activities are to be carried out to avoid spreading marine pests including: • Removal of weeds, animals or sediment from equipment and disposal to an appropriate waste receptacle or facility. • Disposal of sewage and bilge water at an approved pump out facility. F7. A Shorebird Management Plan (SMP) would be prepared prior to the commencement of the works to manage the works within potential shorebird nesting areas. The Shorebird Management Plan must be prepared by a suitably qualified ecologist and is to contain specific actions to avoid direct impacts to breeding birds, minimise disturbance to any shorebirds present during works and ensure that the completion of works leaves the deposit sites in a condition suitable for future nesting opportunities for the Little Tern and Pied Oystercatcher. F8. The placement of sand on Elizabeth Island will be avoided during the Little Tern (Oct-Feb) and Pied Oystercatcher (Aug-Jan) breeding/nesting season wherever possible. Where any works that require access to Elizabeth Island cannot be avoided during breeding/nesting season for these species, the Shorebird Management Plan (SMP) will need to be implemented to ensure a significant impact does not occur. F9. Sand placement would be undertaken in a manner to improve habitat for future use by the Little Tern. This should include removal of, and/or placement of sand in a manner that completely smothers the exotic Bitou Bush Scrub, which is currently colonising areas along the shoreline. Details regarding improvements for creation of shorebird habitat will be provided in the SMP. F10. A Buffer of 10m between the mapped seagrasses and dredging footprint (including associated batters), dredge pipe routes to Elizabeth Island and sand placement area would be implemented. F11. There is to be no mooring or beaching of vessels within any seagrass areas. F12. Access, landing, and excavator-track locations on Elizabeth Island would be positioned outside of established native shoreline vegetation (Banksia Scrub and Swamp Oak Forest). F13. Dredge sand pipes sending the sand ashore would be securely positioned over sand, with a clearance of at least 5m to the edges of any nearby seagrass beds. F14. A buffer of 10m between any native canopy forming vegetation communities and sand placement areas (including stock piling) would be implemented.

	F15. Hydrocarbon-based products would be stored in the storage container in the laydown area only. F16. Excavator operation on Elizabeth Island would be strictly confined to clearly defined access points to and from the Island and outside of the buffer areas (refer to Figure 3-4). F17. All equipment to be brought onto Elizabeth Island must be thoroughly cleaned and free of any soil, to avoid the introduction of additional exotic weeds. F18. Dredge pipes should be positioned between the shore and stockpile/deposition site following a route that avoids any native vegetation (refer to Figure 3-4). F19. Where dewatering of dredged material occurs, adequate sediment and erosion-control structures will be erected to minimise sedimentation on adjacent intertidal and subtidal habitats. F20. Where avoidance of seagrass beds is not possible with the pipeline, the dredge pipes will need to be floated above or, in very shallow or intertidal areas, propped up to avoid seabed contact. F21. Sediment-control fencing would be erected and maintained on the lower slope between the Sand Placement Sites and shoreline, in accordance with the 'Blue Book' (Landcom 2004). F22. All machinery would 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. All staff are to be made aware of the location of the spill kit and trained in its use. F23. Environmental controls such as sediment and erosion controls, as well as the position of dredge pipes, should be inspected weekly by an independent consultant or TfNSW environmental staff.
Traffic and transport	T1. Where possible, current vessel movements and public accesses to the waterway and foreshore are to be maintained during works. Any disturbance is to be minimised as much as practicable. T2. A permit would be sought from Lake Macquarie City Council to use a part of the Marks Point boat rampcar park for the laydown area. Where possible, full pedestrian and vehicle access will be maintained. T3. The following conditions have been provided with the approval under the *Marine Safety Regulation 2016* and must be implemented during works: • All work vessels must comply with the Marine Safety (Domestic Commercial Vessel) National Law Act 2012, the Marine Safety Act 1998, and all relevant subordinate legislation. • All work vessels must exhibit lights and shapes in accordance with the International Regulations for Preventing Collisions at Sea 1972 (COLREGs). • Prior to the commencement of any work, the development and implementation of a Vessel Traffic Management Plan (VTMP) must be undertaken by the contractor in consultation with the local Boating Safety Officer. • All pipes and associated equipment which will restrict or vary existing navigation conditions must 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. • It is the contractor's responsibility to supply, install, maintain, and remove all navigation aids that are required by the VTMP over the duration of the works, which may include: f) Navigation channel lateral marks, g) Channel blocked/closed signals, h) Navigation marks or signage required by NSW Maritime to ensure the safe and

	i) efficient operation of the navigation channel or channels through or around the works, and j) Temporary removal, relocation, or covering of any existing contradictory or superfluous signs, buoyage, or navigation marks. • The dredge Master shall maintain a radio listening watch on VHF channel 16 at all times. • Any marine pollution resulting from a work vessel must be reported to TfNSW by phoning 13 12 36, along with notifying the Senior Boating Safety Officer. • Notification shall be provided to NSW Maritime if the proposal duration will likely extend beyond the above mentioned date. • All item(s) including vessel, plant, machinery, and auxiliary equipment must be removed from NSW State waters on completion of the works unless they otherwise hold an appropriate licence.
Socio-economic	C1. A communication and engagement strategy for the proposal would be prepared and implemented prior to the commencement of works. Stakeholders in this strategy would include the Lake Macquarie City Mayor and Councillors, the Lake Macquarie Aquatic Services Committee, and Lake Macquarie Coastal Zone Management Committee. C2. All complaints are to be recorded on a complaints register and attended to promptly. C3. Notification is to be given to affected community members prior to the proposal taking place. Notification should be a minimum of 7 calendar days prior to the start of works. The notification is to include: o Details of the proposal o The duration of works and working hours. o Any changed traffic or access arrangements. o How to lodge a complaint or obtain more information. o Contact name and details of the project manager.
Landscape character and visual amenity	V1. Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.
Waste	M1. The laydown area would be maintained in a tidy condition at all times during the proposal. At the completion of the proposal, the laydown area would be re-instated to its former condition. M2. All wastewater from vessels is to be discharged at an approved vessel wastewater disposal facility. No vessel wastewater is to be discharged (i.e. pumped out) directly into the water or onto any land adjacent. M3. The volume of material dredged from the channel would be less than 30,000m^3 per year.

5.1 Licensing and approvals

Table 5-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
Fisheries Management Act 1994 (s199)	Notification to the Minister for Primary Industries prior to any dredging or reclamation works.	A minimum of 28 days prior to the start of work. DPI Fisheries were notified of the work on 24/10/22 and in May 2023.

Instrument	Requirement	Timing
Crown Land Management Act 2016 (Division 3.4, 5.5 and 5.6)	Lease or licence to occupy areas of Crown land.	Prior to start of the proposal.
Local Government Act 1993	Permit to use Council owned or managed land at Marks Point boat ramp carpark for the laydown and launching areas.	Prior to start of the proposal.
Marine Safety Act 1998 (S.18)	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. Approval from TfNSW Maritime Operations would be required	A minimum of 14 days prior to the start of the proposal. Approval has already been received and is included in Appendix C.

6. Bibliography

RHDHV. (2014). *Swansea Channel Dredging Review of Environmental Factors.*

NSW RMS. (2016). *NSW State Waters Marine Oil and Chemical Spill Contingency Plan.*

Umwelt. (2013) *Towards a Sustainable Framework for Navigation in Swansea Channel*.

7. Certification, review, and decision

7.1 Certification

This minor works REF 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.

Prepared by:

Signature

Name:	Lisa Proctor
Position:	Director
Company name:	Blue Sky Planning and Environment
Date:	26 May 2023

7.2 Environment staff review

The Minor Works REF has been reviewed and considered against the requirements of sections 5.5 and 5.7 of the EP&A Act.

In considering the proposal this assessment has examined and taken into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity as addressed in the Minor Works REF and associated information. This assessment is considered to be in accordance with the factors required to be considered under section 171 of the Environmental Planning and Assessment Regulation 2021.

The proposal described in the Minor Works REF will have some environmental impacts which can be ameliorated satisfactorily. Having regard to the safeguard and management measures proposed, this assessment has considered that these impacts are unlikely to be significant and therefore approval for the proposal does not need to be sought under Division 5.2 of the EP&A Act.

The assessment has considered the potential impacts of the activity on areas of outstanding value and on threatened species, ecological communities or their habitats for both terrestrial and aquatic species as defined by the *Biodiversity Conservation Act 2016* and the *Fisheries Management Act 1994*.

The proposal described in the Minor Works REF will not affect areas of outstanding value. The activity described in the Minor Works REF will not significantly affect threatened species ecological communities or their habitats. Therefore, a species impact statement is not required.

The assessment has also addressed the potential impacts on the activity on matters of national environmental significance and any impacts on the environment of Commonwealth land and concluded that there will be no significant impacts. Therefore, there is no need for a referral to be made to the Australian Government Department of Agriculture, Water and the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Minor Works REF is considered to meet all relevant requirements.

7.3 Environment staff recommendation

It is recommended that the proposal to undertake maintenance dredging of the Swansea navigation channel at Lake Macquarie as described in this Minor Works REF proceed subject to the implementation of all safeguards identified in the Minor Works REF and compliance with all other relevant statutory approvals, licences, permits and authorisations.

The Minor Works REF has examined and taken into account to the fullest extent possible all matters likely to affect the environment by reason of the activity and established that the activity is not likely to significantly affect the environment or threatened species, ecological communities or their habitats.

The Minor Works REF has concluded that there will be no significant impacts on matters of national environmental significance or any impacts on the environment of Commonwealth land.

The Minor Works REF determination will remain current for five years until June 2028 at which time it shall lapse if works have not been physically commenced..

Recommended by:

Signature 

Name: Renae Martin

Position: Environment and Sustainability Manager

Date: 19/06/2023

Noted by:

Signature 

Name: Dave Hopper

Position: Senior Officer Programs

Date: 19/06/2023

7.4 Determination

In accordance with the above recommendation, I certify that I have reviewed and endorsed the contents of this Minor Works REF, and to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under Section 170 of the EP&A Regulation, and the information is neither false nor misleading.

I determine that Transport for NSW may:

proceed with the activity

Signature Simon Walter

Name: Simon Walter

Position: Senior Manager Maritime Infrastructure Programs

Date: 19/06/2023

7.5 EP&A Regulation publication requirement

Table 7-1: EP&A Regulation publication requirement

Requirement		
Does this Minor Works REF need to be published under section 171(4) of the EP&A Regulation?	Yes ☒	No ☐

NSW GOVERNMENT

Appendix A: Proposal Plans

DREDGE CUT PROFILE

1:2.5 | 10m | DESIGN RL = -3.5mAHD 60m | 1:2.5 | 10m

Point	Easting	Northing
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3	373058.538	6341118.874
4	372979.749	6340933.172
5	373113.786	6340633.919
6	373164.014	6340376.997
7	372414.186	6341982.070
8	372833.566	6341490.068
9	372972.398	6341120.672
10	372892.479	6340932.306
11	373037.030	6340609.579
12	373085.500	6340361.648
13	371813.010	6341206.467
14	372387.126	6341041.401
15	372574.466	6340949.791
16	372781.190	6340796.911
17	372864.026	6340743.679
18	373006.877	6340676.898
19	371790.904	6341129.582
20	372358.282	6340966.453
21	372532.766	6340881.130
22	372735.732	6340731.029
23	372825.289	6340673.478
24	373044.579	6340570.963

REV	DATE	DESCRIPTION	CKD
A	04/04/2023	ORIGINAL ISSUE	SB

CLIENT: TRANSPORT FOR NSW

PROJECT

SWANSEA CHANNEL DREDGE PROGRAM

PROPOSED DREDGE BOUNDARY

HORZ. DATUM MGA56 (2020)
VERT. DATUM APPROX. AHD
ORIGIN OF LEVELS NETWORK RTK
SHEET 01 OF 01

0m 50m 100m 150m 200m
LENGTHS ARE IN METERS

SCALE 1:5000
NCS NUMBER 23029

SURVEYED	PH	05/04/2023
DRAFTED	PH	05/04/2023
CHECKED	SB	05/04/2023
APPROVED	PH	05/04/2023

DRAWING NUMBER NCS-001-01
REVISION A

NORTH COAST SURVEYS
Web: northcoastsurveys.com.au
Email: office@northcoastsurveys.com.au
Phone: (02) 6696 3758

CLIENT:	TRANSPORT FOR NSW	
A	06/04/2023	INITIAL RELEASE
REV	DATE	DESCRIPTION

PROJECT
SWANSEA DREGE PROGRAM

LAYDOWN AREA PLAN

NOTES

BOUNDARY OCCUPATIONS & IMPROVEMENTS ON OR NEAR BOUNDARIES HAVE NOT BEEN SHOWN ON THIS PLAN

THIS PLAN IS TO BE READ IN CONJUNCTION WITH A SITE INSPECTION

THESE NOTES MUST REMAIN AN INTEGRAL PART OF THE PLAN

THIS PLAN MY BE COLOUR CODED. BLACK & WHITE COPIES MAY NOT FULLY DISCLOSE THE INFORMATION HEREON

THIS PLAN HAS BEEN PREPARED FOR THE EXCLUSIVE USE OF THE CLIENT NAMED HEREON. NO RESPONSIBILITY IS TAKEN FOR ANY LOSS INCURRED BY ANY THIRD PARTY RESULTING FROM UNAUTHORISED USE OF THE PLAN

LEGEND

BOUNDARY (DCDB)

PROPOSED DREDGE LIMIT

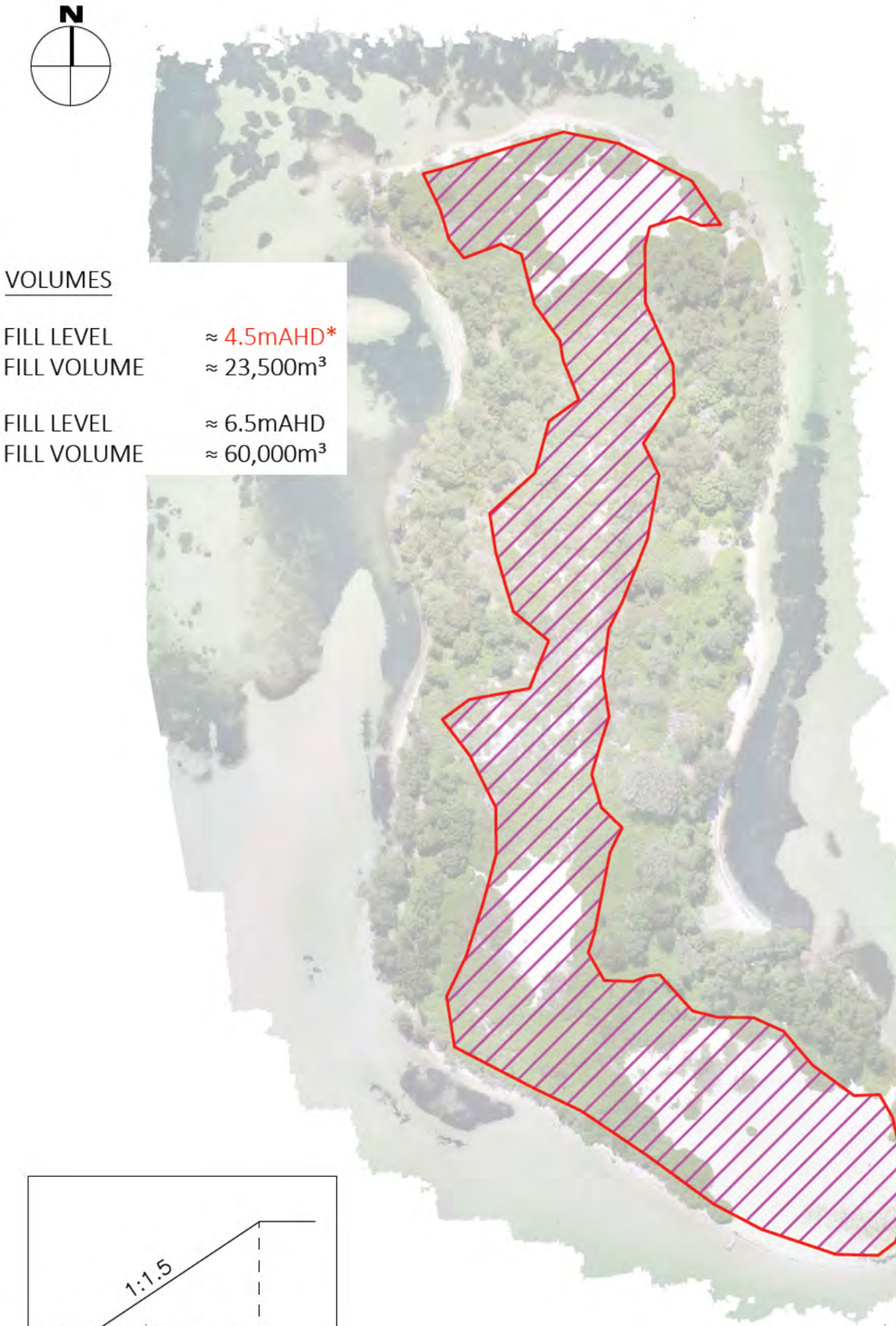
HORZ. DATUM	MGA56(2020)		
VERT. DATUM	N/A		
ORIGIN OF HEIGHTS			
SHEET 01 OF 01			
SCALE 1:750	SURVEYED	PH	06/04/2023
	DRAFTED	SB	06/04/2023
NCS NUMBER 23029	CHECKED	PH	06/04/2023
	APPROVED	PH	06/04/2023

0m 7.5m 15m 22.5m 30m

LENGTHS ARE IN METERS

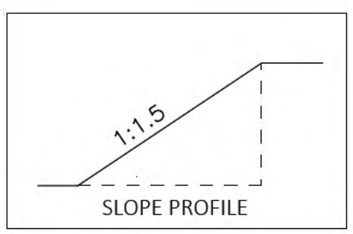
DRAWING NUMBER NCS-001-02 REVISION A

NORTH COAST SURVEYS
Web: northcoastsurveys.com.au
Email: office@northcoastsurveys.com.au
Phone: (02) 6696 3758

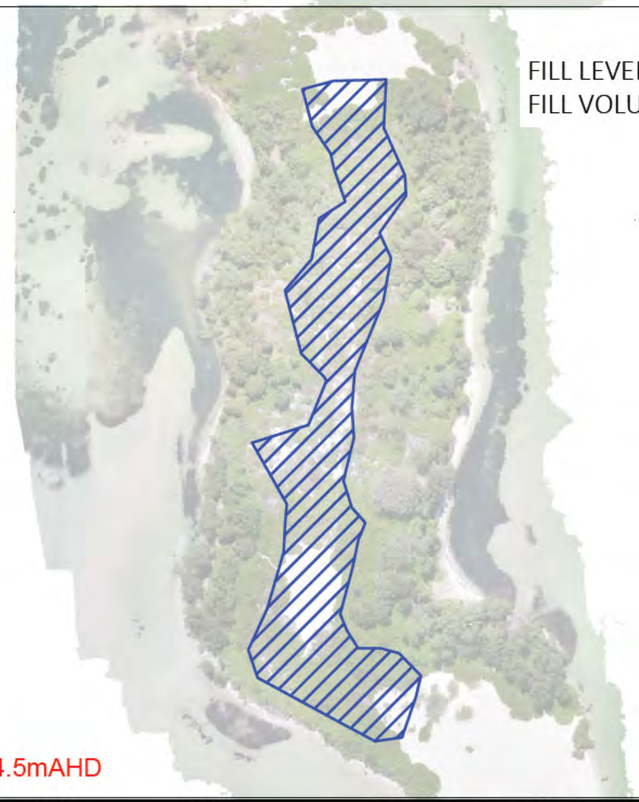


VOLUMES

FILL LEVEL	≈ 4.5mAHD*
FILL VOLUME	≈ 23,500m³
FILL LEVEL	≈ 6.5mAHD
FILL VOLUME	≈ 60,000m³



FILL LEVEL	≈ 6.5mAHD
FILL VOLUME	≈ 27,000m³



FILL LEVEL	≈ 4.5mAHD*
FILL VOLUME	≈ 13,800m³

* CURRENT LEVEL OF STOCKPILE AT HIGHEST POINT ≈ 4.5mAHD

NORTH COAST SURVEYS
Web: northcoastsurveys.com.au
Email: office@northcoastsurveys.com.au
Phone: (02) 6696 3758

REV	DATE	DESCRIPTION
1	02/04/2023	UPDATED VOLUMES
0	28/03/2023	ORIGINAL ISSUE

SCALE

NOT TO SCALE

CAUTION: THE ORIGINAL SCALE OF THIS DRAWING MAY HAVE BEEN ALTERED BY REDUCTION, ENLARGEMENT AND/OR PRINTING. THE SCALE SHOULD BE VERIFIED PRIOR TO TO USING THE DRAWING.

JOB No.	22029
SURVEYED BY	PH
CHECKED BY	SB
DATE OF SURVEY	15/03/2023
Vz DATUM	APPROX AHD
ORIGIN	NETWORK RTK
Hz DATUM	MGA56 (2020)

ORIGINAL SHEET SIZE A3

TITLE: PROPOSED DREDGE SPOIL LOCATIONS & VOLUMES

SITE: ELIZABETH ISLAND
LAKE MACQUARIE NSW 2283

CLIENT: TRANSPORT NSW

DWG No: 23029A.DWG SHEET 1 OF 1 REV 0

Appendix B: Aquatic Ecology Assessment

Aquatic Ecology Assessment

Swansea Channel Maintenance Dredging Project

Prepared For: Transport for NSW

Report Date: 6 June 2023

H2O Consulting Group Pty Ltd

E: info@h2oconsultinggroup.com.au | W: www.h2oconsultinggroup.com.au

H2O CONSULTING GROUP

H2O Consulting Group Pty Ltd

PO Box 3257, Erina NSW 2250
Email: info@h2oconsultinggroup.com.au
Web: https://h2oconsultinggroup.com.au
Ph: 0414 848 105

Document Details	
Report Title	Aquatic Ecology Assessment
Project Title	Swansea Channel Maintenance Dredging Project
Prepared For	Transport for NSW
Report Date	6 June 2023
Job Number	2110-4
Project Team	Dr David Cummings, Alex Swanson, Dr Will Macbeth and Corey Mead (Treehouse Ecology) and Alex Fraser (Fraser Ecological)

Document Control				
Version	Author	Reviewer	Approved by	Date
R0	Dr Will Macbeth Corey Mead	Dr David Cummings	David Cummings	03/11/22
R1	Dr David Cummings Alex Fraser	Alex Swanson	David Cummings	02/05/23
R2	Dr Will Macbeth Corey Mead, Alex Fraser	Alex Swanson	David Cummings	19/05/23
R3	Dr David Cummings	Corey Mead	David Cummings	06/06/23

Disclaimer:

The information provided in this document is based on knowledge, understanding and field observations at the time of review of associated materials and/or site survey. The report should be read and considered in its entirety including consideration of the limitations described in the report.

H2O Consulting Group Pty Ltd has completed this assessment in accordance with the relevant federal, state and local legislation. H2O Consulting Group Pty Ltd accepts no liability or responsibility for contents of this report in respect of any use of, or reliance upon, by any third party or for any use other than the purposes for which it was commissioned. Unauthorised use of this document is prohibited.

Cover Photo: Naru Beach, Marks Point, NSW

Executive Summary

H2O Consulting Group has been engaged by Transport for NSW (TfNSW), to prepare an Aquatic Ecology Assessment (AEA) for dredging activities in the main navigational channel of Swansea Channel, along with associated sand transfer for placement on Elizabeth Island. Swansea Channel is located just south of Newcastle on the Hunter Coast of NSW, within the Local Government Area of Lake Macquarie City Council.

The scope of this Aquatic Ecology Assessment (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. In addition, further description of the shoreline and onshore Plant Community Types on Elizabeth Island has been provided on the request of TfNSW.

The Dredging Site for the current 2023 project is located along a stretch of channel that extends between Pelican Beach (on the Main Channel) to the south and the points of connection between the Main and Airforce Channels and the lake to the north and north-west respectively (Figure 1). It is understood that its location and extent has been generally consistent through the annual maintenance dredging operations undertaken since completion of the initial large-scale dredging project, with the most recent dredging completed in early 2021.

This project proposes to remove an annual maximum of approximately 30,000 m^3 of channel-bed material – primarily clean marine sand – using a Cutter Suction Dredge or Dragflow operated from an Excavator and transfer the sand slurry via pipe directly from the Dredging Site to the onshore Sand Placement Site on Elizabeth Island, up to an overall total of 60,000 m^3 of material deposited (Figure 1). The dredging is designed to an approximate 60 m channel with 5 m batters each side at 1:2.5 slope and -3.5 m Australian Height Datum (AHD) depth (Appendix 1).

Works completed as part of this AEA, included a review of existing information and mapping, searches of threatened species databases for State and Commonwealth listed species of aquatic fauna and flora. Site investigations included an inspection of the site to characterise aquatic habitat including potential shorebird habitat, and mapping of estuarine macrophytes. In addition, vegetation communities on Elizabeth Island were inspected and verified by an accredited and experienced botanist.

In total 67 marine birds and shorebirds (including waders), nine marine mammals, five marine reptiles, nine sharks and rays and four fish, which are considered threatened and/or migratory species were identified to require further consideration. Site investigations also identified important shorebird habitat, including potential nesting habitat for the Endangered Little Tern to occur nearby and on Elizabeth Island, where sand is proposed to be placed. Protected seagrasses also occur in close proximity to the sand placement sites and proposed dredging.

Direct impacts from this maintenance dredging in the Swansea Channel will include removal of a quantity of seabed material – primarily clean marine sandy substrate – resulting in the loss of invertebrate infauna and possibly some sessile or slow-moving epibenthic invertebrates that inhabit that seabed material. The dredging is currently proposed to extend to the edge of the existing seagrass beds just off the western shore of Spoil Island. Dredging in such close proximity to those beds will have substantial risk for some physical disturbance and/or removal. Thus, ensuring avoidance of any seagrass from direct disturbance through dredging design modification to include a 10 m buffer will need to be adopted to adequately avoid any potential harm.

The maintenance dredging is also expected to result in short-term impacts on water quality in the form of elevated levels of turbidity, with associated mobilisation of seabed particulates and subsequent sedimentation in the vicinity of active dredging works (i.e. wider Study Area) during dredging activities. This introduces some potential for some minor and indirect, temporary physical disturbances to seagrass beds. Other potential disturbances to seagrass beds in shallow waters adjacent to the sand placement sites include crushing due to physical contact by the sand slurry transfer pipeline, and the risk of erosion of the sand piles and runoff of sediment-laden water onto those seagrass beds.

The seagrass beds vulnerable to disturbance by the proposed dredging and sand stockpiling operations provide important Key Fish Habitat for various species including protected Syngnathid fishes and potentially, the Endangered White's Seahorse. While these potential impacts may be of significance at small scales, they represent only a very small proportion of seagrass meadows within and beyond the Study Area and are not the preferred habitat of White's Seahorse, therefore they are of little concern at ecological scales of relevance to Lake Macquarie.

The sand placed on the islands adjacent to the Swansea Channel as a result of historical dredging spanning over 35 years has created desirable nesting opportunities for some beach nesting threatened shorebird species, on the dried open deposited sand surface. Due to the highly vegetated nature of these island in their natural state, they were unlikely suitable for such nesting prior to the commencement of dredging works. This habitat is also only temporary for a few years before Bitou Bush, Acacias and other colonising vegetation emerges over the deposited sand. Hence, suitability is also only maintained by the ongoing dredging works. Proposed and placement associated with the dredging works has potential for direct and indirect impacts on potential Little Tern breeding locations as well as potential Pied Oystercatcher breeding locations on and adjacent to previous sand placement areas. These impacts have potential to be both positive through improvement and creation of habitat, while also negative through disturbance during breeding and to the habitat for breeding that the sand provides. Given the potential significance of the site to breeding within the locality, by the Little Tern especially, avoidance of any works, including sand placement, on Elizabeth Island during breeding season will be required without the implementation of a suitable management plan with adequate controls to prevent any disturbance to breeding shorebirds.

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1 Background

1.1 Overview

H2O Consulting Group has been engaged by Transport for NSW (TfNSW), to prepare an Aquatic Ecology Assessment (AEA) for proposed dredging activities in the main navigational and a secondary channel of Swansea Channel, along with associated sand transfer to and stockpiling at a nearby onshore location (Elizabeth Island), near Swansea, NSW (the 'project') (Figure 1). The purpose of the proposed project is to continue the annual sequence of necessary maintenance dredging operations in the Swansea Channel following larger-scale dredging operations completed in 2015 (MPR 2014, RHDHV 2014). Broadly, the objective of this maintenance dredging project is to maintain the recreational amenity of Lake Macquarie, particularly relating to the safety and navigable accessibility of the main Swansea Channel.

This AEA represents an update of the original AEA prepared for the initial and anticipated subsequent annual maintenance dredging operations completed in past years (MPR 2014, RHDHV 2014). It will cover this campaign (i.e., annual dredging events of up to 30,000 m^3 of clean sand until the upper limit of sand disposal capacity at Elizabeth Island has been reached around 60,000 m^3 – refer to Section 1.3 below).

Updates in this AEA include more current threatened species searches and ecological mapping resources, including seagrasses present in areas in and around the Swansea Channel nearby the proposed dredging, sand transfer and sand storage activities. The project will be assessed under Part 5 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. In addition, further description of the shoreline and onshore Plant Community Types on Elizabeth Island has been provided on the request of TfNSW.

1.2 Locality and Sites

Swansea Channel is located just south of Newcastle on the Hunter Coast of NSW, within the Local Government Area of Lake Macquarie City Council (Figure 1). It comprises a main navigational channel (Main Channel) of approximately 5 km in length and numerous secondary channels, such as Airforce Channel (located between Elizabeth and Pelican Islands), that connect Lake Macquarie ('the lake'), a large estuarine waterbody of 114 km^2 in area, with the ocean (MPR 2014, NSW DPIE 2022).The specific site for proposed dredging operations ('Dredging Site') is a two-armed stretch of channel comprising a section of Main Channel and the entire Airforce Channel, located approximately 2,500 m upstream from the Swansea Bridge (Figure 2). The sand slurry extracted is proposed to be piped directly from the Dredging Site to an onshore sand stockpile site ('Sand Placement Site') located on Elizabeth Island, between 110 m and 850 m from various points along the Dredging Site (Figure 1). Where appropriate, the collective total area within the boundaries of these two sites is referred to as the 'Project Area' in this AEA.

A laydown area would be established in the Marks Point Boat Ramp, which is an area managed by Lake Macquarie Council. Pipe racks and a storage container would be located within the laydown area. The laydown area would be approximately 6 x 20 m in size. No site office would be required, and no earthworks

would be required to establish the laydown area. This area is a disturbed hard stand area that is free from vegetation and potential habitat and has not been included for assessment in this AEA.

1.3 Description of the Proposal

While the maintenance dredging operations proposed as part of this project generally follow the long-term scope of the annual maintenance dredging program schedule outlined in the 2014 Review of Environmental Factors (original REF) associated with the initial large-scale dredging operations (RHDHV 2014), they more specifically align with the new, updated scope specified in the current 2023 Review of Environmental Factors (current REF) that is in preparation (TfNSW 2023). The Dredging Site for the current 2023 project is located along a stretch of channel that extends between Pelican Beach (on the Main Channel) to the south and the points of connection between the Main and Airforce Channels and the lake to the north and north-west respectively (Figure 1). Notably, the area extent of the Dredging Site is substantially smaller than the extent of dredging proposed for the initial dredging operations completed in 2015 (RHDHV, 2014). It is understood that its location and extent has been generally consistent through the annual maintenance dredging operations undertaken since completion of the initial large-scale dredging project, with the most recent dredging completed in early 2021.

This project proposes to remove an annual maximum of approximately 30,000 m^3 of channel-bed material – primarily clean marine sand – using a Cutter Suction Dredge or Dragflow operated from an Excavator and transfer the sand slurry via pipe directly from the Dredging Site to the onshore Sand Placement Site on Elizabeth Island, up to an overall total of 60,000 m^3 of material deposited (Figure 1). The dredging is designed to an approximate 60 m channel with 5 m batters each side at 1:2.5 slope and -3.5 m Australian Height Datum (AHD) depth (Appendix 1).

It is proposed to place sand in areas on Elizabeth Island, which have been used for sand placement previously, are subsequently highly disturbed and dominated by the invasive *Bitou Bush.* This is considered a beneficial use of the sand to control the Bitou Bush and enhance breeding habitat for shorebirds. The proposal does not include for any direct disturbance through placement of sand on native vegetation communities that have established on Elizabeth Island.

1.4 Background Information

Lake Macquarie is a marine-dominated barrier estuary classed as a lake, with Swansea Channel being the permanently open, trained entrance connecting the lake with the ocean (NSW DPIE, 2022). The estuary is Australia's largest coastal saltwater lake with an average depth of ~5.7 m, a volume of ~646,274 ML, water surface area coverage of ~114 km^2 and total catchment area of ~604 km^2. It has complex estuary hydrodynamic processes and responses and supports a wide diversity of habitat types such as seagrasses, mangroves, saltmarsh, sand and mud flats, and large areas of deep open waters (LMCC 2015, NSW DPIE 2020a, NSW DPE 2022). The 5-km long Swansea Channel, the substrate of which being mostly comprised of clean marine sands, provides the only avenue for tidal flushing between Lake Macquarie and the ocean. The width of the channel ranges between 100 and 400 m wide, while the maximum cross-sectional depths across the width of the channel mostly ranges between 2 and 5 m, up to 8 m under the main road bridge (MPR, 2014). Tidal water velocities in the Swansea Channel can reach up to 2 m/s^{-1}.

Lake Macquarie is a valuable asset of the Marine Estate of New South Wales and provides social, environmental and economic benefits to the local community and the state of NSW (NSW DPIE 2020a). The Lake Macquarie catchment comprises residential, industrial, rural and natural areas, with the foreshore is a highly valued cultural landscape with locally and regionally significant recreational heritage values (LMCC 2015). There has been increasing demand for land and water based recreational opportunities around the lake, providing for local residents and also for visitors from elsewhere in the Hunter, Central

Coast regions and Sydney, so Lake Macquarie is considered a highly significant recreational waterway in NSW.

The Aquatic Ecology Assessment prepared by MPR (2014) as part of the large-scale dredging campaign proposal and, by extension, future smaller-scale maintenance dredging operations including the current proposal, provides a brief review of some of the background literature relevant to this current AEA. Specifically, MPR (2014) cited an estuary processes study (AWACS 1995), estuary management study (WBM 1996), and overviews of estuarine habitats (Carter 1995) and the general ecology (LMCC 2015, 2020) of Lake Macquarie. Citing reports by Nichols (1999) and Eyre (2005), MPR (2014) provided a summary of the improvement in water quality – specifically the beneficial decreases in nutrient (nitrate and phosphate) concentrations – from 1994 to 2005. The low nutrient levels were reflected in the low level of phytoplankton chlorophyll a in the lake by 2005, which was found (at that time) to not exceed the ANZECC (2000) guidelines for protection of aquatic life. The more recently published 'State of the Estuary' report (NSW DPIE 2020a – see details below) provides a comprehensive overview of the suite of threats to water quality and ecosystems in Lake Macquarie, including eutrophication.

Swansea Channel has been subject to dredging since 1939 and associated sand stockpiling and disposal around the channel, including the formation of several islands (RHDHV 2014). A series of studies have been undertaken in more recent times to investigate dredging options for the entrance channel and to detail possible environmental impacts and impact mitigation measures for dredging (WMB 2002a, 2002b, 2004, 2005) and Umwelt (2013a, 2013b). These reports have included seagrass distribution mapping plus benthos (fauna of seabed sediments) and sediment contamination surveys (see also Roberts et al 2000 and Roberts 2005). The management of the channel over the past decade has required repeated dredging campaigns and various works, such as partial closure of the southern entrance to Swan Bay, to address issues with navigation and foreshore erosion (Haines et al 2015).

The clean marine sands typical of the channel substrate to be dredged were found to support a narrower species diversity (~25%) and lower overall abundance (<10%) of benthic infauna than substrate sampled from the entrances to Swan Bay (WBM 2005, MPR 2014). Similarly, fish surveys done as part of the AWACS (1995) study tallied very few resident fish in the relatively barren channel section to be dredged, with resident fish mainly confined to the few sections of rock rubble reef along the shorelines and other, more diverse and complex habitats along the fringes of the main channel. It was also noted that the relatively wide diversity of fish species recorded in and around the Swansea Channel compared to the rest of Lake Macquarie would be expected given that all fish and larvae movement between the lake and ocean is via the channel. Finally, MPR (2014) emphasised the importance of Swansea Channel as a thoroughfare for fish larvae that settle onto the seagrass habitat in the lake and subsequently recruit into recreational fisheries of Lake Macquarie.

More recently, NSW DPIE (2020a) published an extensive 'State of the Estuary' overview of a number of research projects concerning Lake Macquarie that have been done over the past decade. The lake and catchment were assessed in the context of the high-risk threats to the environmental values and benefits of the bioregion including Lake Macquarie, as identified via the NSW Marine Estate Management Authority's (MEMA) Threat and Risk Assessment framework (NSW DPIE 2020a). The main threats identified were catchment inputs (stormwater discharges, eutrophication and suspended sediments, and associated potential for seagrass losses); industrial pollution (legacy contamination of sediments by heavy metal inputs, thermal discharges on seagrass beds); foreshore development and recreational use (foreshore urbanisation and shoreline development, reclamation of wetlands for urban/recreational development, stormwater input and vessel impacts on seagrass communities); and impacts from climate change (sea level rise and associated loss of wetlands, increased frequency of storm events and short-term flooding of low-lying areas, water temperature and pH increase). A major priority action identified for foreshore/

nearshore areas can be inferred as being protecting seagrass beds from disturbances associated with developing and maintaining maritime infrastructure and accessibility (NSW DPIE, 2020a). Further, Seagrasses are sensitive ecological receptors to environmental conditions and, as such, occupy a narrow depth band in shallow areas of estuaries where suitable sediment composition occurs, coastal processes allow their establishment, and available light is adequate (Waycott *et al.* 2014).

Detailed Estuarine Mapping of Swansea Channel done by NSW DPI (2022a) shows significant areas of *Zostera* sp. seagrass beds and mangrove stands, along with some smaller areas of *Posidonia australis* and saltmarsh communities, in the vicinity (i.e., within ~50 m) of the Project Area (Appendix 3, Item 1; and refer to Section 3.1.2). There is also a significant *Posidonia australis* meadow present in Swan Bay, nearby but outside the Project Area. *P. australis*, which is widespread around the lake, is listed as an Endangered Population in Lake Macquarie under the *Fisheries Management Act 1994* (FM Act) (NSW DPI 2012) and has also been listed in 2015 as an Endangered Ecological Community (EEC) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). These *P. australis* and other seagrass beds are highly likely to provide habitat for threatened species such as the Endangered White's Seahorse (*Hippocampus whitei*) (NSW DPI 2019). Transient species of marine mammals (e.g., dolphins and fur-seals), marine reptiles (e.g., sea turtles), sharks and fish have also been known to traverse through Swansea Channel and utilise Lake Macquarie waters at times (Dinneen 2012, McMurray 2015, Lee 2020, NSW NPWS 2022).

Mapping as part of the Resilience and Hazards SEPP indicates the waters of Lake Macquarie and Swansea Channel to be part of the Coastal Environment Area (Appendix 3, Item 2). There are areas of Coastal Wetlands (mangroves and saltmarsh) present along the eastern foreshore of the Main Channel, with the associated Proximity Area overlapping the Dredging Site (refer to Section 3.1.2). There is also an area of Coastal Wetlands associated with Pelican Island to the south-west of the Dredging Site, but there is no overlap of its Proximity Area with the Project Area.

Currently no commercial fisheries operate in Lake Macquarie, nor are there any aquaculture leases or designated Aquaculture Strategy Areas (NSW DPI 2022a). Lake Macquarie was declared a Recreational Fishing Haven in 2002 and is an extremely popular destination for recreational anglers around the region and beyond.

With consideration to local wading and sea birds in particular, the state Endangered Little Tern has been identified as having nested recently on the dredged sand from previous works. Two pairs of this species were recorded nesting on the dredged sand on Elizabeth Island over the 2021/22 breeding period (i.e., October to February), and observations suggesting interest in nesting have also been observed on Spoil Island at that time and at the commencement of dredging in 2010. Nesting attempts may have also occurred in other non-surveyed years since the commencement of dredging in the Study Area (D. Edmonds 2022, pers. comm. 29 September). Historical records sourced prior to dredging only indicate breeding activity by four (4) pairs near Pelican Point at the entrance to Lake Macquarie during the 1959/60 breeding period (Morris 1980).

The state Endangered Pied Oystercatcher has also been recorded as being present within the vicinity of the Project Area and has potential to utilise the same exposed sand surface of dredged sand for nesting. Some wading birds, including threatened and protected migratory species, may also utilise the intertidal zone and areas just above or below this zone for seasonal foraging value. Such foraging habitat for these species is otherwise well represented elsewhere in the immediate locality.

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*

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 fr 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 the Environment Agency Head can include on the BV Map include the following:

- Coastal wetlands and littoral rainforest mapped under the State Environmental Planning Policy - Resilience and Hazards SEPP 2021.
- Core koala habitat identified in a plan of management under State Environmental Planning Policy Koala SEPP 2021.
- Declared Ramsar wetlands defined by the Environment Protection and Biodiversity Conservation Act 1999.
- Land containing threatened species or threatened ecological communities identified as having potential for serious and irreversible impacts (SAII) under section 6.5 of the BC Act.
- Protected riparian land.
- High conservation-value grasslands or groundcover.

- Old growth forest identified in mapping developed under the National Forests Policy Statement but excluding areas not meeting the criteria published jointly by the Minister for the Environment and the Minister for Primary Industries.
- Rainforest identified in mapping developed under the National Forests Policy Statement but excluding areas not meeting the criteria published jointly by the Minister for the Environment and the Minister for Primary Industries.
- Declared areas of outstanding biodiversity value.
- Council-nominated areas with connectivity or threatened species habitat that the Minister for the Environment considers will conserve biodiversity at bioregional or state scale.
- Land that, in the opinion of the Environment Agency Head, is of sufficient biodiversity value to be included.

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. Appropriate Assessments of Significance have been undertaken in Section 4.5 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 Section 5.1 of the EP&A Act, there is a duty for determining authority to consider the environmental impacts of proposed activities. The specific aspects of these environmental considerations are detailed in Clause 228 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation). Under section 5.1 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 original REF (RHDHV 2014) associated with the long-term scope of the annual maintenance dredging program schedule, along with the current REF (TfNSW2023) prepared for the proposed project, collectively fulfil these requirements in terms of the currently proposed maintenance 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 State Environmental Planning Policy (Coastal Management) 2018, 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.

Resilience and Hazards SEPP 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.

Clause 2.7 of the SEPP, which states that development on land in coastal wetlands 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.

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 Environment (DoE).

The EPBC Act identifies and categorises matters of national environmental significance (MNES) as the following:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- Nuclear actions (including uranium mining)
- The Great Barrier Reef Marine Park
- A water resource, in relation to coal seam gas development and large coal mining development.

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: 1) dredging to maintain existing navigational channels would not normally be expected to have a significant impact on the environment where the activity is undertaken as part of normal operations; and 2) the disposal of spoil 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 EPA is made the regulatory authority for:

- activities listed in Schedule 1 to the Act and the premises where they are carried out;
- activities carried out by a State or public authority; and
- other activities in relation to which a licence regulating water pollution is issued.

The POEO Act provides for the provision of and conditioning of activities requiring environmental protection licensing. Scheduled activities as listed under Schedule 1 of the Act require an Environmental Protection License (EPL) from the EPA, unless clauses in Schedule 1 specify otherwise. No more than 30,000 m^3 p.a. will be removed by dredging activities done as part of this project, so an EPL will not be required.

Any removal of material undertaken as part of these proposed dredging works will require further consideration in regard to waste classification, Acid Sulphate Soil (ASS) risk, and the potential direct and indirect ecological consequences these items may have on the environment.

1.6 Assessment Objectives

The objectives of this assessment are to:

- Identify any potential impacts from the proposed project 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) or equivalent document and identify any additional permitting and approval requirements under the FM Act, including any requirements for an SIS.

Figure 1: Location of the Project Area with proposed Dredging Sites and Sand Placement Sites

2 Methodology and Approach

2.1 Desktop Review

2.1.1 Threatened Species Searches

Relevant databases were searched during September 2022, applying a 5 km radius around the Project 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)
- Atlas of Living Australia - Selected species
- Birdata (Birdlife Australia)
- eBird (The Cornell Lab of Ornithology)
- NSW DPI Fisheries Threatened species lists (NSW DPI 2022b)
- EPBC Act Protected Matters Report tool

2.1.2 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, and Coastal Management SEPP layers.
- Biodiversity Values Map and Threshold Tool – Biodiversity values.
- Spatial Information Exchange (aerial photography analysis)
- Google Earth Pro (aerial photography analysis of historical imagery)

In addition to the above Nearmap aerial imagery was also used.

A review of the potential environmental constraints identified via these maps was undertaken.

The Lake Macquarie Vegetation (2022) mapping was also reviewed.

2.2 Site Investigations

Site surveys of the Dredging Site and Sand Placement Site, and surrounding terrestrial, benthic and aquatic habitats in the vicinity of those sites (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 Dredging Site and Sand Placement Site;
- Description of intertidal flora and fauna present;
- Description of subtidal flora and fauna present in shallow areas at low tide;
- Diurnal census survey of birds (shorebirds, wading birds and terrestrial species) 19/9/22; and
- Verification and mapping of macrophytes (e.g. seagrasses).

Fauna survey effort included 2 hours: 15 minutes (09:30 – 11:35) of diurnal observations within the entire study area. Weather conditions at this time included 7-3/8 cloud, light NW wind 0-5kts, no rain, at 16-20°C.

2.3 Mapping

2.3.1 Habitat

Mapping works focused on estuarine macrophytes within the Study Area (i.e., within 50 m of the Dredging Site and Sand Placement Site). Habitat maps and recent aerial imagery were verified *in situ* with visual observations aided by an underwater towed camera system that provided real-time imagery of the seabed in subtidal areas. Mapping data were collected *in situ* using a specialised data-form collection application with GPS integration for benthic mapping. Data were then imported into GIS-based mapping software, which created shapefiles and polygons based on interpretation of the following data sources:

- Previous seagrass mapping data (NSW DPI Fisheries Spatial Portal)
- *In situ* estuarine mapping data
- Aerial imagery

For seagrass habitat, densities were estimated using categories for each seagrass species present, as per King and Barclay (1986) (See Table 1).

Table 1: Seagrass categories for density and patchiness developed from King and Barclay 1986.

Density	
Low	Sparse growth: up to 15% cover
Medium	Moderate growth: 15 – 50% cover
High	Abundant growth: greater than 50% cover

In addition to mapping of aquatic macrophytes and habitats, an experienced Botanist and accredited Biodiversity Assessor undertook a field survey to verify and update existing mapping. This included collection of rapid data points to assist in verify and updating vegetation types.

2.4 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 outlines in Table 2. Once the likelihood of occurrence has been established, the likelihood of impact (none, unlikely, possible or likely), which considered the occurrence and proposed action itself is assigned to each species. Those species with a moderate of higher likelihood of occurrence and possible likelihood or higher of being impacted will trigger further assessment through the 5 / 7 Part Test and/ or Impact Assessment criteria processes.

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.

2.5 Limitations

This impact assessment is limited to aquatic flora and fauna (including marine birds and shorebirds). Additional habitat descriptions of terrestrial/shoreline vegetation communities have been provided and general recommendations provided. However, this assessment does not include for detailed impact assessment of terrestrial biodiversity values.

Fauna surveys included an assessment of aquatic habitat values present within the Study Area and was limited to observations of seasonal species present at the time of survey. Habitat assessments are conservative, defaulting to assume presence where there is insufficient knowledge to determine otherwise.

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).

The density and coverage of seagrass will change seasonally and/or in response to weather events. Weather events that result in high levels of sediment mobilisation and subsequent sedimentation may smother and cover shorter seagrasses such as *Halophila* and turfing *Zostera* beds. Seagrass, especially *Halophila,* may increase in coverage during summer months and retract in coverage and density during winter months.

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.

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 14 items listings under the BC Act within a 5 km radius of the Project Area (Figure 2). These included:

- 11 threatened marine birds and/or shorebirds,
- 1 threatened marine mammal; and
- 3 threatened marine reptiles.

Specific to the state endangered Little Tern, known to nest on sand placement sites within the Project Area in recent years, additional database searches were undertaken to source any otherwise recorded nesting observations. Birdata (Birdlife Australia) and eBird (The Cornell Lab of Ornithology) recordings of this species are shown (Appendix 2).

In addition, three shark species and three species of fish listed under the FM Act may also occur within 5 km of the Project Area.

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 5 km radius of the Project Area (Appendix 2):

- 87 listed threatened species;
- 73 listed migratory species; and
- 6 Threatened Ecological Communities (TEC).

In addition to the above, the EPBC Protected Matters Report Search identified 108 protected marine species that include certain species of fish, along with some marine birds, reptiles and mammals. A total of 13 marine mammals were identified as part of protected listings for cetaceans (Appendix 2).

Of the Commonwealth listed threatened and/or migratory species, the following were identified for consideration as part of this assessment:

- 36 marine birds and shorebirds,
- 9 marine mammals,
- 5 marine turtles,
- 9 sharks and rays,
- 4 fish; and
- 1 TEC.

In total 67 marine birds and shorebirds (including waders), 9 marine mammals, 5 marine reptiles, 9 sharks and rays, and 4 fish considered threatened and/or migratory species were identified to require further consideration. A summary of all threatened and migratory species considered as part of this assessment, along with consideration of their likelihood of occurrence within the Study Area and potential to be impacted, is provided in Table 3.

Table 3: Threatened and migratory species identified from searches. Species in bold type have been considered further in subsequent sections as part of this assessment.

Scientific Name	Common Name	BC/FM Acts	EPBC Acts	Sightings Bionet	Likelihood of Occurrence	Possibility of Impact
Marine Birds and Shorebirds						
Actitis hypoleucos	Common Sandpiper	P	C,J,K		Low	Unlikely
Anous stolidus	Common Noddy	P	C,J		Low	Unlikely
Apus pacificus	Fork-tailed Swift	P	C,J,K		Low	Unlikely
Ardenna carneipes	Flesh-footed Shearwater, Fleshy-footed Shearwater	V,P	J,K		Low	Unlikely
Ardenna grisea	Sooty Shearwater	P	J		Low	Unlikely
Ardenna pacifica	Wedge-tailed Shearwater	P	J	1	Moderate	Unlikely
Ardenna tenuirostris	Short-tailed Shearwater	P	C,J,K	2	Moderate	Unlikely
Arenaria interpres	Ruddy Turnstone	P	C,J,K		Moderate	Unlikely
Botaurus poiciloptilus	Australasian Bittern	E,P	E		Unlikely	Unlikely
Burhinus grallarius	Bush Stone-curlew	E,P		1	Low	Unlikely
Calidris acuminata	Sharp-tailed Sandpiper	P	C,J,K		Moderate	Unlikely
Calidris canutus	Red Knot, Knot	P	E,C,J,K, B		Moderate	Unlikely
Calidris ferruginea	Curlew Sandpiper	E,P	CE,C,J,K ,B		Moderate	Unlikely
Calidris melanotos	Pectoral Sandpiper	P	J,K		Low	Unlikely
Calidris ruficollis	Red-necked Stint	P	C,J,K		Moderate	Unlikely
Calonectris leucomelas	Streaked Shearwater	P	C,J,K		Low	Unlikely
Charadrius bicinctus	Double-banded Plover	P	B		Low	Unlikely
Charadrius leschenaultii	Greater Sand Plover, Large Sand Plover	P	V,B,C,J, K		Low	Unlikely
Charadrius mongolus	Lesser Sand Plover, Mongolian Plover	P	C,J,K		Moderate	Unlikely
Diomedea antipodensis	Antipodean Albatross	V,P	V,B		Low	Unlikely
Diomedea antipodensis gibsoni	Gibson's Albatross	V,P	V		Low	Unlikely
Diomedea epomophora	Southern Royal Albatross	P	V,B		Low	Unlikely
Diomedea exulans	Wandering Albatross	E,P	V,B		Low	Unlikely
Diomedea sanfordi	Northern Royal Albatross	P	E,B		Low	Unlikely
Erythrotriorchis radiatus	Red Goshawk	CE,P	V		Low	Unlikely
Falco hypoleucos	Grey Falcon	E,P	V		Low	Unlikely
Fregata ariel	Lesser Frigatebird, Least Frigatebird	P	C,J,K		Low	Unlikely
Fregata minor	Great Frigatebird, Greater Frigatebird	P	C,J		Low	Unlikely
Fregetta grallaria grallaria	White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian)	P	V		Low	Unlikely
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	P	B,J,K		Low	Unlikely
Haematopus longirostris	**Pied Oystercatcher**	**E,P**		**1**	**Known**	**Possible**
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P		6	Known	Unlikely

Scientific Name	Common Name	BC/FM Acts	EPBC Acts	Sightings Bionet	Likelihood of Occurrence	Possibility of Impact
Hirundapus caudacutus	White-throated Needletail	P	V,C,J,K	1	High	Unlikely
Lathamus discolor	Swift Parrot	E,P	CE	10	Moderate	Unlikely
Limicola falcinellus	Broad-billed Sandpiper	V,P	C,J,K		Low	Unlikely
Limosa lapponica	Bar-tailed Godwit	P	C,J,K	1	High	Unlikely
Limosa lapponica baueri	Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit	P	V		Low	Unlikely
Macronectes giganteus	Southern Giant-Petrel, Southern Giant Petrel	E,P	E,B		Low	Unlikely
Macronectes halli	Northern Giant Petrel	V,P	V,B		Low	Unlikely
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	P	CE,B,C,J ,K	2	High	Unlikely
Numenius phaeopus	Whimbrel	P	B,C,J,K		Moderate	Unlikely
Pachyptila turtur subantarctica	Fairy Prion (southern)	P	V		Low	Unlikely
Pandion cristatus	Eastern Osprey	V,P	B	8	Known	Unlikely
Phaethon lepturus	White-tailed Tropicbird	P	C,J		Low	Unlikely
Phoebetria fusca	Sooty Albatross	V,P	V,B		Low	Unlikely
Pluvialis fulva	Pacific Golden Plover	P	C,J,K		Moderate	Unlikely
Pterodroma leucoptera leucoptera	Gould's Petrel, Australian Gould's Petrel	V,P	E		Low	Unlikely
Pterodroma neglecta neglecta	Kermadec Petrel (western)	V,P	V		Low	Unlikely
Rostratula australis	Australian Painted Snipe	E,P	E		Low	Unlikely
Sterna hirundo	Common tern	P	C,J.K		Known	Unlikely
Sternula albifrons	**Little Tern**	**E,P**	**B,C,J,K**		**High**	**Likely**
Sternula nereis nereis	Australian Fairy Tern	P	V		Low	Unlikely
Thalassarche bulleri	Buller's Albatross, Pacific Albatross	P	V,B		Low	Unlikely
Thalassarche bulleri platei	Northern Buller's Albatross, Pacific Albatross	P	V		Low	Unlikely
Thalassarche carteri	Indian Yellow-nosed Albatross	P	V,C,J,K, B		Low	Unlikely
Thalassarche cauta	Shy Albatross	V,P	E,B		Low	Unlikely
Thalassarche eremita	Chatham Albatross	P	E,B		Low	Unlikely
Thalassarche impavida	Campbell Albatross, Campbell Black-browed Albatross	P	V,B		Low	Unlikely
Thalassarche melanophris	Black-browed Albatross	V,P	V,B		Low	Unlikely
Thalassarche salvini	Salvin's Albatross	V,P	V,B		Low	Unlikely
Thalassarche steadi	White-capped Albatross	P	V,B		Low	Unlikely
Thalasseus bergii	Crested Tern	P	J	7	Known	Unlikely
Tringa brevipes	Grey-tailed Tattler	P	B,C,J,K		Moderate	Unlikely
Tringa nebularia	Common Greenshank, Greenshank	P	C,J,K		Moderate	Unlikely
Tringa stagnatilis	Marsh Sandpiper, Little Greenshank	P	C,J,K		Low	Unlikely
Marine Mammals						

Scientific Name	Common Name	BC/FM Acts	EPBC Acts	Sightings Bionet	Likelihood of Occurrence	Possibility of Impact
Balaenoptera edeni	Bryde's Whale	P	B		Low	Unlikely
Balaenoptera musculus	Blue Whale	E,P	E,B		Low	Unlikely
Caperea marginata	Pygmy Right Whale	P	B		Low	Unlikely
Dugong dugon	Dugong	E,P	B	1	Low	Unlikely
Eubalaena australis	Southern Right Whale	E,P	E,B		Low	Unlikely
Lagenorhynchus obscurus	Dusky Dolphin	P	B		Low	Unlikely
Megaptera novaeangliae	Humpback Whale	V,P	V,B		Low	Unlikely
Orcinus orca	Killer Whale, Orca	P	B		Low	Unlikely
Sousa sahulensis	Australian Humpback Dolphin	P	B		Low	Unlikely
Marine Reptiles						
Caretta caretta	Loggerhead Turtle	E,P	E,B	3	High	Unlikely
Chelonia mydas	Green Turtle	V,P	V,B	15	High	Unlikely
Dermochelys coriacea	Leatherback Turtle	E,P	E,B		Low	Unlikely
Eretmochelys imbricata	Hawksbill Turtle	V,P	V,B	1	Moderate	Unlikely
Natator depressus	Flatback Turtle	P	V, B		Low	Unlikely
Sharks and Rays						
Carcharhinus longimanus	Oceanic Whitetip Shark	P	B		Unlikely	Unlikely
Carcharias taurus (east coast population)	Grey Nurse Shark (east coast population)	CE,P	CE		Low	Unlikely
Carcharodon carcharias	White Shark, Great White Shark	V,P	V,B		High	Unlikely
Galeorhinus galeus	School Shark		CD		Low	Unlikely
Lamna nasus	Porbeagle, Mackerel Shark	P	B		Low	Unlikely
Mobula alfredi	Reef Manta Ray, Coastal Manta Ray	P	B		Low	Unlikely
Mobula birostris	Giant Manta Ray	P	B		Low	Unlikely
Rhincodon typus	Whale Shark	P	V,B		Low	Unlikely
Sphyrna lewini	Scalloped Hammerhead	E			Low	Unlikely
Fish						
Epinephelus daemelii	Black Rockcod, Black Cod, Saddled Rockcod	V,P	V		Low	Unlikely
Hippocampus whitei	**White's Seahorse, Crowned Seahorse, Sydney Seahorse**	**E**	**E**		**Moderate**	**Possible**
Seriolella brama	Blue Warehou		CD		Low	Unlikely
Thunnus maccoyii	Southern Bluefin Tuna	E	CE		Low	Unlikely

CD = Conservation Dependent, P = Protected, V = Vulnerable, E Endangered, CE = Critically Endangered, C = Migratory listed species under CAMBA, J = Migratory species under JAMBA, K = Migratory species under ROKAMBA, B = Migratory species under Bonn Agreement, M = Marine Species, CT = Cetacean.

Figure 2: Map showing threatened and migratory species sightings from Bionet

3.1.2 Existing Ecological Mapping and Aerial Imagery

Detailed mapping of Estuarine Macrophytes in and around Swansea Channel done by NSW DPI (2022a) shows significant areas of *Zostera* sp. seagrass beds, along with some mangrove stands and saltmarsh communities, within the Study Area but outside the Project Area (Appendix 3, Item 1; Figure 1). Notably, the NSW DPI mapping indicates that there is no seagrass present within the boundaries of the Dredging Site, although the pathway of the dredging track (Figure 1) will come close to some isolated patches of *Zostera*, specifically in the shallow water (<2 m) along the eastern fringes of the main channel, adjacent to Spoil Island (Figure 1). The NSW DPI mapping also indicates that there are some patches of *Zostera* sp. seagrass beds located immediately adjacent to the Elizabeth Island shoreline (but not the onshore Sand Placement Site boundary *per se*) around most of the island, although there are some small *Zostera* patches off the south-western shore immediately adjacent to the Sand Placement Site boundary (Appendix 3, Item 1; Figure 1).

NSW DPI mapping indicates that there is a significant *P. australis* meadow present in Swan Bay – a body of water to the east of the Dredging Site and connected to the Main Channel at two connecting-channel points (Appendix 1), although the edge of this large meadow is at least 250 m away from the Dredging Site and well outside the Study Area (Appendix 3, Item 1; Figure 1). Notably, however, the mapping indicates a relatively smaller, but significant *P. australis* bed located within the Study Area on the southern side of the northern Swan Bay connecting-channel point, ~30 m away from the eastern boundary of the Dredging Site along the Main Channel. There is also some smaller, but significant *P. australis* bed mapped within the Study Area ~30 m from the southern edge of the Airforce Channel section of the Dredging Site (Appendix 3, Item 1; Figure 1). As mentioned above, *P. australis* is listed as an Endangered Population in Lake Macquarie under the FM Act (NSW DPI 2012) and has also been listed in 2015 as an EEC under the EPBC Act.

Estuarine macrophyte mapping by NSW DPI (2022a) identified areas of mangroves and mixed mangrove/saltmarsh present along the southern foreshore bounding the southern entrance channel to Swan Bay (Appendix 3, Item 1; Figure 1). These areas coincide with an area of Coastal Wetlands mapped over the same location as part of the Resilience and Hazards SEPP 2021. The associated Proximity Area to that Coastal Wetlands area (200 m radius around the area) (Appendix 3, Item 2; Figure 1) overlaps sections of the Project Area where some dredging may be required, however this overlap is confined to waters within the established navigational channel (Appendix 1).

The entirety of tidal areas inside the Study Area are identified as Key Fish Habitat – Central Rivers (Appendix 3, Item 3). Key Fish Habitat adjacent to or nearby (i.e., within 100 m) the boundaries of the Dredging Site and Sand Placement Site includes some Type 1 – Highly sensitive key fish habitat based on the presence of seagrass beds covering an area of greater than 5 m^2, with the remainder, including the entirety of the area within the Dredging Site boundary, classed as Type 2 – Moderately sensitive key fish habitat due to the stable sands (Fairfull 2013).

There are no Marine Protected Areas (MPAs) near the Study Area, with the nearest being the Port Stephens Great Lakes Marine Park, ~50 km north from the mouth of Swansea Channel (NSW DPI 2022a).

Currently no commercial fisheries operate in Lake Macquarie, nor are there any aquaculture leases or designated Aquaculture Strategy Areas (NSW DPI 2022a).

Lake Macquarie vegetation mapping (2022) and Lake Macquarie vegetation community profiles (Bell 2016) indicates that Elizabeth Island may include the following Plant Community Types (PCT) and communities (Appendix 3, Item 4):

- Coastal Sand Swamp Forest (PCT 1653) – 'Coast Tea Tree – Coast Banksia – (*Finica nodosa*) low open shrubland on coastal foredunes',
- Swamp Oak - Rushland Forest (PCT 1727) – 'Swamp Oak – Sea Rush – *(Baumea juncea*) swamp forest on coastal lowlands of the Central Coast and Lower North Coast',Beach Spinifex – Maritime Grasslands (PCT 1204) – 'Spinifex beach strand grassland, Sydney Basin Bioregion and South East Corner Bioregion',
- Mangrove Estuarine Complex (PCT 1747) – 'Grey Mangrove low closed forest'; and
- Bitou Bush Scrub – Map Unit 50c (Bell 2016).

A review of available aerial imagery as depicted in Figure 3 shows the historical sequence of sand disposal on Spoil Island (commencing sometime between June 2005 and January 2007), the Naru Beach area (receiving surplus sand in 2012) and Elizabeth Island (commencing sometime between November 2013 and March 2014).

June 2005 – Naru Beach clearance only

January 2007 – Dredge spoil on Spoil Island

April 2014 – Dredge spoil commencing on Elizabeth Is.

Recent – added spoil on new vegetation on Spoil Is.

Figure 3: Review of aerial imagery since 2005.

3.2 Site Survey Results

The Project Area includes the proposed Elizabeth Island sand placement site for the dredged sand (Sand Placement Site), which has previously and repeatedly been used for this purpose since 2014, and the proposed Dredging Site (Figure 1). The Dredging Site comprises a two-armed stretch of navigational channel comprising a section of the Main Channel between Pelican Beach to the south and the lake connection to the north, running between Elizabeth and Spoil Islands, and the entirety of the secondary Airforce Channel that also connects the Main Channel with the lake, running between Elizabeth and Pelican Islands. The habitats and biota observed to be associated with the Dredging Site and Sand Placement Site, as well as the wider Study Area, during the Site Surveys completed as part of this AEA are described further and/or listed below.

3.2.1 Elizabeth Island Sand Placement Site Habitat

Elizabeth Island appears to be highly modified as a result of reclamation that has occurred during previous sand placement. These sand placement events have formed a steep sand hill on the southern shoreline that rises 10-15 m above sea level. At the bases of the southern and eastern slopes of the sand hill the shoreline is unvegetated, with some *Spinifex* sp. having established in higher, more stable areas (Plate 2). The sand hills are covered with a dense shrub layer across the north-eastern side to the south-western side of the hill. This vegetation is dominated by the exotic Bitou Bush Scrub Unit 50c, which forms dense vegetation to the High-Water Mark (HWM) in places (Plate 2). This is the predominant vegetation community occurring within the central portion of Elizabeth Island. The vegetation communities on Elizabeth Island are described further below and their distribution is provided in Figure 4.

Bitou Bush Scrub - Unit 50c

It is not consistent with Plant Community Type (PCT) under the NSW Statewide Vegetation Classification System and mapping. It is identified by Council as Community 'Bitou Bush Scrub Unit 50c' (Bell 2016) (Figure 4).

The predominant species in this community is Bitou Bush (*Chrysanthemoides monilifera subsp. rotundata*) that can occur up to 3 m in height in some areas. It is an environmental weed species that has colonised the understorey of most of the island.

Other introduced species occurring within this vegetation community include:

- Pennywort (*Hydrocotyle peduncularis*),
- Pampas grass (*Cortaderia* species); and
- Lantana (*Lantana camara*).

A very small patch of native Pigface (*Carpobrotus glaucescens*) and Sea Rocket (*Cakile maritima*) were recorded on the margins of this community where it integrates with other vegetation communities.

This vegetation community has colonised previously disturbed areas. It is of low ecological value and is not consistent with a Threatened Ecological Community under the NSW *BC Act 2016* or Commonwealth *EPBC Act 1999.*

Coastal Sand Banksia Scrub

This vegetation community is consistent with Plant Community Type (PCT) 1653 – 'Coast Tea Tree - Coast Banksia – (*Ficinia nodosa*) low open shrubland on coastal foredunes' under the NSW Statewide Vegetation Classification System. Lake Macquarie Council vegetation mapping refers to it as 'No. 50b - Coastal Sand Banksia Scrub' (Figure 4).

This vegetation community predominantly occurs along the western shoreline and central eastern shoreline of Elizabeth Island. It is a floristically simple community with low species diversity. The predominant canopy species recorded in this community include:

- *Banksia integrifolia subsp. integrifolia* (dominant),
- *Melaleuca quinquernervia* (dominant),
- *Banksia aemula* (sporadic),
- *Casuarina glauca* (sporadic),
- *Acacia longifolia subsp. sophorae* (sporadic); and
- *Leptospermum laevigatum* (sporadic).

Other species recorded included *Scaevola calendulaceae, Spinifex sericeus, Phragmites australis, Juncus kraussii subsp. australiensis, Tetragonia tetragoides* and *Sporobolus virginicus*.

The understorey strata is intermixed with occurrences of invasive introduced *Chrysanthemoides monilifera subsp. rotundata, Ehrarta erecta*, and Pennywort (*Hydrocotyle peduncularis).*

This vegetation community is not consistent with a Threatened Ecological Community under the NSW *BC Act 2016* or Commonwealth *EPBC Act 1999.* However, it does represent a remnant native community type that should be protected where possible.

Swamp Oak - Rushland Forest

This vegetation community is consistent with Plant Community Type (PCT) 1727 – 'Swamp Oak - Sea Rush – (*Baumea juncea*) swamp forest on coastal lowlands of the Central Coast and Lower North Coast' under the NSW Statewide Vegetation Classification System. Lake Macquarie Council vegetation mapping refers to it as Community No. 40 'Swamp Oak - Rushland Forest' (Figure 4).

Swamp Oak – Rushland Forest occurs adjacent to tidal estuaries on Lake Macquarie and associated inlets. Swamp Oak (*Casuarina glauca*) clearly dominates this community, with an understorey of sedges and rushes such as *Juncus kraussii subsp. australiensis* and *Baumea juncea*, and the herb *Apium prostratum* (LMCC 2014).

Areas that have been previously cleared and then left to regenerate are quickly re-colonised by monospecific stands of Swamp Oak, however other components of the community do not always return and are replaced by weed species (LMCC 2014).

Characteristic features of this community are:

- canopy dominated exclusively by Swamp Oak,
- understorey of sedges and estuarine herbs; and
- occurs in saline areas close to the lake edge.

This vegetation community occurs along the northeast, northwest and southeast portions of Elizabeth Island.

Other species recorded included *Scaevola calendulaceae, Spinifex sericeus, Phragmites australis, Juncus kraussii subsp. australiensis, Tetragonia tetragoides* and *Sporobolus virginicus*.

The understorey strata is intermixed with occurrences of invasive introduced *Chrysanthemoides monilifera subsp. rotundata, Ehrarta erecta*, and Pennywort (*Hydrocotyle peduncularis*).

This vegetation community is consistent with Swamp Oak Floodplain which is listed as a Threatened Ecological Community under the NSW *BC Act 2016*.

This is the same community is listed under Commonwealth EPBC Act 1999 as 'Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community'. Based on the key diagnostic features and minimum condition thresholds it meets the following EPBC 'Key Diagnostics' criteria:

- Has an open woodland, woodland, forest, or closed forest structure, with a tree canopy that has a total crown cover1 of at least 10 per cent.; and

- Has a canopy of trees dominated by Casuarina glauca (swamp-oak, swamp she-oak).

The occurrence is categorised as a 'Small patch' - The patch is at least 0.5 ha and less than 2 ha. However, under 'Patch Size Classes' it does not meet the 'moderate' quality vegetation class as:

- It contains almost no native understorey;
- Non-native species comprise greater than 80% of total understorey vegetation cover; and
- Transformer species (Bitous Bush *Chrysanthemoides monilifera*) comprise more than 50% of total understorey vegetation cover in some areas.

Intertidal Habitat

Intertidal habitat adjacent to the proposed sand placement area was found to be clean marine sands, which appeared to consist of material eroded from the adjacent sand hill. Nearby the boundary of the terrestrial Sand Placement Site a narrow and sparse stand of Grey Mangroves (PCT 1747 – Mangrove Estuarine Complex – 'Grey Mangrove low closed forest'), hereafter referred to as 'mangroves', was found to be located behind the beach along the eastern shore, while there were also some isolated occurrences of smaller patches along the western shore (Figure 4). Lake Macquarie Council vegetation mapping refers to it as Community No 47 - Mangrove – Estuarine Complex (Figure 4).

Subtidal Habitat

Subtidal habitat adjacent to the island was found to be shallow, comprising a combination of shoaling clean marine sands and some medium- to high-density mixed-species seagrass beds (Figure 4). These seagrass beds consisted of *Zostera* sp., with occasional patches of *Halophila* sp. interspersed amongst the *Zostera* in shallow areas and were found to be most expansive to the west, north-west and north of the island (Plate 2). Clean marine sands dominated around the southern tip and adjacent to the north-eastern corner.

3.2.2 Dredging Site Habitat

The Dredging Site (i.e., Main and Airforce Channel arms collectively) was found to consist of clean marine sands (Plate 3) that formed shallow (<2 m depth) shoaling banks (particularly from Elizabeth Island southeast across the Main Channel towards the southern entrance to Swan Bay) or slightly deeper (>2 m) areas along most of the lengths of both channel arms. There was some notable debris in the Airforce Channel (e.g., tree logs and stumps).

The nearest seagrass patches or beds fringe (i.e., are within 10 m of) the eastern edge of the proposed Dredging Site for a distance approximately 20-30 m of the Main Channel along the western shore of Spoil Island (Figure 4). Seagrass patches/beds in this area included predominately *Z. capricorni* growing at high densities, interspersed with low density *Halophila* sp. (Plate 3). In addition, the northern section of the Main Channel arm of the Dredging Site passes to the east and within close proximity (i.e., within 10 m) of medium- to high-density *Zostera* seagrass beds located to the north of Elizabeth Island.

The north-western section of the Airforce Channel arm of the Dredging Site passes nearby (i.e., within 10-20 m of) some beds of medium- to high-density *Zostera* and of mixed *P. australis* (Figure 4). These beds are located to the south of the southern boundary of the Dredging Site.

Some mangroves also occur on Elizabeth Island (described above in Section 3.2.1) approximately 200m from dredging within the main channel. There are also some mangroves on nearby Spoil Island that runs adjacent to (on the eastern side) to the main channel. These mangroves along the shoreline are located ~30 m from the proposed dredging channel in its nearest proximity to Spoil Island. Behind the mangrove

stands on the northern side of Spoil Island some small areas of Coastal Saltmarsh were also observed (~40 m from the dredging channel) (Figure 5). Coastal Saltmarsh is considered Key Fish Habitat under the FM Act, a TEC under the BC Act (*Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions*), and a vulnerable ecological community under the EPBC Act (*Subtropical and Temperate Coastal Saltmarsh*) (Figure 5).

3.2.3 Biota Present

A wide range of species of flora and fauna was observed within the Study Area during the site surveys undertaken as part of this AEA (Table 4). Details and discussion concerning possible impacts to these species and some other relevant species are presented in Section 4 of this report.

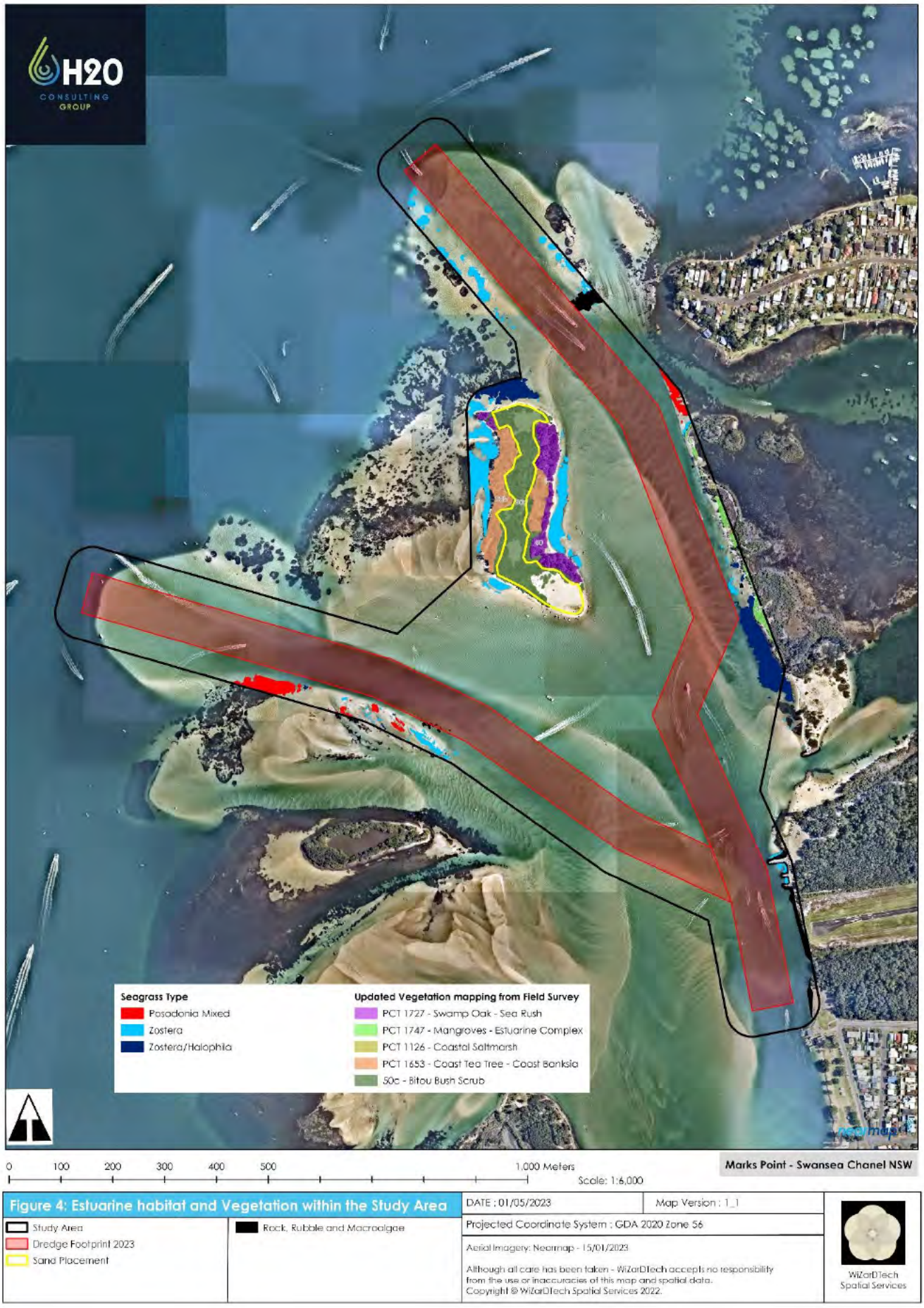

Figure 4: Habitat map of the Study Area showing estuarine macrophytes within the Study Area

Table 4: List of species observed within the Study Area during the site survey.

Species present within the Project Area [i.e., the dredging or sand placement sites] are indicated by '√', whilst species not present within the Project Area are indicated by 'X'.

Name	Species	Habitat	Within Project Area
Invertebrates			
Mulberry Whelk	*Morula marginalba*	Intertidal Habitat- Rock Groynes	X
Sydney Rock Oyster	*Saccostrea glomerata*	Intertidal Habitat- Rock Groynes	X
Rose Barnacles	*Tesseropora rosea*	Intertidal Habitat- Rock Groynes	X
Macroalgae			
Sinuous Ballweed	*Colpomenia sinuosa*	Intertidal and subtidal soft sediments	√
Green Alga	*Enteromorpha sp*	Intertidal Habitat- Rock Groynes	X
Brown Alga	*Padina crassa*	Intertidal Habitat- Rock Groynes	X
Gulfweed	*Sargassum sp.*	Subtidal Habitat	√
Sea Lettuce	*Ulva sp.*	Intertidal Habitat- Rock Groynes	X
Brown Macroalgae	*Zonaria diesingiana*	Subtidal Habitat	X
Saltmarsh			
Pig Face	*Carpobrotus virescens*	Saltmarsh Habitat	X
Knobby Club rush	*Ficinia nodosa*	Saltmarsh Habitat	X
Spiny rush	*Juncus acutus*	Saltmarsh Habitat	X
Saltwater couch	*Sporobolus virginicus*	Saltmarsh Habitat	X
Samphire	*Sarcocornia quinqueflora*	Saltmarsh Habitat	X
Warrigal Greens	*Tetragonia tetragonioides*	Saltmarsh Habitat	X
Seagrass			
Paddle weed	*Halophila sp.*	Subtidal soft sediments	√
Eelgrass	*Zostera capricorni*	Subtidal soft sediments	√
Strapweed	*Posidonia australis*	Subtidal soft sediments	x
Plants			
Sydney Golden Wattle	*Acacia longifolia*	Shoreline Habitat	√
Stiff-leaf Wattle	*Acacia obtusifolia*	Shoreline Habitat	√
Grey mangrove	*Avicennia marina*	Shoreline Habitat	√
Swamp She-oak	*Casuarina glauca*	Shoreline Habitat	X
Bitou Bush	*Chrysanthemoides monilifera*	Shoreline Habitat	√
Pennywort	*Hydrocotyle peduncularis*	Shoreline Habitat	√
Lantana	*Lantana camara*	Shoreline Habitat	√
Spiny-headed Mat-rush	*(Lomandra longifolia),*	Shoreline Habitat	X
Birds			
Brown Thornbill	*Acanthiza pusilla*	Shoreline scrub	√
Pacific Black Duck	*Anas superciliosa*	Shoreline Habitat	X
Darter	*Anhinga melanogaster*	Shoreline Habitat	√
Red Wattlebird	*Anthochaera carunculata*	Near shore open forest	X
Intermediate Egret	*Ardea intermedia*	Shoreline Habitat	X
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	Near shore open forest	X
Yellow-faced Honeyeater	*Caligavis chrysops*	Near shore open forest	X
Grey Shrike-thrush	*Colluricincla harmonica*	Near shore open forest	X
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	Near shore open forest	X
Australian Raven	*Corvus coronoides*	Shoreline Habitat	X

Grey Butcherbird	*Cracticus torquatus*	Near shore open forest	X
Galah	*Eolophus roseicapilla*	Near shore open forest	X
White-faced Heron	*Egretta novaehollandiae*	Shoreline Habitat	X
Mangrove Gerygone	*Gerygone levigaster*	Mangrove habitat- sandspoil island	√
Magpie-lark	*Grallina cyanoleuca*	Shoreline Habitat	√
Australian Magpie	*Gymnorhina tibicen*	Near shore open forest	√
Pied Oystercatcher	*Haematopus logistics*	Intertidal Habitat- Rock Groynes	X
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	Flying overhead	√
Brahminy Kite	*Haliastur Indus*	Flying overhead	X
Welcome Swallow	*Hirundo neoxena*	Flying overhead	X
Silver Gull	*Larus novaehollandiae*	Flying overhead	X
Brown Honeyeater	*Lichmera indistincta*	Mangrove habitat- Elizabeth Island	√
Little Pied Cormorant	*Microcarbo melanoleucos*	Shoreline Habitat	X
Red-browed Finch	*Neochmia temporalis*	Mangrove habitat- Elizabeth Island	X
Crested Pigeon	*Ocyphaps lophotes*	Near shore open forest	X
Eastern Osprey	*Pandion cristatus*	Flying overhead- Swan Bay	X
Australian Pelican	*Pelecanus conspicillatus*	Feeding- sand bar in channel	X
Rose Robin	*Petroica rosea*	Near shore open forest	X
Striped Honeyeater	*Plectorhyncha lanceolata*	Near shore open forest	X
Little Black Cormorant	*Phalacrocorax sulcirostris*	Shoreline Habitat	X
Willie Wagtail	*Rhipidura leucophrys*	Shoreline Habitat	√
Spotted Turtle-Dove *	*Spilopelia chinensis*	Near shore open forest	X
Common Tern	*Sternula hirundo*	Flying overhead- sandspoil island	X
Masked Lapwing/ Plover	*Vanellus miles*	Sandspoil Island	X
Silvereye	*Zosterops lateralis*	Near shore open forest	√
Fish			
Yellowfin Bream	*Acanthopagrus australis*	Subtidal Habitat	√
Luderick	*Girella tricuspidata*	Subtidal Habitat	√
Dusky Flathead	*Platycephalus fuscus*	Subtidal Habitat	√
Sand Whiting	*Sillago ciliata*	Subtidal Habitat	√
Common Toadfish	*Tetractenos hamiltoni*	Subtidal Habitat	√

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.

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 5.

Direct and indirect impacts may also occur at the site of sand deposition. In this case foreshore and island edge terrestrial habitats are to be covered by the dredged sand substrate, which will later dry out to result in an elevated pile with limited capacity for some sedge, plant, tree and shrub species to recolonise. Previous sand placement from dredging in the Swansea Channel has also created new habitat opportunities, notably for some threatened shorebirds. However, in this case new sand deposition occurring during the nesting periods may also impact on nesting success for that season.

Table 5: Identification of potential aquatic impacts from the proposal.

Impact	Likelihood	Description
Physical		
Removal or modification of habitat	Known	The subtidal habitat within the Dredging Site consists of unvegetated, clean marine sandy sediment. These sediments will require removal via dredging to remove shoaling sands and provide sufficient draught for safe navigation of the main and secondary thoroughfares of the Swansea Channel. Placement of dredged material on the Elizabeth Island Sand Placement Site may also modify habitat at that site. This area may provide potential nesting habitat for some shorebird species, and for many of these species the dredge sediments can provide for more favourable nesting habitat over non-native shrubs that are currently present.
Removal or loss of marine fauna and flora	Known	Some sessile or slow-moving epibenthic invertebrates and some infauna associated with sediment within the Dredging Site will be removed and lost as part of these maintenance dredging activities. Without careful dredge navigation practices there may be potential for loss of *Zostera* seagrass patches in close proximity to the proposed dredging track (i.e., in nearshore waters off the western shore of Spoil Island) from subsidence/slumping of fringing sediment and seabed down the slopes of the dredged areas. Without impact-avoidance strategies and measures there is slight potential for loss of *Zostera* and/or *Halophila* seagrass plants in shallow nearshore areas adjacent to Elizabeth Island during dredging/deposition operations due to physical contact by the sand slurry transfer pipeline, and over medium- and/or longer-terms via the risk of erosion of the sand piles and runoff of sediment-laden water into the mangroves or onto the seagrass beds. Adult birds will likely take flight when outlet pipes are relocated, however eggs and young chicks of some sand nesting species, such as Little Tern and Pied Oystercatcher, present on the sand surface may get buried.
Removal or loss of threatened species	Unlikely	While there is potential for some short-, medium- and/or long-term disturbances to seagrass beds in shallow nearshore areas adjacent to the Dredging and Sand Placement Site, with strategies and measures in place to avoid impacts to those beds the proposed dredging and sand

		transfer/stockpiling are unlikely to result in removal or loss of White's Seahorses (*H. whitei*) that may potentially be present in those seagrass beds. Possible impacts on White's Seahorse will be confined to the potential disturbance of habitat associated with seagrass.
Removal or loss of a threatened ecological community or population	Possible	Proposed dredging activities in the Airforce Channel will be done in the vicinity of (i.e., 20 m from) *P. australis* beds located to the south of that section of the Dredging Area. Similarly, dredging of the Main Channel near the northern entrance to Swan Bay will also be done in the vicinity of (i.e., 20 m from) a *P. australis* bed. Without strict dredge navigation practices there is the possibility of loss of perimeter areas of those beds. Other than those locations, proposed dredging and sand transfer/stockpiling activities will not be occurring in the vicinity of any other mapped *P. australis* beds within Swansea Channel, however a large meadow of *P. australis* does occur nearby in Swan Bay, nearby to the channel where dredging will occur (Figure 5). An additional EECs listed under the BC Act as a Threatened Ecological Community (Swamp Oak Forest) occurs nearby to the Sand Placment Site on Elizabeth Island. The project description indicates works will avoid any native vegetation communities on Elizabeth Island. To adequately avoid impacts dredging pipelines will need to be routed outside of areas with seagrasses or native vegetation.
Physical disturbance to marine fauna and flora	Possible	The maintenance dredging may result in some physical disturbance to marine fauna and flora, particularly epibenthic organisms (seagrass and sessile invertebrates) and benthic infauna associated with soft sediments located within and < 5 m away from the Dredging Site. There is potential for some physical disturbances to seagrass beds located within 5 m of the Dredging Site caused by subsidence/slumping of fringing sediment and seabed down the slopes of the dredged areas. 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. During dredging activities there is also some potential for some minor, temporary physical disturbances to *Zostera* and/or *Halophila* seagrass beds (and the fauna and epiphytes that live in the beds) present in nearby shallow nearshore areas due to elevated levels of turbidity and sedimentation in the vicinity of the Dredging Site and, without impact-avoidance strategies and measures in place, due to physical contact by the sand slurry transfer pipeline near the Sand Placement Site (Elizabeth Island). Without impact-avoidance strategies and measures in place, following completion of the dredging operations there is the risk of erosion of the sand piles and runoff of sediment-laden water onto the seagrass beds adjacent to Elizabeth Island over the medium- and/or longer-term.
Disturbance to threatened aquatic species or their habitat	Possible	Despite not being its preferred habitat, White's Seahorses may be present in (or if not, sometimes utilise) the *Zostera* and/or *Halophila* seagrass beds in shallow nearshore areas nearby the Dredging Site and off Elizabeth Island. If disturbed by an increase in turbidity, settling particulates or an encroaching pipeline, individuals would likely have the alertness and mobility to disperse from the area to similar, undisturbed habitat nearby. The sand substrate currently on Elizabeth Island from previous dredging activities has created desirable threatened shore bird nesting opportunities on dried open surface areas. Any future dredging and sand deposition activities undertaken during the nesting period for the endangered Little Tern (Oct-Feb) and Pied Oystercatcher (Aug-Jan).could potentially disturb breeding behaviour at that time.
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 during construction work 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	Unlikely	The works are not expected to result in any notable or sustained increase in vessel movements in the Study Area that pose a risk to marine fauna that occupy waters at or near the surface.
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.
Chemical		

Changes in water quality	Known	The maintenance dredging is expected to result in elevated levels of turbidity in the vicinity (wider Study Area) of active dredging works during dredging and sand disposal activities. The potential for direct or indirect impacts from turbidity (i.e., light attenuation and sedimentation) can be adequately mitigated through adoption of suitable environmental controls during dredging activities and associated with the periphery of the Elizabeth Island Sand Placement Site following completion of the project.
Mobilisation of contaminants	Unlikely	The sediments present in the Dredging Site are comprised of clean marine sands that historically have, since 2014, been periodically dredged, most recently in early 2021. Supporting studies on sediment quality for the initial, 2014/15 dredging project identified that the sediments have a low risk of potential for mobilisation of contaminate (RHDHV 2014).
Nutrification	Unlikely	The works are not expected to result in any nutrient-enriched inputs or mobilisation of significant amounts of nutrient-enriched sediments as sediments are typically clean marine sands.
Biological		
Invasion or spread of non-native or invasive species including weeds.	Possible	The invasive green marine alga *C. taxifolia* occurs amongst soft sediment habitats in Lake Macquarie. Its distribution can be highly spatially and temporally variable. Surveys as part of this AEA did not detect this species to occur within the Study Area and it has not been previously mapped to be present in the Swansea Channel. However, there remains some potential that it may occur in the Study Area at the time of dredging works. Further, equipment brought to site during construction works has potential to introduce non-native or invasive species (including *C. taxifolia*) to the site from other areas. Other weed species that occur along the shoreline, including those present such as Bitou Bush may also be spread, while others not present could be introduced on Machinery brought to site. Thus, adequate mitigation measures, especially to reduce the potential for introduction of new weed species to Elizabeth Island will be required.
Introduction of disease or pathogens	Unlikely	No known diseases or pathogens have been identified as an environmental issue for marine fauna and flora in Lake Macquarie, while no aquaculture occurs in the estuary.
Behavioural		
Generation of underwater noise	Unlikely	The level of underwater noise expected to be generated via the dredging machinery will be highly unlikely to have potential to impact on the behaviour of marine mammals or reptiles, or fish, to any detrimental degree.
Noise impacts on threatened species	Possible	Dredging activities during the nesting period for the endangered Little Tern (Oct-Feb) and Pied Oystercatcher (Aug-Jan). can potentially cause noise and activity disturbance to nesting areas of these species at the pump outlet sites, where sand piles created from previous dredging activities have made desirable nesting habitat areas.

4.1 Estuarine Flora and Fauna

4.1.1 Seagrasses

Surveys of the Study Area found the Endangered seagrass *Posidonia australis* to occur outside but adjacent to: 1) the southern side of the Airforce Channel, to the south-west of Elizabeth Island; and 2) the eastern side of the Main Channel at the northern entrance to Swan Bay. In these places dredging works may be required to occur within 20 m of *P. australis,* considered an Endangered Population under the FM Act and an Endangered Ecological Community under the EPBC Act (Figure 5). An Assessment of Significance was undertaken for the Endangered *P. australis* Population / Ecological Community (Appendix 4).

In terms of other seagrass species, the main potential impacts from the proposed dredging activities and/or sand slurry transfer/stockpiling operations relates to the presence of patchy *Zostera* sp. and *Halophila* sp. seagrass beds in the vicinity (i.e., <5 m) of the Dredging Site and Sand Placement Site (see below). Seagrass beds, especially *P. australis* may also provide habitat for threatened species such as White's

Seahorse (*Hippocampus whitei*) (NSW DPI 2019), the use of *Zostera* seagrass by White's Seahorse in NSW is considered unlikely and very rare (D. Harasti 2022, pers. comm.12 October 2022). Notably, there is no seagrass present directly within the Dredging Site, while the Sand Placement Site *per se* is located onshore, so direct impacts to seagrass (i.e., loss) would not be expected with appropriate impact-avoidance strategies and measures.

There is potential for any maintenance dredging undertaken too close to the edges of the seagrass beds fringing the western shore of Spoil Island to result in physical disturbance to those seagrass beds caused by subsidence/slumping of sediment and seabed down the slopes of the dredged areas. At worst, without careful dredge planning and navigation practices some seagrass plants could be lost. Ensuring a 10 m 'buffer zone' is maintained between the eastern boundary of the Dredging Site and the western edges of the seagrass beds will mitigate the risk of such disturbance.

There is potential for turbid water and mobilised sediments from dredging activities to disperse towards the strip of patchy *Zostera* sp. and *Halophila* sp. seagrass beds present in shallow nearshore waters along the western shore of Spoil Island. However, given that water flow can typically be quite strong during the flood and ebb tidal cycles and sediment to be dredged is clean marine sand with minimal fines, sediment-laden waters would likely be directed away from those seagrass beds and diluted in the current of the main channel, with sedimentation occurring on sandflats up- or down-channel. It is considered unlikely that the very temporary reductions in water-quality and mobilisation of sediments emanating from dredging operations would lead to any light attenuation or sedimentation issues for those nearby seagrass beds. In the short-, medium- and longer-term there is also potential for weather-facilitated erosion of the stockpiles of sand at the Elizabeth Island Sand Placement Sites to cause influxes of turbid, sediment-laden runoff into the *Zostera* sp. / *Halophila* sp. seagrass beds that fringe the shoreline of Elizabeth Island. With significant quantities of sand to be deposited, there is potential for creation of unstable slopes, which may exacerbate the risk of such erosion events. At the very least, without appropriate onshore erosion-mitigation measures in place, there is some risk that such erosion events could lead to pulses of poor water quality from increased turbidity and possibly excessive sedimentation over the seagrass beds that eventually smother them. Despite this, seagrasses of the *Halophila* genus are considered early colonisers and can rapidly recolonise areas or expand in distribution and density following disturbances (Sainty *et al.* 2012). The species can assist in stabilising sediments and is commonly associated with later establishment of the slower growing seagrasses of the *Zostera* genus. The coverage and density of *Halophila* and *Zostera* may also change substantially between seasons or following heavy weather events and may also disappear or retract in distribution during winter months, particularly in shallower water (Waycott *et al.* 2014). Such changes in *Halophila* and *Zostera* have recently been observed as part of baseline monitoring of seagrasses in nearby Botany Bay (Niche 2021). Both genera are known to have a high capacity to re-establish from the natural seed bank (Waycott *et al.* 2004), with such spatial changes in coverage regularly observed in NSW estuaries (Cummings, Pers. Obs.). Given the above, any excessive sedimentation over areas of seabed containing *Zostera* and *Halophila* seagrass as a result of erosional processes, is likely a temporary and medium- to long-term direct impact, as once the right environmental conditions are met, *Halophila* is likely to rapidly reproduce from seeds and also possibly spread into the affected areas via rhizomes within the sediment (Sainty *et al.* 2012).

Selection of suitable pathways through nearshore areas around Elizabeth Island for the sand slurry transfer pipeline(s) from the Dredging Site to the Sand Placement Site that avoid the seagrass beds will be essential. Contact between the pipeline and these beds – particularly in water shallower than the diameter of the pipeline – would cause direct damage to the seagrass and possibly some fauna inhabiting the beds. There are, however, clear routes to those Sand Placement Site that could avoid such contact and provide some buffer (e.g., the southern and northern tips of Elizabeth Island). These potential pathways through the nearshore habit are indicated in Figure 7.

Figure 5: Habitat map of the Study Area showing Threatened Ecological Communities (TECs) in relation to proposed Dredging Sites

4.1.2 Mangrove and Saltmarsh Communities

Some mangrove stands occur on the central stretches of Elizabeth Island, along or in close proximity to the shoreline. These areas will need to be avoided and provision of appropriate buffers to sand transfer and stockpiling operations provided (Figure 4). Mangroves also occur along the majority of the shoreline of the central and northern sections of Spoil Island, adjacent to the proposed dredging works, while some stands of Coastal Saltmarsh occur behind the mangroves on the northern side of Spoil Island. The Saltmarsh is also likely to align with the Coastal Saltmarsh EEC listed under the BC Act. These areas are not expected to be directly impacted by water-based dredging works in the Main Channel.

4.1.3 Marine Birds, Shorebirds and Waders

Marine birds, shorebirds and waders regularly use the aerial, estuarine and terrestrial habitats associated with the Study Area to forage, rest or roost, and potentially nest at times. Such species are known to include gulls, terns, cormorants, herons, egrets, oystercatchers and plovers, which are often restricted to coastal areas along the NSW coast. Impacts on these birds that may occur due to dredging and sand stockpiling may include short-term disturbances to habitat quality relating to reduced water quality, lower prey abundances, construction noise and modification of some existing shoreline/foreshore feeding and/or nesting habitats (Figure 6).

The sand substrate placed on the islands adjacent to the Swansea Channel as a result of historical dredging spanning over 35 years has created desirable nesting opportunities for some beach nesting threatened shorebird species, on the dried open deposited sand surface. Due to the highly vegetated nature of these island in their natural state, they were unlikely suitable for such nesting prior to the commencement of dredging works. This habitat is also only temporary for a few years before Bitou Bush, Acacias and other colonising vegetation emerges over the deposited sand. Hence, suitability is also only maintained by the ongoing dredging works. The current available breeding habitat areas based on a recent site assessment is shown on Figure 6.

Notably, the state Endangered Little Tern (*Sternula albifrons*) has been identified as having recently nested on sand deposited during previous works in the Swansea Channel. Recent years' observations have been made by the Hunter Bird Observers Club volunteers, although these details on nesting or roosting activity do not appear to have been formally captured within comments for Birdata, eBird or Bionet database records (Appendix 2). Two pairs of this species have been recorded nesting on the deposited sand on Elizabeth Island over the 2021/22 breeding period, while other observations suggesting interest in nesting on the sand placed on Spoil Island have also been recently made (as well as back at the commencement of dredging in 2010. Nesting attempts may have also occurred in other non-surveyed years since the commencement of initial dredging in the Study Area in 2015, however there are no records to confirm this, and no other known breeding by the species in the locality. The species Recovery Plan (NPWS, 2003) identifies a historical nesting record of four pairs at a Swansea Site near Pelican Point at the entrance to Lake Macquarie in 1959/60 (Source: Morris 1979 Little Terns typically arrive on the NSW Coast to nest in October/November and nest through to January/February, before numbers begin to decline as the birds depart as part of their annual migratory movements undertaken between March and May (NPWS 2003).

Similarly, the state Endangered Pied Oystercatcher (*Haematopus. longirostrisi*) is known to occur within the Study Area and has the potential to utilise the same exposed sand surface from deposited sand for nesting. This species typically forages on intertidal flats of inlets and bays, open beaches and sandbanks (DPIE 2020b). With consideration to potential breeding impact the Test of Significance in Appendix 4 has assessed the Little Tern and Pied Oystercatcher in detail, with these findings are summarised in Section 4.5.

Other threatened and protected migratory shorebirds and waders that may occur in the immediate locality include Bar-tailed Godwit (*Limosa lapponica*), Caspian Tern (*Hydroprogne caspia*) and Crested Tern (*Thalasseus bergii*) with historical records also of Eastern Curlew (*Numenius madagascariensis*), Whimbrel (*Numenius phaeopus*), Grey-tailed Tattler (*Tringa brevipes*), Red Knot (*Calidris canutus*), Curlew Sandpiper (*Calidris ferruginea*), Red-necked Stint (*Calidris ruficollis*), Great Knot (*Calidris tenuirostris*), Lesser Sand Plover (*Charadrius mongolis*), Pacific Golden Plover (*Pluvialis fulva*), Sharp-tailed Sandpiper (*Calidris acuminata*) and Common Greenshank (*Tringa nebularia*).

Some of the abovementioned species may on occasion utilise the intertidal zone, along with areas just above or below this and the channel waters, for seasonal foraging value. Such foraging habitat is otherwise well represented for these species in the immediate locality of the Lake Macquarie entrance channels and islands. The proposed dredging would therefore not likely cause any impact on breeding habitat or any habitat otherwise unique or of importance.

A wide diversity of marine birds that forage along the coastline may also forage in waters within the Study Area at times. These species are typically birds of flight that 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). In addition, the White-bellied Sea Eagle (*Haliaeetus leucogaster*) and Eastern Osprey (*Pandion cristatus*) were observed flying in the vicinity of the Study Area during the site survey. At times these species may breed or perch in high trees, which are not expected to be impacted by this proposal. These aquatic-dependent raptors typically forage over the water and rely on detecting prey aerially from above (Billerman *et al.* 2020, DAW 2020, DPIE 2020b). There is potential for reduced prey detection success from waters with elevated levels of turbidity for some species that forage aerially (Lunt and Smee 2015), or due to a reduction in prey abundance during the dredging works. Given that the potential for detrimental impacts to the water quality from the proposed dredging operations is considered to be generally minor in spatial extent and duration, it is highly unlikely that there would be foraging impacts to any of these species, thus further Assessment is not required.

4.1.4 Marine Mammals

The proposed maintenance dredging is confined to a Dredging Site in the main channel and one secondary channel of Swansea Channel well away (~5,000 m) from the channel mouth. It is highly unlikely that larger marine mammals such as cetaceans (whales) would enter the shallow, narrow channels. Use of channel waters by any smaller marine mammals, such as dolphins and fur-seals, is likely to occur on occasions as part of transient movements in and out of Lake Macquarie for opportunistic feeding or for refuge (Dinneen 2012, Lee 2020), although it is most likely that such occurrences would be fleeting given the channel is effectively a thoroughfare. Given these species forage over very large areas including those within the lake, and particularly coastal waters outside the channel entrance, when considered against the relatively small extent of the Study Area the potential for ecologically significant impacts on these species as a result of the proposed maintenance dredging works is minimal. While the natural and developed urban shorelines within or in the vicinity of the Study Area are unlikely to offer significant resting locations for fur-seals to haul out to, there is nevertheless a remote possibility of this specific occurrence during dredging activities. The maintenance dredging is not expected to generate any ecologically significant levels of underwater noise with potential for detrimental physiological or behavioural responses by any marine mammals should they be present in the vicinity.

Given the above, the proposed maintenance dredging is not considered to have potential to impact on any threatened or migratory marine mammals that may occasionally occur in the Study Area or adjacent waters to any biologically or ecologically significant degree.

4.1.5 Marine Reptiles

Marine turtles are known to traverse through Swansea Channel and utilise Lake Macquarie waters at times (NSW NPWS 2022). While seagrass habitat is generally important for marine turtles, particularly the Green Turtle (*Chelonia mydas*), there is not expected to be any direct seagrass removal. Dredging is proposed adjacent to the beds which, without appropriate impact-avoidance strategies and measures in place, may result in some edge effects and associated disturbances. While these species may traverse through the channel at times, they typically forage over very large areas of coastline, including the extensive seagrass beds elsewhere in the main body of the lake. Any small-scale habitat changes confined to the Study Areas during or following dredging works and spoil transfer and stockpiling operations are considered to be of minimal ecological significance to foraging prospects for this group of species.

The maintenance dredging is not expected to generate any ecologically significant levels of underwater noise with potential for detrimental physiological or behavioural responses by marine turtles should they be present in the vicinity. The works are also 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. In general, impacts from the maintenance dredging on threatened and migratory marine turtles that may occur in the Study Area during dredging activities are considered very minimal.

Given the above, the proposed maintenance dredging is not considered to have potential to impact on any threatened marine turtles that may occasionally occur in the Study Area or adjacent waters to any biologically or ecologically significant degree.

4.1.6 Fish, Sharks and Rays

Given the relatively slow forward progress of the dredging machinery during dredging activities, any fish, sharks and rays in the path of the dredge machinery would have sufficient levels of alertness and mobility to evade it and possibly quickly settle in suitable alternative areas nearby. Given this, direct detrimental impacts on any pelagic or benthic fish, sharks or rays are considered unlikely. It is also possible, however, that the disturbed seabed immediately behind the operating dredge machinery and associated sediment plume will attract many of these species, including Yellowfin Bream (*Acanthopagrus australis*) and Dusky Flathead (*Platycephalus fuscus*), due to the expected elutriation of substantial amounts of benthic infauna prey items into the water column.

Cryptic species such as protected Syngnathid fishes almost certainly utilise habitat associated with the seagrasses in the vicinity of the Dredging and Sand Placement Sites. This may potentially include the Endangered White's Seahorse (*Hippocampus whitei*), which is known to occur within Lake Macquarie. Any loss of seagrass habitat or reduction in seagrass habitat quality within these areas would likely reduce habitat availability for some of these species over longer time scales. The natural habitat of White's Seahorse includes seagrass beds, with a preference for *P. australis* in some estuaries (NSW DPI 2019), so the potential for its use of seagrass habitat in those areas is high. Given the preference this species has for *P. australis* seagrass, which is not expected to be directly impacted, and considering the presence of other and more preferential suitable artificial habitat elsewhere in the main lake body and around the Swansea Channel, such as jetties/pylons in nearby Swan Bay, it is unlikely that the local population is reliant on habitat within the Study Area. Nevertheless, potential for impacts on White's Seahorse was considered further through a 7- part Test and Significant Impact Criteria Assessments (Appendix 4). These assessments determined that the viability of the White's Seahorse population that utilise marginal habitat (*Zostera*/*Halophila*) within and around the Study Area, and other preferred habitat in Swan Bay beyond the Study Area, is unlikely to be significantly affected by the proposed maintenance dredging and sand stockpiling. Some temporary minor disturbances to potential White's Seahorse habitat (i.e., *P. australis*

beds in the vicinity of the Dredging Site) via turbidity may occur at times during dredging works. These disturbances would, however, be minimal at a population level and, in the case of *Zostera*/*Halophila*, confined to very marginal habitats.

As mentioned above, the dredging activities may impact on some marine fishes by introducing underwater noise disturbance and/or dispersing some of the more motile species, thereby having indirect impacts on the habitat quality for any other fish assemblages nearby (Erbe 2012). In contrast, It may also result in fewer foraging opportunities and/or reduced channel accessibility for larger predatory and more transient species of sharks during dredging. This incumbent assemblage is likely to at times include occupation by benthic dwelling species and transient occurrences of sharks and rays, including the Endangered White Shark (*Carcharodon carcharias*) (McMurray 2015). Most of these species forage over very large areas that encompass habitats inside and outside of Lake Macquarie, so any changes in prey item abundance in the Study Area is not expected to be of ecological significance to these species.

It is extremely unlikely that benthic soft-sediment habitat within and in the vicinity of the Dredging and Sand Placement Sites would provide suitable habitat for the Vulnerable Black Rockcod (*Epinephelus daemelii*). Further, the small amounts of rocky subtidal habitat located in the Study Area, specifically near rock revetments and the eastern shoreline adjacent to the Dredging Site south of the southern entrance to Swan Bay, would provide only very marginal potential habitat for Black Rockcod, which are typically sighted closer to the entrance to the ocean (NSW DPI 2015). Given this, potential impacts on Black Rockcod from the proposed dredging activities and sand stockpiling operations are considered unlikely and minimal, so further assessment is not considered necessary.

4.1.7 Marine Invertebrates

Removal of soft sediment from within the Dredging Site will result in the loss of infaunal community assemblages inhabiting the volume of sediment that will be removed. These assemblages are likely to consist of various polychaetes, gastropods and bivalves. However, recolonisation of the seabed sediment in the newly dredged channel section will likely begin soon after dredging and recover to pre-dredging diversity and abundance quickly (Dernie *et al.* 2003). Furthermore, 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 sessile and mobile epibenthic invertebrates may occur on the sandy seabed within the channel area from which sediment is proposed to be removed. During the Site Survey a search of the Dredging Site and surrounding seabed areas was undertaken for the Endangered Cauliflower Soft Coral (*Dendronephthya australis*), which was not found. While the Cauliflower Soft Coral is known to occur in sandy subtidal sediment where moderate to strong tidal movements exist, however is not documented to occur in Swansea Channel or Lake Macquarie (Fisheries Scientific Committee 2020, NSW DPI 2021). Given this, it is assumed that this species has a low likelihood of occurrence within the Study Area and further assessment through a 7-Part test as well as the Significant Impact Criteria is not required.

4.1.8 Macroalgae

Rocky subtidal habitat within the Study Area included isolated outcrops and groins associated with the shoreline immediately east of and adjacent to the Main Channel. These areas comprised of common macroalgae including Gulfweed (*Sargassum* sp.), *Padina crassa, Zonaria* sp. and *Ulva* sp. Some dredging may be required in close proximity (<10 m) to these rocky subtidal habitats adjacent to Marks Point. While dredging activities may have some potential to temporarily disturb these assemblages due to a reduction in water quality (increased turbidity) caused by mobilisation of sediments, disturbances, if any, are expected to be minor, short-term and very localised, with no loss of those macroalgae. Macroalgae – the common

species that dominate assemblages within the Study Area in particular – are less sensitive to light requirements, typically more resilient to disturbance, and recolonise areas relatively quickly (Sze 1998).

4.2 Sediment and Water Quality

Dredging mobilises sediments into the water column as sediments are removed from the seabed. Stockpiling of sand on nearby foreshore and island areas such as Elizabeth Island may also result in some flow back into the adjacent waters of high loads of sediment, even after the dredging project has been completed. Increases in suspended sediments in the water column can alter physical chemistry of the water, increase turbidity and reduce available light to the seabed. These suspended sediments will eventually settle on the seabed, which in some areas can impact on marine vegetation such as seagrass beds (Clark 2001).

Mobilisation of particulate terrestrial material and discharge of water via onshore construction activities and other unplanned spills and discharges may also quickly enter waterways and disperse, resulting in impacts on water quality and indirect flow-on impacts on fauna that utilise adjacent habitats. The sediments present in the proposed Dredging Site are primarily comprised of clean marine sands that have been periodically dredged since 2014 (most recently in early 2021). Given the clean, generally uncontaminated composition of these sediments (RHDHV 2014), the potential for mobilisation of contaminated particles into the water column directly via dredging activities can be considered unlikely.

Habitats in waters adjacent to onshore Sand Placement Sites and nearby the Dredging Site include seagrass beds, which are typically considered more susceptible to sedimentation and reduced water clarity (Kirkman and Kuo 2012). As noted above, the proposed maintenance dredging may result in elevated levels of turbidity in the vicinity of active dredging works during dredging activities. Given that the sediments in the Dredging Site are clean marine sands and mobilised sediments are likely to be dispersed up- or down-current along the deeper channel and/or settle quickly, so any pluming is likely to be very localised to the location of the disturbance and unlikely to encroach out over the shallow nearshore waters (and seagrass beds) off the western shore of Spoil Island and south of the Airforce Channel. The amount of pluming and most appropriate controls will ultimately depend on the size and type of dredge selected for the project.

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- or land-based machinery (see below), sand slurry from burst transfer pipes and spills of other potential environmental contaminants required on site during the project. Discharges may include operational wastewater, ballast water from vessels and, arguably, run-off of sediment-laden water via erosion of sand piles at the Sand Placement Sites during or after the project. These works will require suitable measures to avoid, minimise and mitigate the risk of unplanned spills and discharges during project works.

4.3 Key Threatening Processes

4.3.1 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 and land-based sand manipulation 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.

4.3.2 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 from place to place 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 *Caulerpa taxifolia* is evident in Lake Macquarie, it has only been found inside the main lake and not along the Swansea Channel (NSW DPI 2022c). This species can colonise areas of soft substrate rapidly and out-compete seagrasses, particularly *Zostera* and *Halophila* (Williams 2007, Glasby 2013). 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.

4.4 Coastal Wetlands

The proposed works are not expected to impact on the adjacent coastal wetlands that have been mapped to occur behind Naru Beach. However, some dredging works may encroach into the 200 m proximity zone that encompasses the seabed and parts of the existing navigational channel. This is not expected to result in any direct disturbances of the nearby wetlands identified under the SEPP.

4.5 Assessments of Significance

4.5.1 *Posidonia australis*

The findings of a 7-Part Test for the Endangered *Posidonia australis* Population in Lake Macquarie listed under the FM Act concluded that the proposed dredging works are not expected to result in any removal of the mapped *P. australis* population in Lake Macquarie (Appendix 4). Any disturbances will be minimal and, if realised, confined to the edge of two beds near the existing Main and Airforce Channels. The implementation of a 10 m buffer to dredging will provide additional protection for *P. australis* in close proximity to the dredging works. Given this, any disturbances are unlikely to affect the viability and long-term survival of the Lake Macquarie population of *P. australis*.

The findings of the Impact Assessment Criteria for the Endangered *P. australis* Ecological Community under the EPBC Act found that the proposed dredging is not expected to remove any areas of mapped *P. australis*. Impacts will be confined to habitat disturbance such as sedimentation and elevated turbidity. These impacts have some potential to favour growth of undesirable species that can out compete slow growing seagrasses such as *P. australis*. The application of a 10 m buffer between any mapped *P. australis* and areas to be dredged should adequately avoid direct disturbances to *P. australis* such that it is not considered to be representative of a significant impact on the environment under the EPBC Act and as such a referral to DCCEEW would not be required.

4.5.2 Threatened Shorebirds

The findings of 5-Part Test for Threatened Shorebirds listed under the BC Act included the Endangered Pied Oystercatcher (*Haematopus longirostris*) and the Endangered Little Tern (*Sternula albifrons*) (Appendix 4). This assessment found that it is important that nesting areas be avoided during the breeding season for the Little Tern (i.e. October through to February) due to the potential significance of the sites for

breeding within the locality. A number of mitigation measures to prevent direct and indirect impacts of dredging on nesting success of Little Tern and Pied Oystercatcher have been outlined. Assuming that direct disturbances of Little Tern breeding habitat can be avoided during the breeding season, and provided the appropriate mitigation measures are formulated and implemented, the proposal is not considered likely to result in a significant impact on the viable local breeding populations of either species.

The Impact Assessment Criteria for Threatened and or Migratory Shorebirds has been applied to the Little Tern (*S. albifrons*), listed as a protected migratory species under the EPBC Act. This assessment found that assuming that direct disturbances of Little Tern breeding habitat can be avoided during the breeding season, and provided the recommended mitigation measures are implemented, the proposal is not considered likely to result in a significant impact on the viable local breeding populations of either species and as such a referral to DCCEEW would not be required.

4.5.3 White's Seahorse

The findings of 7-Part Test for the Endangered White's Seahorse (*Hippocampus whitei*) listed under the FM Act concluded that the viability of the White's Seahorse population that utilise marginal habitat (*Zostera* and *Halophila* seagrass beds) within and around the Study Area, and other preferred habitat (*Posidonia australis*, jetties/pylons) in the vicinity of the Dredging Site, is unlikely to be significantly affected by the proposed maintenance dredging and spoil stockpiling. Some temporary minor disturbances to marginal habitat for White's Seahorse may occur at times during dredging works and/or after project completion if onshore sand piles erode into nearshore waters. These disturbances would, however, be minimal at a population level.

The findings of Impact Assessment criteria for the Endangered White's Seahorse (*H. whitei*) listed under the EPBC Act found that it is unlikely that the White's Seahorse population that utilises marginal habitat (*Zostera* and *Halophila* seagrass beds) within and around the Study Area, and other preferred habitat (*P. australis*, jetties/pylons) in the vicinity of the Dredging Site and in Swan Bay beyond the Study Area, will be impacted by the proposed maintenance dredging and sand stockpiling operations. Some temporary minor disturbances to White's Seahorse individuals or habitat may occur at times during dredging works and/or after project completion if onshore sand piles erode into nearshore waters. These disturbances would, however, be minimal at a population level and confined to marginal habitats associated with *Zostera* and *Halophila* seagrass beds.

Figure 6: Map showing the shorebird nesting and roosting habitat within the Study Area.

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

The following recommendations should be implemented to avoid impacts to marine flora, fauna, infauna and their habitats:

- The placement of sand on Elizabeth Island should be avoided during the Little Tern (Oct-Feb) and Pied Oystercatcher (Aug-Jan) breeding/nesting season in the absence of a Shorebird Management Plan (SMP). It is envisaged that management methods identified by a Shorebird Management Plan could also provide an opportunity to simultaneously manage recreational boat user impacts to nesting birds during the summer months if implemented during dredging activities. The Shorebird Management Plan must be prepared by a suitably qualified ecologist prior to the commencement of dredging works. The Shorebird Management Plan is to contain specific actions to avoid direct impacts to breeding birds, minimise disturbance to any shorebirds present during works and ensure the completion of works leaves the deposit sites in a condition suitable for future nesting opportunity by Little Tern.
- A Shorebird Management Plan that specifically addresses the Little Tern and Pied Oystercatcher should be prepared by a suitably qualified ecologist prior to the commencement of dredging works. The Shorebird Management Plan would contain actions to avoid direct impacts to breeding birds, minimise disturbance to any shorebirds present during works and ensure the completion of works leaves the Sand Placement Site in a condition suitable for nesting.
- A Buffer of 10 m between the mapped seagrasses and dredging (including associated batters), dredge pipe routes to Elizabeth Island and sand placement should be implemented.
- No mooring or beaching of vessels within any seagrass areas.
- Access, landing and excavator-track locations on Elizabeth Island should be positioned outside of established native shoreline vegetation (Banksia Scrub and Swamp Oak Forest).
- Dredge sand pipes sending the sand ashore should be securely positioned over sand, with a clearance of at least 5 m to the edges of any nearby seagrass beds.
- Avoid storing hydrocarbon-based products on any sites within the Project Area.
- A Buffer of 10 m between any native canopy forming vegetation communities and sand placement (including stock piling) should be implemented (Figure 7).

The following recommendations should be implemented to minimise impacts to marine flora, fauna, infauna and their habitats:

- Where any works that require access to Elizabeth Island cannot be avoided during breeding/nesting season for Little Terns (October/November to January /February), the Shorebird Management Plan will first need to be referred to and followed to ensure a significant impact does not occur.
- Should any placement of sand occur on Elizabeth Island outside of Little Tern nesting season, placement should be done in a manner to improve habitat for future use by the Little Tern. This should include removal of, and/or placement of sand on (in a manner that completely smoothers) the exotic Bitou Bush Scrub, which is currently colonising areas along the shoreline. Further detail regarding improvements for creation of Shorebird Habitat will be provided in the SMP.
- All equipment to be brought onto Elizabeth Island must be thoroughly cleaned and free of any soils, to avoid introduction of exotic weeds.

- Excavator operation on Elizabeth Island should be strictly confined to clearly-defined access points to and from the Island and outside of the buffer areas identified in Figure 7.
- Where dewatering of slurry occurs, adequate sediment- and erosion-control structures will need to be erected to minimise sedimentation on adjacent intertidal and subtidal habitats. These structures and their effectiveness and position should be inspected weekly by a TfNSW Environmental Scientist or independent environmental contractor to the dredging contractor.
- Visual and turbidity monitoring of the dredge pluming should be included in as part of standard water quality monitoring requirements undertaken during maintenance dredging works.
- Dredge pipes should be positioned between the shore and stockpile/deposition site following a route that avoids any native vegetation.
- Where avoidance of seagrass beds is not possible, the dredge pipes will need to be floated above or, in very shallow or intertidal areas, propped up to avoid seabed contact.
- Sediment-control fencing should be erected and maintained on the lower slope between the Sand Placement Sites and shoreline, in accordance with the 'Blue Book' (Landcom 2004).
- All machinery should 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. All staff are to be made aware of the location of the spill kit and trained in its use.

Environmental controls such as sediment and erosion controls, as well as the position of dredge pipes, should be inspected weekly by a TfNSW Environmental Scientist or independent environmental consultant.

5.1.2 Additional Works

A Shorebird Management Plan will need to be prepared to guide dredging operations in the Dredging Site and associated sand placement works on Elizabeth Island.

For future dredging works scheduled to occur greater than 24 months following completion of the site surveys done as part of this AEA, seagrass mapping will need to be updated for inclusion into an updated version of the CEMP. This should include updates to the map of seagrass and associated dredge pipe routes and required buffers.

Should removal of any established native vegetation be required, a full terrestrial ecology assessment may be necessary to meet TfNSW Biodiversity Assessment requirements.

5.1.3 Permits and Consultation

The requirement for a Permit under Section 205 of the FM Act will not be required where there is no potential to harm marine vegetation. The current proposal is not expected to directly impact on any estuarine vegetation (seagrass, mangroves or saltmarsh), while adoption and application of the management measures in this report are considered adequate to avoid potential harm. 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.

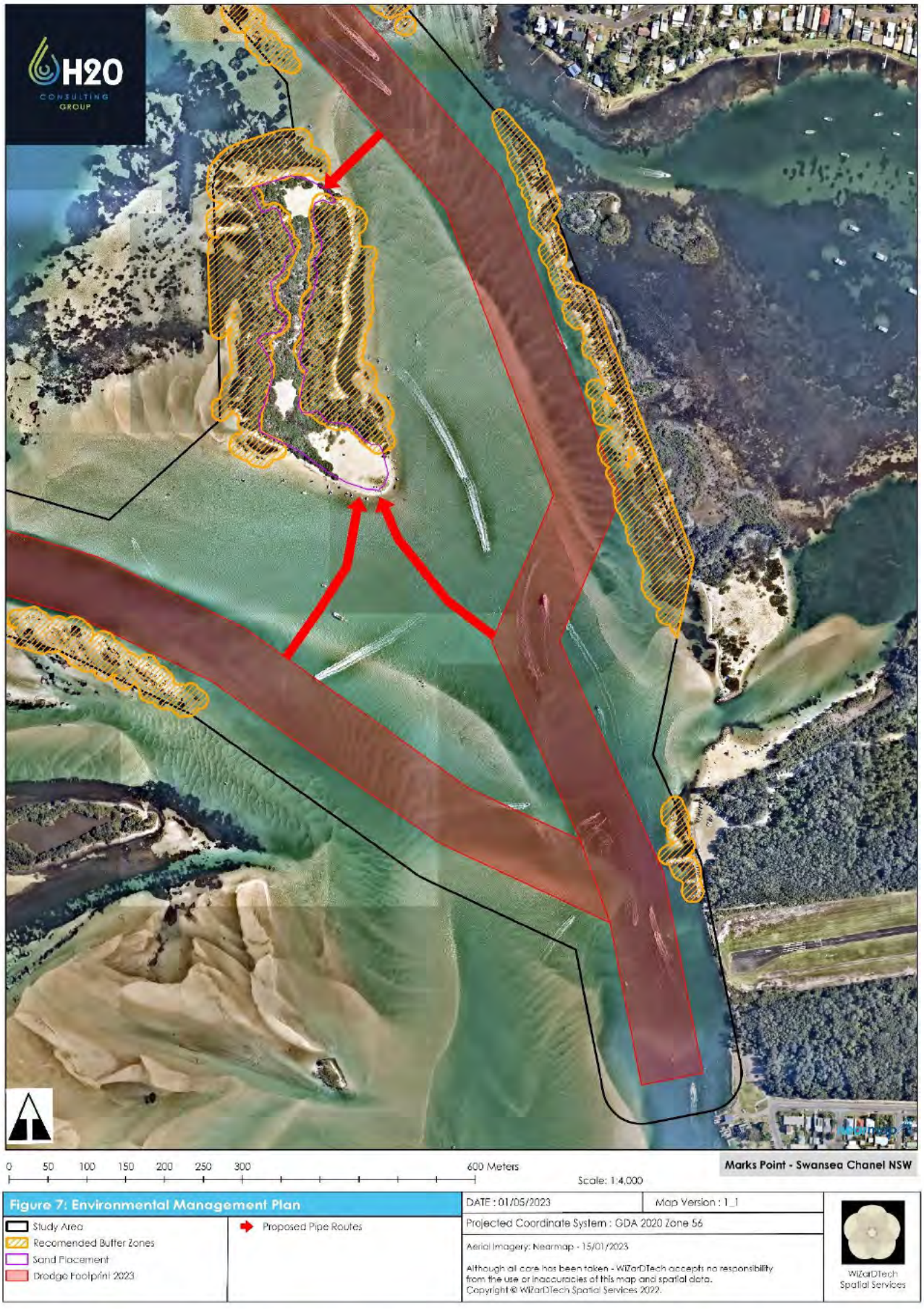

Figure 7: Management plan showing buffer zones to avoid and minimise impacts to seagrasses in the Study Area.

5.1.4 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 seagrass 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). If a 10-m buffer between the mapped seagrass beds and dredging works is applied, along with the recommendations above, direct disturbance and/or removal of any estuarine vegetation can be avoided.

The Test of Significance (Appendix 4) has also concluded that, provided the Avoid and Minimise mitigation measure advised in Section 5.1.1 and 5.1.2 above are adopted and implemented, there will likely be no significant impact on threatened birds, most notably considering shorebirds and waders. Therefore, the proposal will not require offsetting under the requirements of the BC Act 2016.

5.2 Conclusions

Direct impacts from this maintenance dredging project in the Swansea Channel will include removal of a quantity of seabed material – primarily clean marine sandy substrate – resulting in the loss of invertebrate infauna and possibly some sessile or slow-moving epibenthic invertebrates that inhabit that seabed material. These losses will not detrimentally impact on the wider populations and communities of infauna of the area to any degree of concern. The dredging is currently proposed to extend to the edge of the existing seagrass beds just off the western shore of Spoil Island. Dredging in such close proximity to those beds would likely result in some physical disturbance and/or removal if appropriate impact-avoidance strategies and measures are not implemented. Thus, ensuring avoidance of direct disturbance to any seagrass through applying a dredging design modification that includes a 10 m buffer is strongly recommended.

The maintenance dredging is also expected to result in short-term impacts on water quality in the form of elevated levels of turbidity, with associated mobilisation of seabed particulates and subsequent sedimentation in the vicinity of active dredging works (i.e., wider Study Area) during dredging activities. This introduces some potential for some minor and indirect, temporary physical disturbances to *P. australis*, *Zostera* and/or *Halophila* seagrass beds (and the fauna and epiphytes that live in the beds) present in shallow nearshore areas in the vicinity of the Dredging Site due to elevated levels of turbidity and possibly sedimentation. Other potential disturbances to *Zostera* and/or *Halophila* seagrass beds in shallow waters adjacent to Elizabeth Island (i.e., the Sand Placement Site) include crushing due to physical contact by the sand slurry transfer pipeline, and the risk of erosion of the sand piles and runoff of sediment-laden water onto those seagrass beds over the medium- and/or longer-term. The potential for direct or indirect impacts from turbidity (i.e., light attenuation and sedimentation) can be adequately mitigated through adoption of suitable environmental controls during dredging activities and associated with the periphery of the Sand Placement Site following completion of the project.

The seagrass beds vulnerable to disturbance by the proposed dredging and sand stockpiling operations provide important Key Fish Habitat for various species including protected Syngnathid fishes and potentially, the endangered White's Seahorse. While these potential impacts may be of significance at small scales, they represent only a very small proportion of seagrass meadows within and beyond the Study Area, and most are not the preferred habitat of White's Seahorse, therefore they are of little concern at ecological scales of relevance to Lake Macquarie.

The sand placement plans associated with the proposed dredging works have been identified to have potential for direct and indirect impacts on known and potential Little Tern and Pied Oystercatcher breeding locations on Elizabeth Island. Given the occasional use of the site to breeding by the Little Tern within the

locality, avoidance of any works, including sand placement, on Elizabeth Island during Little Tern nesting season is strongly recommended so as to avoid the possibility of any negative impact on this species during breeding. Where the proposed action is unable to avoid the Little Tern nesting season, a suitable Shorebird Management Plan will need to be prepared to adequately minimise and mitigate any potential impacts. In any case, a detailed Shorebird Management Plan for Little Terns should be prepared prior to commencement of the project to avoid a potential significant impact should works overlap with breeding season.

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, 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 proposed dredging activities. With adoption of these recommendations, the proposal is considered unlikely to have a significant impact on State- and/or Commonwealth-listed threatened aquatic biodiversity. As such, referral to the Department of the Environment under the EPBC Act is not required. Similarly, the preparation of a Species Impact Statement (SIS) And or BDAR (Biodiversity Development Assessment Report) for aquatic and or marine ecological values based on the provisions of the BC and FM Act should not be required.

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Plates

Plate 1: Elizabeth Island General Photos.

A: The northern end of Elizabeth Island with Bitou Bush overgrowth and dense fringing seagrass.
B: Clean marine sands adjacent to the southern end of Elizabeth Island.
C: Elizabeth Island Sand Placement Site – southern tip looking south.
D: Elizabeth Island Sand Placement Site with western aspect.

Plate 2: The Elizabeth Shore Line.

A: Spinifex revegetating the previously deposited dredge spoil.
B: The steep sandy shoreline along the southern tip of the Island.
C: Dense Acacia and Bitou bush scrub regrowth
D: Adjacent seagrass beds and fringing mangrove trees along to the north-east of the site

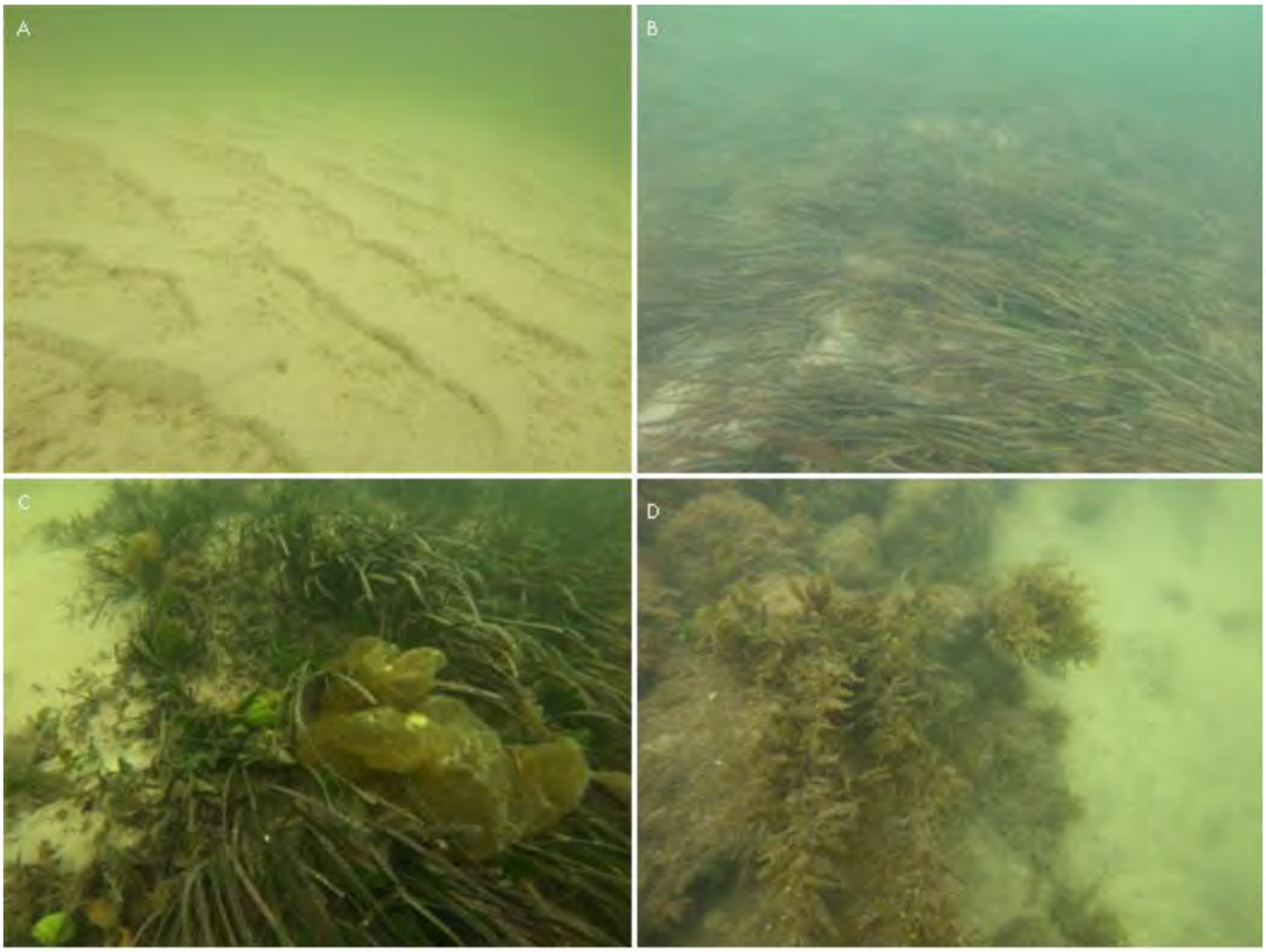


Plate 3: Subtidal habitat within the Study Area

A: Clean marine sands
B: Dense beds of high-density *Z. capricorni*.
C: Seagrasses, density *Z. capricorni* with low density *Halophila* sp. and the brown alga *Colpomenia sinuosa*.
D: Macroalgae *Sargassum* sp. and algae amongst rocky substrates.

Appendix 1: Dredge Design

A1.1: Proposed Dredge Plan

A1.2: Sand Placement Locations and Volumes

DREDGE CUT PROFILE

1:2.5 | 10m | DESIGN RL = -3.5mAHD | 60m | 1:2.5 | 10m

Point	Easting	Northing
1	372475.070	6342033.967
2	372903.528	6341531.313
3	373058.538	6341118.874
4	372979.749	6340933.172
5	373113.786	6340633.919
6	373164.014	6340376.997
7	372414.186	6341982.070
8	372833.566	6341490.068
9	372972.398	6341120.672
10	372892.479	6340932.306
11	373037.030	6340609.579
12	373085.500	6340361.648
13	371813.010	6341206.467
14	372387.126	6341041.401
15	372574.466	6340949.791
16	372781.190	6340796.911
17	372864.026	6340743.679
18	373006.877	6340676.898
19	371790.904	6341129.582
20	372358.282	6340966.453
21	372532.766	6340881.130
22	372735.732	6340731.029
23	372825.289	6340673.478
24	373044.579	6340570.963

CLIENT: TRANSPORT FOR NSW

REV	DATE	DESCRIPTION	CKD
A	04/04/2023	ORIGINAL ISSUE	SB

PROJECT

SWANSEA CHANNEL DREDGE PROGRAM

PROPOSED DREDGE BOUNDARY

N

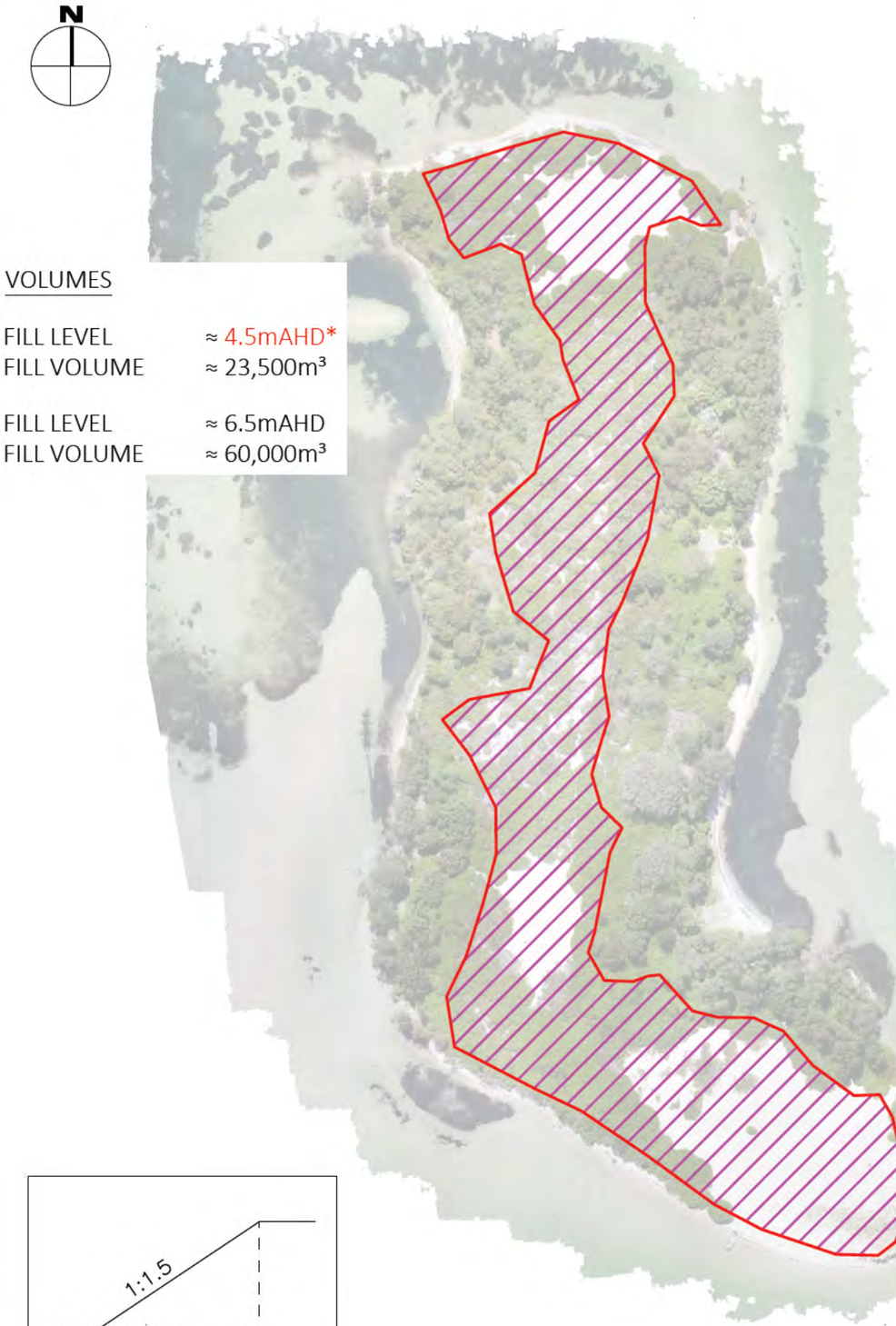
HORZ. DATUM MGA56 (2020)
VERT. DATUM APPROX. AHD
ORIGIN OF LEVELS NETWORK RTK
SHEET 01 OF 01

0m 50m 100m 150m 200m
LENGTHS ARE IN METERS

SCALE 1:5000			
	SURVEYED	PH	05/04/2023
	DRAFTED	PH	05/04/2023
NCS NUMBER 23029	CHECKED	SB	05/04/2023
	APPROVED	PH	05/04/2023

DRAWING NUMBER NCS-001-01
REVISION A

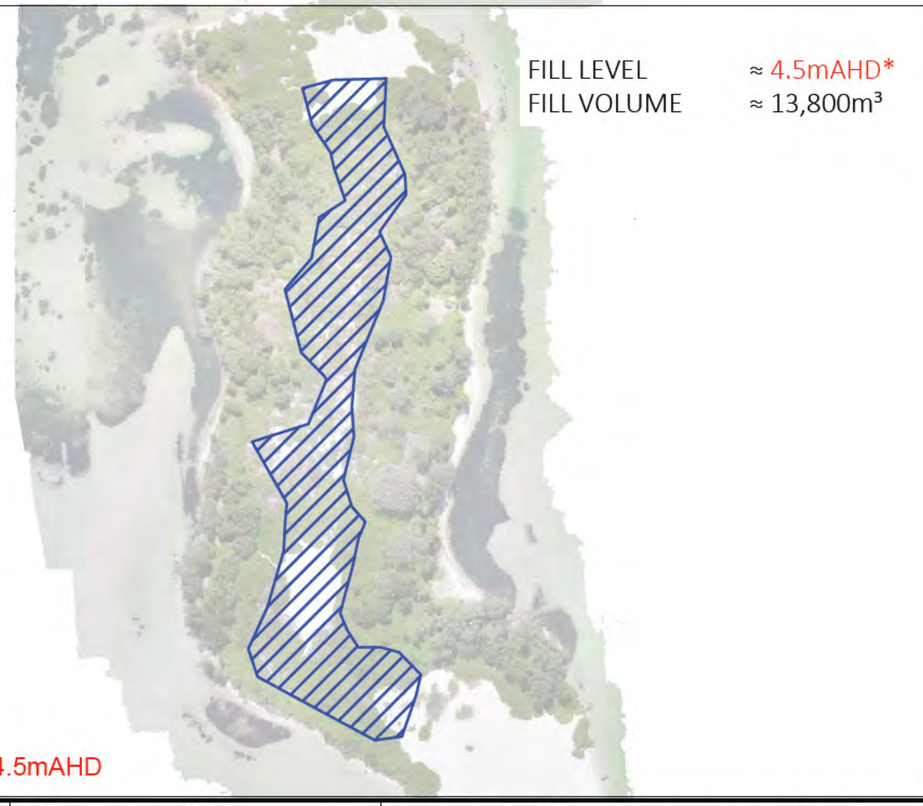
NORTH COAST SURVEYS
Web: northcoastsurveys.com.au
Email: office@northcoastsurveys.com.au
Phone: (02) 6696 3758



VOLUMES

FILL LEVEL	≈ 4.5mAHD*
FILL VOLUME	≈ 23,500m³
FILL LEVEL	≈ 6.5mAHD
FILL VOLUME	≈ 60,000m³

FILL LEVEL	≈ 6.5mAHD
FILL VOLUME	≈ 27,000m³



FILL LEVEL	≈ 4.5mAHD*
FILL VOLUME	≈ 13,800m³

* CURRENT LEVEL OF STOCKPILE AT HIGHEST POINT ≈ 4.5mAHD

NORTH COAST SURVEYS
Web: northcoastsurveys.com.au
Email: office@northcoastsurveys.com.au
Phone: (02) 6696 3758

REV	DATE	DESCRIPTION
1	02/04/2023	UPDATED VOLUMES
0	28/03/2023	ORIGINAL ISSUE

SCALE

NOT TO SCALE

CAUTION: THE ORIGINAL SCALE OF THIS DRAWING MAY HAVE BEEN ALTERED BY REDUCTION, ENLARGEMENT AND/OR PRINTING. THE SCALE SHOULD BE VERIFIED PRIOR TO TO USING THE DRAWING.

JOB No.	22029
SURVEYED BY	PH
CHECKED BY	SB
DATE OF SURVEY	15/03/2023
Vz DATUM	APPROX AHD
ORIGIN	NETWORK RTK
Hz DATUM	MGA56 (2020)

ORIGINAL SHEET SIZE A3

TITLE: PROPOSED DREDGE SPOIL LOCATIONS & VOLUMES

SITE: ELIZABETH ISLAND
LAKE MACQUARIE NSW 2283

CLIENT: TRANSPORT NSW

DWG No: 23029A.DWG SHEET 1 OF 1 REV 0

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: -33.01 West: 151.59 East: 151.69 South: -33.11] recorded since 01 Sep 2002 until 15 Sep 2022 returned a total of 428 records of 40 species.

Report generated on 15/09/2022 5:06 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Amphibia	Myobatrachidae	3137	*Crinia tinnula*		Wallum Froglet	V,P		7	
Animalia	Reptilia	Cheloniidae	2004	*Caretta caretta*		Loggerhead Turtle	E1,P	E	3	
Animalia	Reptilia	Cheloniidae	2007	*Chelonia mydas*		Green Turtle	V,P	V	15	
Animalia	Reptilia	Cheloniidae	2008	*Eretmochelys imbricata*		Hawksbill Turtle	P	V	1	
Animalia	Aves	Apodidae	0334	*Hirundapus caudacutus*		White-throated Needletail	P	V,C,J,K	1	
Animalia	Aves	Procellariidae	0069	*Ardenna pacifica*		Wedge-tailed Shearwater	P	J	1	
Animalia	Aves	Procellariidae	0071	*Ardenna tenuirostris*		Short-tailed Shearwater	P	C,J,K	2	
Animalia	Aves	Accipitridae	0226	*Haliaeetus leucogaster*		White-bellied Sea-Eagle	V,P		6	
Animalia	Aves	Accipitridae	8739	*^^Pandion cristatus*		Eastern Osprey	V,P,3		8	
Animalia	Aves	Burhinidae	0174	*Burhinus grallarius*		Bush Stone-curlew	E1,P		1	
Animalia	Aves	Haematopodidae	0130	*Haematopus longirostris*		Pied Oystercatcher	E1,P		6	
Animalia	Aves	Scolopacidae	0153	*Limosa lapponica*		Bar-tailed Godwit	P	C,J,K	1	
Animalia	Aves	Scolopacidae	0149	*Numenius madagascariensis*		Eastern Curlew	P	CE,C,J,K	2	
Animalia	Aves	Laridae	0115	*Thalasseus bergii*		Crested Tern	P	J	7	
Animalia	Aves	Cacatuidae	0268	*^^Callocephalon fimbriatum*		Gang-gang Cockatoo	V,P,3	E	1	
Animalia	Aves	Cacatuidae	0265	*^Calyptorhynchus lathami*		Glossy Black-Cockatoo	V,P,2		3	
Animalia	Aves	Psittacidae	0260	*Glossopsitta pusilla*		Little Lorikeet	V,P		1	
Animalia	Aves	Psittacidae	0309	*^^Lathamus discolor*		Swift Parrot	E1,P,3	CE	10	
Animalia	Aves	Strigidae	0248	*^^Ninox strenua*		Powerful Owl	V,P,3		52	
Animalia	Aves	Tytonidae	0250	*^^Tyto novaehollandiae*		Masked Owl	V,P,3		1	
Animalia	Aves	Meliphagidae	0603	*Anthochaera phrygia*		Regent Honeyeater	E4A,P	CE	6	
Animalia	Mammalia	Dasyuridae	1008	*Dasyurus maculatus*		Spotted-tailed Quoll	V,P	E	2	
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*		Koala	E1,P	E	3	
Animalia	Mammalia	Burramyidae	1150	*Cercartetus nanus*		Eastern Pygmy-possum	V,P		1	
Animalia	Mammalia	Petauridae	1137	*Petaurus norfolcensis*		Squirrel Glider	V,P		31	
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*		Grey-headed Flying-fox	V,P	V	48	
Animalia	Mammalia	Molossidae	1329	*Micronomus norfolkensis*		Eastern Coastal Free-tailed Bat	V,P		3	
Animalia	Mammalia	Vespertilionidae	1372	*Falsistrellus tasmaniensis*		Eastern False Pipistrelle	V,P		3	
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*		Southern Myotis	V,P		3	
Animalia	Mammalia	Vespertilionidae	1361	*Scoteanax rueppellii*		Greater Broad-nosed Bat	V,P		3	
Animalia	Mammalia	Vespertilionidae	1025	*Vespadelus troughtoni*		Eastern Cave Bat	V,P		4	
Animalia	Mammalia	Miniopteridae	1346	*Miniopterus australis*		Little Bent-winged Bat	V,P		20	
Animalia	Mammalia	Miniopteridae	3330	*Miniopterus orianae oceanensis*		Large Bent-winged Bat	V,P		8	
Animalia	Mammalia	Dugongidae	1558	*Dugong dugon*		Dugong	E1,P		1	
Plantae	Flora	Apocynaceae	1226	*Cynanchum elegans*		White-flowered Wax Plant	E1	E	1	
Plantae	Flora	Elaeocarpaceae	6205	*Tetratheca glandulosa*			V		1	
Plantae	Flora	Elaeocarpaceae	6206	*Tetratheca juncea*		Black-eyed Susan	V	V	151	
Plantae	Flora	Myrtaceae	4283	*Rhodamnia rubescens*		Scrub Turpentine	E4A	CE	2	
Plantae	Flora	Myrtaceae	4293	*Syzygium paniculatum*		Magenta Lilly Pilly	E1	V	6	
Plantae	Flora	Orchidaceae	11806	*^Corybas dowlingii*		Red Helmet Orchid	E1,P,2		2	

The following listed include marine estuarine species only.

Little Tern records (Source: Birdata 2022)

Little Tern records (Source: eBird 2022)

Australian Government
Department of Agriculture, Water and the Environment

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: 15-Sep-2022

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:	None
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	87
Listed Migratory Species:	73

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

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 http://www.environment.gov.au/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:	11
Commonwealth Heritage Places:	None
Listed Marine Species:	98
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
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:	4
Regional Forest Agreements:	1
Nationally Important Wetlands:	2
EPBC Act Referrals:	8
Key Ecological Features (Marine):	None
Biologically Important Areas:	6
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

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 buffer area only
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area	In buffer area only
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	Endangered	Community likely to occur within area	In feature area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area	In feature area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only

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
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known 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
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat 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 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

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may 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 buffer area only
Grantiella picta Painted Honeyeater [470]	Vulnerable	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	In feature area
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]	Vulnerable	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
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In buffer area only
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In buffer area only
Pycnoptilus floccosus Pilotbird [525]	Vulnerable	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely 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 buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche eremita			
Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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	Foraging, feeding or related behaviour known to occur within area	In feature area
FISH			
Epinephelus daemelii			
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 buffer area only
Seriolella brama			
Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area	In buffer area only
Thunnus maccoyii			
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area
FROG			
Litoria aurea			
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area	In feature area
Uperoleia mahonyi Mahony's Toadlet [89189]	Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population) 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
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Petauroides volans Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area	In feature area
Petaurus australis australis Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) 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
Potorous tridactylus tridactylus Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Pteropus poliocephalus](#) Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
PLANT			
[Acacia bynoeana](#) Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Angophora inopina](#) Charmhaven Apple [64832]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Caladenia tessellata](#) Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Corunastylis insignis](#) Wyong Midge Orchid 1, Variable Midge Orchid 1 [84692]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Cryptostylis hunteriana](#) Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Cynanchum elegans](#) White-flowered Wax Plant [12533]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Diuris praecox](#) Newcastle Doubletail [55086]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Eucalyptus camfieldii](#) Camfield's Stringybark [15460]	Vulnerable	Species or species habitat may occur within area	In feature area
[Eucalyptus parramattensis subsp. decadens](#) Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Euphrasia arguta](#) [4325]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Grevillea parviflora subsp. parviflora Small-flower Grevillea [64910]	Vulnerable	Species or species habitat known to occur within area	In feature area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area	In feature area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area	In buffer area only
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may 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 likely to occur within area	In feature area
Rutidosis heterogama Heath Wrinklewort [13132]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area	In feature area
Tetratheca juncea Black-eyed Susan [21407]	Vulnerable	Species or species habitat known to occur within area	In feature area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In feature area
REPTILE			

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
SHARK			
[Carcharias taurus (east coast population)](#) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Galeorhinus galeus](#) School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	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 buffer area only
[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

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat likely to occur within area	In feature area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In buffer area only
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat 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 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
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely 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
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sternula albifrons Little Tern [82849]		Breeding likely to occur within area	In buffer area only
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 buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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

Scientific Name	Threatened Category	Presence Text	Buffer Status
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	Foraging, feeding or related behaviour known to occur within area	In feature area
Migratory Marine Species			
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area	In buffer area only
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In buffer area only
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area
Dugong dugon Dugong [28]		Species or species habitat may occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour 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 buffer area only
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In buffer area only
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In buffer area only
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may 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	Foraging, feeding or related behaviour known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
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
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely 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 known to occur within area	In feature area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat likely to occur within area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area	In feature area
[Charadrius bicinctus](#) Double-banded Plover [895]		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
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In feature area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
[Limicola falcinellus](#) Broad-billed Sandpiper [842]		Species or species habitat known to occur within area	In feature area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In feature area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to 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
Commonwealth Trading Bank of Australia		
Commonwealth Land - Commonwealth Trading Bank of Australia [11726]	NSW	In buffer area only
Communications, Information Technology and the Arts - Australian Postal Corporation		
Commonwealth Land - Australian Postal Commission [11724]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Australian Postal Commission [11729]	NSW	In buffer area only
Commonwealth Land - Australian Postal Commission [11728]	NSW	In buffer area only
Commonwealth Land - Australian Postal Commission [11730]	NSW	In buffer area only
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [11723]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11732]	NSW	In buffer area only
Commonwealth Land - Telstra Corporation Limited [15536]	NSW	In buffer area only
Defence - Defence Housing Authority		
Commonwealth Land - Director of War Service Homes [11725]	NSW	In buffer area only
Commonwealth Land - Director of War Service Homes [11720]	NSW	In buffer area only
Unknown		
Commonwealth Land - [11721]	NSW	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus Common Noddy [825]		Species or species habitat may 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]		Species or species habitat likely to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Ardenna pacifica as Puffinus pacificus](#) Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In buffer area only
[Arenaria interpres](#) Ruddy Turnstone [872]		Species or species habitat 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]		Species or species habitat known to occur within area	In feature area
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	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 known to occur within area overfly marine area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat likely to occur within area overfly marine area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In feature area
[Calonectris leucomelas](#) Streaked Shearwater [1077]		Species or species habitat known to occur within area	In feature area
[Charadrius bicinctus](#) Double-banded Plover [895]		Species or species habitat known to occur within area overfly marine 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
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In feature area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In feature area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area	In buffer area only
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
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area	In buffer area only
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely 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
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine 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
Larus dominicanus Kelp Gull [809]		Breeding known to occur within area	In buffer area only
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Limicola falcinellus Broad-billed Sandpiper [842]		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

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Macronectes halli](#) Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[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
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat likely 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]		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 phaeopus](#) Whimbrel [849]		Species or species habitat known to occur within area	In feature area
[Pachyptila turtur](#) Fairy Prion [1066]		Species or species habitat known to occur within area	In feature area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In feature area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine 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 skua as Catharacta skua Great Skua [823]		Species or species habitat may occur within area	In buffer area only
Sternula albifrons as Sterna albifrons Little Tern [82849]		Breeding likely to occur within area	In buffer area only
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 buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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	Foraging, feeding or related behaviour known to occur within area	In feature area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Tringa stagnatilis](#) Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to 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 buffer area only
[Festucalex cinctus](#) Girdled Pipefish [66214]		Species or species habitat may occur within area	In buffer area only
[Filicampus tigris](#) Tiger Pipefish [66217]		Species or species habitat may occur within area	In buffer area only
[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 penicillus](#) Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In buffer area only
[Hippocampus abdominalis](#) Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area	In buffer area only
[Hippocampus whitei](#) White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[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 buffer area only
[Maroubra perserrata](#) Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In buffer area only
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In buffer area only
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area	In buffer area only
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In buffer area only
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area	In buffer area only
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In buffer area only
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In buffer area only
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In buffer area only
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In buffer area only
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In buffer area only
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In buffer area only
Mammal			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In buffer area only
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area	In buffer area only
Dugong dugon Dugong [28]		Species or species habitat may occur within area	In feature area
Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area	In buffer area only

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			

Current Scientific Name	Status	Type of Presence	Buffer Status
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may 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 buffer area only
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In buffer area only
Lagenorhynchus obscurus Dusky Dolphin [43]		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 buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat likely to occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		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 buffer area only
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In buffer area only

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Lake Macquarie	State Conservation Area	NSW	In buffer area only
Moon Island	Nature Reserve	NSW	In buffer area only
Pulbah Island	Nature Reserve	NSW	In buffer area only
Wallarah	National Park	NSW	In buffer area only

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Jewells Wetland	NSW	In buffer area only
Lake Macquarie	NSW	In feature area

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Open cut coal mine and extension to underground mine.	2006/2542	Controlled Action	Completed	In buffer area only
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Myuna Colliery extension of underground mining	2011/5956	Not Controlled Action	Completed	In buffer area only
Northern Precinct residential development	2007/3412	Not Controlled Action	Completed	In buffer area only
Road interchange	2002/592	Not Controlled Action	Completed	In buffer area only
Wallarah Peninsula Residential development	2004/1490	Not Controlled Action	Completed	In feature area
Wallarah Peninsula residential development - coastal sector	2006/2810	Not Controlled Action	Completed	In buffer area only
Referral decision				
Breeding program for Grey Nurse Sharks	2007/3245	Referral Decision	Completed	In buffer area only

Biologically Important Areas

Scientific Name	Behaviour	Presence	Buffer Status
Dolphins			
Tursiops aduncus			
Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Breeding	Likely to occur	In buffer area only
Seabirds			
Ardenna grisea			
Sooty Shearwater [82651]	Foraging	Likely to occur	In feature area
Ardenna pacifica			
Wedge-tailed Shearwater [84292]	Foraging	Likely to occur	In feature area
Ardenna tenuirostris			
Short-tailed Shearwater [82652]	Foraging	Likely to occur	In feature area
Sharks			
Carcharias taurus			
Grey Nurse Shark [64469]	Foraging	Known to occur	In buffer area only
Whales			
Megaptera novaeangliae			
Humpback Whale [38]	Foraging	Known to occur	In buffer area only

Bioregional Assessments

SubRegion	BioRegion	Website	Buffer Status
Hunter	Northern Sydney Basin	BA website	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.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

Appendix 3: Existing Mapping

1: NSW Estuarine Macrophytes

2: NSW Resilience and Hazards SEPP

3: NSW KFH Map

4: Lake Macquarie Vegetation Mapping 2022

Department of Primary Industries

Legend

NSW Estuarine Macrophytes

- Posidonia
- Posidonia - Sparse
- Posidonia/Zostera
- Posidonia/Zostera/Halophila
- Posidonia/Halophila
- Posidonia/Halophila/Ruppia
- Posidonia/Ruppia
- Zostera
- Zostera - Sparse
- Zostera/Halophila
- Zostera/Halophila/Ruppia
- Zostera/Ruppia
- Halophila
- Halophila/Ruppia
- Ruppia
- Mangrove
- Mangrove/Saltmarsh
- Saltmarsh

Notes

0.9 0 0.46 0.9 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

16-Sep-2022

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Department of Primary Industries

Legend

- Coastal Wetlands
- Proximity Area for Coastal Wet
- Littoral Rainforests
- Proximity Area for Littoral Rain
- Coastal Vulnerability Area Map this time
- Coastal Environment Area Map
- Coastal Use Area Map
- Land Application Map

Notes

0.9 0 0.46 0.9 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

16-Sep-2022

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Department of Primary Industries

Legend

Key Fish Habitat - Central Rive

Notes

3.7 0 1.83 3.7 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

16-Sep-2022

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

H2O CONSULTING GROUP

0 100 200 300 400 500 1,000 Meters

Scale: 1:7,000

SITE : Marks Point, Belmont NSW

Lake Macquarie Vegetation

DATE : 12/04/2023

Map Version : 1_0

Projected Coordinate System : GDA 2020 Zone 56

Aerial Imagery: Nearmap - 15/01/2023

WiZarDTech Spatial Services

Appendix 4: Threatened Species Assessments

Posidonia australis seagrass

Species Review

Name /Species		Status FM Act	Status EPBC Act
Posidonia australis		Endangered Population	Endangered Ecological Community
[illegible]	**Distribution**	**Habitat**	**Life History**
P. australis	*Posidonia australis* is endemic to the temperate waters of the south-eastern, southern and south-western coasts of Australia. It occurs in 20 estuaries along the east coast of New South Wales from Wallis Lake on the mid-north coast to Twofold Bay near the New South Wales/Victorian border.	The species can grow in coarse sandy to fine silty sediments at depths between the low tide line and approximately 10 m. It may also occur in deeper water if water clarity is good, as the plants require sufficient light to establish and grow.	Sexual reproduction is via the production of monoecious flowers that are pollinated underwater. *Posidonia australis* fruits in November and the floating fruits are distributed by currents before splitting open to expose the see. *Posidonia australis* have the ability to grow quite rapidly via asexual reproduction, however if the growing tips of the rhizomes are damaged, the plants cease to establish lateral rhizome runners and are very slow to recover.

Source: NSW DPI 2019.

7 Part Test – FM Act

***Posidonia australis* in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie (NSW) – Endangered Population (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.
Not Applicable
(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.
No *Posidonia australis* is expected to be directly removed as a result of these works although two small beds of mixed *P. australis* occurs within ~20 m of two separate sections of channel proposed for dredging. The dredging works may result in some additional minor physical disturbance to *P. australis* beds in the vicinity of the dredging works via temporary increases in turbidity and some minor sedimentation. These impacts will be temporary and generally limited to a small amount of mixed *P. australis* seagrass at the edge of the bed. No direct losses of *P. australis* seagrass are expected, while the 10 m buffer has been recommended will provide adequate protection during construction works from unexpected physical disturbances. Any remaining impacts will likely be limited to some minor edge effects as a result of reduced water quality and increased sedimentation during dredging. Given this, it is unlikely this action has potential to place at risk of extinction the local population of *P. australis* in Lake Macquarie.
(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)	The proposed dredging works will not result in any direct removal of mapped *P. australis*, any impacts will be limited to some potential edge disturbances where *P. australis* occurs nearby.
ii)	The proposed dredging the works won't result in any additional fragmentation of *P. australis* habitat within Lake Macquarie.
iii)	The *P. australis* habitat in proximity (20 m) to the Dredging works represents only the edges of two beds that in most part are unlikely to be disturbed.

(e) Whether the proposed development or activity is likely to have an adverse effect on any critical habitat (either directly or indirectly)

Not applicable

(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 and that pose a risk to *P. australis* populations include:

- The introduction of non-indigenous fish and marine vegetation to the coastal waters of NSW

Introduced and non-indigenous marine vegetation, such as *Caulerpa taxifolia*, has the potential to displace, smother and outcompete seagrasses such as *P. australis*. *Caulerpa taxifolia* is known to occur in Lake Macquarie and dredging works have the potential to introduce and/or spread it in the Study Area. Mitigation measures to reduce the introduction and spread of this and other species can be implemented during before mobilisation of dredging machinery and during dredging works to minimise this risk.

Conclusion	The proposed dredging works are not expected to result in any removal of the mapped *P. australis* population in Lake Macquarie. Any disturbances will be minimal and confined to the edge of two beds near the existing channel. The implementation of a 10 m buffer to dredging will provide additional protection for *P. australis* in the vicinity of the dredging works. Given this, any disturbances are unlikely to affect the viability and long-term survival of the Lake Macquarie population of *P. australis*.

Significant Impact Assessment: *Posidonia australis* in seagrass meadows of the Manning-Hawkesbury ecoregion – Endangered Ecological Community (EPBC Act)

***Posidonia australis* in seagrass meadows of the Manning-Hawkesbury ecoregion – Endangered Ecological Community (EPBC Act)**	**Likelihood of Impact**
An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:	
1. reduce the extent of an ecological community	
Lake Macquarie represents the central area of the extent of the community listed under the EPBC Act. This community is common in eastern areas of Lake Macquarie between Swansea and Belmont where good tidal exchange and shallow sandy sediments occur. The action is not expected to remove any mapped occurrences of *P. australis* in Lake Macquarie.	Unlikely
2. fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	
Dredging works will be confined to navigational channels in which *P. australis* does not directly occur. An additional 10 m buffer zone has also been recommended. No removal of *P. australis* and hence no fragmentation of the EEC is expected.	Unlikely
3. adversely affect habitat critical to the survival of an ecological community	
Any *P. australis* habitat with potential to be affected will be minimal, and confined to short-term water quality disturbances to two beds that occur within the vicinity of the proposed dredging works. Any long-term decline in these beds is not expected, while it is not considered critical to the survival of the ecological community in the wider locality.	Unlikely
4. modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	

The action is restricted to some potential minor habitat disturbances to *P. australis* within 20 m of the proposed works. This may include some exposure to short-term increases in sedimentation and turbidity. Given this action is also considered a routine action that has occurred previously, it is unlikely to be of significance to the survival of the ecological community in this locality	Unlikely
5. cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	
It is not expected that any mapped areas of *P. australis* will be removed as a result of dredging. Impacts will be confined to habitat disturbance such as sedimentation and elevated turbidity. These impacts have some minor potential to favour growth of undesirable species that can out-compete slow growing seagrasses such as *P. australis*. However, this disturbance is expected to restricted to isolated occurrences, will be minimal in nature and is unlikely to result in a decline of loss of functionality of the community in the wider locality.	Unlikely
6. cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • assisting invasive species, that are harmful to the listed ecological community, to become established, or • causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological • community which kill or inhibit the growth of species in the ecological community, or interfere with the recovery of an ecological community	
Impacts will be confined to habitat disturbance such as sedimentation and elevated turbidity. These impacts have some potential to favour growth of undesirable species that can out-compete slow growing seagrasses such as *P. australis* such as the invasive alga *C. taxifolia* or epiphytic algae that can smother seagrass. However, these disturbances will be short-term, minimal in nature and are unlikely to result in a substantial reduction in the quality or integrity of *P. australis* in Lake Macquarie.	Possible
7. interfere with the recovery of an ecological community.	
Short-term habitat disturbances from these proposed maintenance dredging works are considered unlikely to interfere with the recovery of the ecological community in the wider locality.	Unlikely
Conclusion	
The proposed dredging is not expected to remove any areas of mapped *P. australis*. Impacts will be confined to habitat disturbance such as sedimentation and elevated turbidity. These impacts have some potential to favour growth of undesirable species that can out-compete slow growing seagrasses such as *P. australis*. The application of a 10 m buffer between any mapped *P. australis* and areas to be dredged should adequately prevent direct disturbances to *P. australis* and is not considered to be representative of a significant impact on the environment under the EPBC Act.	

Threatened Shorebirds

Review of Species

Name /Species		Status BC Act	Status EPBC Act
Pied Oystercatcher *(Haematopus longirostris)*		Endangered	-
Little Tern *(Sternula albifrons)*		Endangered	Migratory
Species	**Distribution**	**Habitat and Prey**	**Breeding**
H. longirostris	Distributed around the entire Australian coastline, although it is most 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.
S. albifrons	Migrates from eastern Asia, and is found on the north, east and south-east Australian coasts. In NSW,	Almost exclusively coastal, preferring sheltered environments; however, may occur several kilometres from the sea in harbours, inlets and rivers. Feeds on small fish,	Nests in small, scattered colonies in low dunes or on sandy beaches (especially sand spits

Species	Distribution	Habitat and Prey	Breeding
	they arrive from September to November, occurring mainly north of Sydney with most departing by May.	crustaceans, insects, worms and molluscs, typically by diving while aerially foraging.	along the NSW coast), just above high tide mark near estuary mouths or adjacent to coastal lakes and islands. Breeds in spring and summer.

Sources: DPIE (2020)

5-Part Test – BC Act

Threatened Shore Birds – 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 the deposit of sand spoil from dredging onto both Spoil Island and Elizabeth Island have potential to impact directly and/or indirectly on breeding habitat for both the endangered Little Tern and Pied Oystercatcher. Impacts identified in Table 5 include loss of marine fauna, possible disturbance to threatened species and their habitat and possible noise impacts. Both species will utilise open sandy habitat above high tide in estuary entry areas typical of both of the identified recipient areas for the proposed works. Such ideal nesting habitat, albeit anthropogenic and purely as a result previous dredging activities, is not otherwise present at such high quality in the immediate Lake Macquarie entrance locality. Two pairs of the migratory Little Tern have been recorded nesting on the sand spoil on Elizabeth Island over the 2021/22 breeding period, and observations suggesting interest in nesting has also been observed on the spoil of Spoil Island at this same time, as well as at the commencement of dredging at this location in 2010. Attempts may have occurred in other non-surveyed years since the commencement of dredging in the study area. The Pied Oystercatcher has also been recorded present within the study area however breeding attempts at these locations by this species are currently undocumented. Should dredging works coincide with the breeding period. Spoil placed on current open, low slope and unvegetated areas of previously constructed spoil piles may directly impact on eggs and chicks. Dredging activities otherwise close to these areas may indirectly impact on the breeding behaviour of adults to occupy the nesting areas. Therefore, the proposed dredging may impact on nesting success during the breeding period. The Little Tern has only ~400 known breeding pairs within the state and current evidence indicates these numbers are declining. Once breeding sites are established, birds will show site fidelity. The Little Tern is not considered to maintain a viable local breeding population of individuals that return year to year to Lake Macquarie but rather the use of the estuary is likely opportunistic use for breeding young birds or overflow from nearby breeding areas (The Entrance and Manning River) and use by non-breeding birds (P. Straw Pers Comm). All breeding locations and breeding pairs within these locations are important to the viability of the overall population. Sporadic and likely opportunistic nesting during some of the recent breeding seasons since previous dredging placed sand on Elizabeth Island has been recorded within the Project Area, which consists of habitat likely created as a result of previous spoil placement. The information available indicates that during the season that this occurred, it was restricted to two pairs.. Also, with consideration to the site not likely providing any contribution to the population under natural vegetated conditions, it would be appropriate to conclude that any works that have potential to disturb nesting at this site for a single season, is not likely to cause significant impacts on the viability of the overall breeding population. In either case it is recommended that all efforts are undertaken for potential disturbances to be minimise and mitigated. Placement of sand will likely improve habitat quality for breeding as it will control and displace dense shoreline growth of Bitou Bush, which reduces nesting habitat potential for the Little Tern. This will likely have a positive impact (assuming the site is left in the correct condition) on the life cycle of any representation of breeding pairs from the local population that opportunistically nest in Lake Macquarie in future nesting seasons. Where the nesting season cannot be avoided there is some potential that the works could prevent opportunistic nesting if any suitable habitat remains. If suitable alternative habitats to nest nearby are not available this could trigger an adverse lifecycle impact on any nesting pairs seeking to utilise habitat in the project Area during the works.
(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 suitable nesting habitat present on the two islands has been created through previous dredging works and such nesting opportunity did not likely exist prior to 2007. New spoil from dredging works may further create future nesting habitat, particularly if placed over larger shrubs and plants that have colonised the spoil, making for progressively larger nesting areas. ii) The spoil areas on the islands provide potential threatened bird species breeding habitat. These birds can easily access these islands such that the available habitat will not become fragmented or isolated from use due to the proposal. The Little Tern is migratory. With respect to the threatened bird species breeding habitat, this will not be removed, fragmented or isolated. The modification will more likely improve its future use. With consideration to the sites importance, it represents only small numbers of sporadic and opportunistic nesting of part of the local Little Tern population, which is not considered a viable local population in Lake Macquarie, however with future management that supports year to year nesting by returning individuals this site could become or form a viable local population within Lake Macquarie. The significance of the site for breeding by the Pied Oystercatcher has not been demonstrated.
(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 Little Tern and Pied Oystercatcher.
Conclusion — It is important that nesting areas be avoided once breeding season for the Little Tern commences due to the potential significance of the sites for breeding within the locality. A number of mitigation measures to prevent direct and indirect impacts of dredging on nesting success of Little Tern and Pied Oystercatcher will also be required. Assuming that direct disturbances of Little Tern breeding habitat can be avoided during the breeding season and provided the appropriate mitigation measures are implemented and undertaken, the proposal is not considered likely to result in a significant impact on the viable local breeding populations of either species.

Significant Impact Criteria: Migratory Marine Birds – Little Tern

Significant Impact Criteria: Migratory Marine Birds (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	
New spoil from dredging works may further create future nesting habitat, particularly if placed over larger shrubs and plants that have colonised the spoil, making for progressively improved nesting sites. This modification is considered beneficial where it does not impact on or result in a disturbance during the breeding season of the Little Tern. Modifications to habitat as a result of spoil placement during the breeding season has a high potential to disturb and impact on breeding of the Little Tern at the locality and should be avoided.	Known
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	
The proposal is not likely to result in an invasive species harmful to the little tern becoming established in the Area. Instead, smothering with spoil the existing invasive Bitou Bush Scrub, which degrades potential nesting habitat, is likely to provide habitat improvement in regard to invasive species with potential to impact on the Little Tern	Unlikely
3. Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	
While the site is of lesser significance for nesting of the population that occurs in NSW, it remains of elevated ecological significance to nesting of Little Terns within the region. Placement of any spoil within this habitat during the breeding season has potential to seriously disrupt the life cycle of the population of the species that occurs within the locality.	Possible
Conclusion	
It is important that nesting areas be avoided once breeding season for the Little Tern commences due to the significance of the sites for breeding within the locality. If dredging is required to progress coinciding with the breeding period a suitable Species Management Plan would need to be developed that can ensure the works can be completed without a Significant Impact on the migratory Little Tern. The SMP could also guide the appropriate creation of future habitat. Assuming that direct disturbances of Little Tern breeding habitat can be avoided during the breeding season and provided the recommended mitigation measures are undertaken, the proposal is not considered likely to result in a significant impact on the viable local breeding populations of either species.	

White's Seahorse

Species Review

Name /Species		Status FM Act	Status EPBC Act
White's Seahorse (*Hippocampus whitei*)		Endangered	Endangered
H. whitei	Inhabits shallow-water estuarine habitats. Currently known to occur in eight estuaries on the NSW Coast, including Lake Macquarie, but is most abundant in Port Stephens, Sydney Harbour and Port Hacking. Its northern limit is Hervey Bay in Queensland and it has been historically recorded as far south as St Georges Basin in NSW.	The species is known to occur from depths of 1 m to 18 m. Habitats that are considered important habitat for the White's Seahorse include natural habitats such as seagrass meadows, sponge gardens and soft corals. It is also known to use artificial habitats such as protective swimming net enclosures and jetty pylons. In the Sydney and Hunter region, including Lake Macquarie, they are most likely to be found occurring on the artificial protective swimming net habitats and, to a lesser extent, pylons and *P. australis* seagrass.	Known to live for up to six years and the breeding season is from September to around February. They display long-term monogamy to their partners and the pregnancy period is about 3 weeks. The male seahorse gives birth to 100 – 250 babies and can reproduce up to 8 times during the breeding season.

Source: NSW DPI 2019.

7-Part Test – FM Act

Threatened White's Seahorse – 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.
White's Seahorse is known to utilise seagrass habitats within the locality, with a strong preference for *P. australis* seagrass beds. There are many areas of *Zostera* sp. seagrass habitat, of which the denser stands may provide some marginal habitat for this species within the Study Area, including in close proximity to the proposed dredging areas. There is considered to be a moderate likelihood of occurrence of this species in these seagrass beds, given the extensive beds of *P. australis* and *Zostera* in nearby Swan Bay. If individuals are present in beds nearby the Dredging Site, dredging works may result in disturbance to these individuals. Similarly, over a medium- to long-term timeframe, if individuals are present in beds nearby to the Spoil Site and an episode of erosion/runoff of sediment-laden water occurs, then that may also result in disturbance to individuals. In any case, there are substantial amounts of adjacent and connected habitat for this species to move to if disturbed during dredging works or instances of erosion pluming. Given the above, the dredging works do not have potential to have an adverse effect on the life cycle of the species such that a viable local population of the species in Lake Macquarie 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
White's Seahorse may potentially occur in *Posidonia*, *Zostera* and *Halophila* seagrass beds within parts of the Study Area at times. I. The project proposal will not result in any removal of *Posidonia* or marginal habitat provided by *Zostera* and *Halophila* seagrass beds. There remains, however, some potential for modification of some small areas of the latter, marginal habitat in waters surrounding the Elizabeth Island Spoil Site via damage due to contact with the spoil slurry transfer pipeline and/or smothering of seagrass by sediments should there be excessive erosion of the onshore spoil piles. II. The project proposal will not result in any seagrass habitat becoming fragmented or isolated from other areas of habitat. III. The small areas of seagrass that are at minor risk of modification via pipeline contact and/or sedimentation/smothering offer only marginal habitat for this species and are not considered of importance to the long-term survival of the species or ecological community 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 White's Seahorse.
(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.
This question is not applicable, as no recovery plan or threat abatement plan has been prepared for White's Seahorse.
(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 project do not have potential to impact on White's Seahorse.

Conclusion	The viability of the White's Seahorse population that utilises *Posidonia* beds and other marginal habitat (*Zostera* and *Halophila* seagrass beds) within and around the Study Area, and other preferred habitat (*Posidonia australis*, jetties/pylons) in Swan Bay beyond the Study Area, is unlikely to be significantly affected by the proposed maintenance dredging and spoil stockpiling. Some temporary minor disturbances to marginal habitat for White's Seahorse may occur at times during dredging works and/or after project completion if onshore spoil piles erode into nearshore waters. These disturbances would, however, be minimal at a population level and confined to marginal habitats associated with *Zostera* and *Halophila* seagrass beds.

Significant Impact Criteria: White's Seahorse

Significant Impact Criteria: White's Seahorse (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 a population or important population of a species	
Some habitat for White's Seahorse is provided by *P. australis* and *Zostera*/*Halophila* seagrass patches located adjacent to the proposed dredging and/or in waters adjacent to the Elizabeth Island Spoil Site. Some of these patches may be impacted via temporary minor disturbances to habitat quality (turbidity, minor sedimentation) during dredging activities. Other areas of this marginal habitat in waters surrounding the Spoil Site may potentially be impacted via damage due to contact with the spoil slurry transfer pipeline and/or smothering of seagrass by sediments should there be excessive erosion of the onshore spoil piles. No White's Seahorses were observed during the site surveys, although there is nevertheless the potential for individuals to be present in those seagrass areas at those times. While the proposed project is not expected to have an impact at the population level for White's Seahorse in Lake Macquarie, there remains a potential for temporary disturbances to habitat quality (turbidity, minor sedimentation) that may elicit a flight response by any individuals present and put them at increased risk of predation. Given this species is rare, sparsely spread, and unlikely to occur in high densities within the marginal habitat provided by *Zostera* and *Halophila* seagrass beds, it remains unlikely the proposed project would have a significant impact over a spatial scale or of a magnitude that may result in a local population decline for White's Seahorse.	Unlikely
2. reduce the area of occupancy of an important population	
White's Seahorse is known to occur in Lake Macquarie, with natural habitat typically including seagrasses and complex, highly vegetated rocky reefs. However, in partially urbanised estuaries such as Lake Macquarie White's Seahorse is commonly associated with artificial structures, especially netted swimming pool enclosures and jetty piles with suitable habitat provided by marine growth. If present in the *Posidonia* or *Zostera*/*Halophila* seagrass habitat within the Study Area during dredging activities or subsequent instances of excessive erosion of spoil piles, the greatest potential for direct impact on White's Seahorse would be via disturbances to habitat and habitat quality (turbidity, sedimentation) that may elicit a flight response by individuals and put them at increased risk of predation. Given this, these disturbances are unlikely to reduce the area of occupancy of an important population of White's Seahorse that may occur in Swansea Channel.	Unlikely
3. fragment an existing important population into two or more populations	
It is unlikely that a population of White's Seahorse is reliant on habitat nearby the Dredging Site or Spoil Site. Any habitat use is likely to be occasional and sporadic, if at all. Any minor disturbances to these beds are unlikely to have potential to fragment a local population of White's Seahorse.	Unlikely
4. adversely affect habitat critical to the survival of a species	
Posidonia australis beds, which are the preferred seagrass habitat and critical to the survival of White's Seahorse, are present in Lake Macquarie, including a substantial meadow nearby in Swan Bay that will not be directly impacted by the proposed project. There are, however, small sections of two beds that occur in the vicinity of the proposed dredging works that may be subjected to temporary, minor indirect disturbances to habitat quality (turbidity, minor sedimentation) during dredging activities. Minor disturbance to this and the more marginal *Zostera* and *Halophila* seagrass habitat within the Study Area is unlikely to be critical to the survival of White's Seahorse.	Unlikely
5. disrupt the breeding cycle of an important population or seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	
White's Seahorse was not observed during the site survey, and any use of marginal seagrass habitat within the Study Area is likely to be minimal and restricted to occasional use by individuals of the species, if at all. Given this, the likelihood that an ecologically significant proportion of the local population of this species occurs within the Study Area, and for the proposed project to result in the lifecycle of a significant proportion of the White's Seahorse population to be disrupted is unlikely.	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 or an area of important habitat for a species	
Some *P. australis* habitat and other marginal habitat for White's Seahorse provided by *Zostera*/*Halophila* seagrass patches are located adjacent to the proposed dredging and in waters adjacent to the Spoil Site. Some of these patches may be impacted via temporary minor disturbances to habitat quality (turbidity, minor sedimentation) during dredging activities. Other areas of this marginal habitat in waters surrounding the Spoil Site may potentially be impacted via damage due to contact with the dredge pipes and/or smothering of seagrass by sediments should there be excessive erosion of the onshore spoil piles. Given the habitat involved is considered generally marginal, the potential for habitat impacts to contribute to a localised decline in the species is considered low.	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 White's Seahorse are likely to be released or have their population enhanced as a result of this proposed project.	Unlikely
8. introduce disease that may cause the species to decline, or	
The proposed project is unlikely to result in the introduction of disease that may cause a decline in the White's Seahorse population.	Unlikely
9. interfere substantially with the recovery of the species.	
A recovery plan for White's Seahorse has not been prepared	n/a
For listed migratory species	
10. 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	
Not applicable	n/a
11. seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	
Not applicable	n/a
Conclusion	
It is unlikely that the White's Seahorse population that utilises *Posidonia australis* habitat and other marginal habitat (*Zostera* and *Halophila* seagrass beds) within the Study Area, and other preferred habitat (*Posidonia australis*, jetties/pylons) in Swan Bay beyond the Study Area, will be impacted by the proposed maintenance dredging and spoil stockpiling operations. Some temporary minor disturbances to White's Seahorse individuals or habitat may occur at times during dredging works and/or after project completion if onshore spoil piles erode into nearshore waters. These disturbances would, however, be minimal at a population level and confined to relatively marginal seagrass habitats.	

H2O Consulting Group Pty Ltd

E: info@h2oconsultinggroup.com.au | W: www.h2oconsultinggroup.com.au

Appendix C: Agency Consultation Responses

Department of Planning and Environment

Our ref: DOC22/949683-2

Mr Kevin Morton
Principal Manager Maritime Infrastructure Programs (North)
Maritime Infrastructure Delivery Officer
Transport for New South Wales

By email: kevin.morton@transport.nsw.gov.au

Dear Mr Morton

Subject: Proposed Swansea Channel Dredging – Advice on an updated Review of Environmental Factors and a proposed small dredging campaign

Thank you for your letter dated 25 October 2022 in which Transport for New South Wales (TfNSW) invited Biodiversity and Conservation Division (BCD) of the Department of Planning and Environment for advice in relation to the preparation of a Review of Environmental Factors (REF). The REF from 2014 is to be updated ahead of planned small dredging campaign in the Swansea Channel and is to consider current regulatory requirements. The dredging works would be done as a Part 5 activity under Division 5.1 of the *Environmental Planning and Assessment Act 1979*.

BCD has reviewed proposal and the previous REF. Following this review BCD's key comments relate to:

- the timing of the proposed dredging (November-December), that coincides with the breeding of Little Tern (*Sternual albifrons*) and Pied Oystercatcher (*Haematopus longirostris*) both species listed as 'endangered' under the Biodiversity Conservation Act 2016. Little Terns have been recorded breeding between October and March, and Pied Oystercatchers between August and January,
- the location of two of the proposed sand dredging deposit sites:
  (a) the southern end of Spoil Island foreshore, an historical nesting site for Little Terns and Pied Oystercatchers,
  (b) the southern end of Elizabeth Island, an historical nesting site for Little Terns and a feeding and roosting site at low tide for shorebirds of conservation importance,
- key legislation including the Environmental Planning and Assessment Act 1979 (EP&A Act), Environmental Planning and Assessment Regulations 2021 (EP&A Reg), Coastal Management Act 2016 (CM Act), and the State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP), and
- recommendations and actions set out in the certified Lake Macquarie Coastal Zone Management Plan and the draft Lake Macquarie Coastal Management Program.

Biodiversity and Conservation Division's (BCD) recommendations are provided in **Attachment A** and detailed comments are provided in **Attachment B.** If you have any further questions about this issue, please contact Neil Kelleher, Senior Team Leader, Water Floodplains and Coast, on 0243 204 206 or at huntercentralcoast@environment.nsw.gov.au

Yours sincerely

14 November 2022

Neil Kelleher
Senior Team Leader, Water Floodplains and Coast
Hunter Central Coast Branch
Biodiversity and Conservation Division

Enclosure: Attachments A and B

BCD's recommendations

Proposed Swansea Channel Dredging – Advice on an updated Review of Environmental Factors and a proposed small dredging campaign

Biodiversity

1. BCD recommends that in order to avoid impacts, dredging and spoil placement operations should not occur proximate to Little Tern nesting/roosting sites between November and February of any year.

2. BCD recommends that the updated REF considers current records of threatened species, populations and communities that may be impacted by dredging campaigns in the Swansea Channel.

3. BCD recommends that the proponent obtain a current (no more than two-months old) set of threatened biodiversity records and checks the NSW Threatened Species Scientific Committee Final Determinations for local threatened ecological communities to update the REF. The potential impact of any proposed dredging campaigns will then be considered against a current dataset of local threatened biodiversity.

4. A REF will not cover actions that are likely to have significant impacts to threatened biodiversity. If significance is triggered then an Environmental Impact Statement will need to be prepared, in which impacts to threatened biodiversity must be assessed either by application of the Biodiversity Assessment Method 2020 or a Species Impact Statement.

Coastal Management

5. BCD recommends that the updated REF considers the environmental factors set out in cl171(2) of the *Environmental Planning and Assessment Regulations 2021* (EP&A Reg), including but not limited to; direct, indirect and cumulative impacts (beneficial and adverse) on coastal processes and hazards, especially:

    a. sediment grain size, roundness and colour

    b. sediment transport pathways at the extraction and nourishment site/s

    c. profile recovery and erosion buffer at the nourishment site/s

    d. water quality as a result of extraction and nourishment activities

    As well as direct, indirect and cumulative impacts (beneficial and adverse) on:

    e. cultural heritage, including Aboriginal cultural heritage and site amenity, maritime historical heritage, and post-settlement cultural amenity

    f. coastal infrastructure, shipping, defence and other coastal uses

    g. social matters (e.g. access, recreational activities, fishing, visual amenity etc.)

    h. economic costs and benefits.

6. BCD recommends that the updated REF considers the objects of the *Coastal Management Act 2016* (CM Act) in the design of the proposed activities.

7. BCD recommends that the updated REF meets the management objectives of the coastal management areas defined in the CM Act.

8. BCD recommends that the updated REF considers the impacts of various environmental and cultural factors specific to the classification of each mapped area within the coastal zone as per the conditions set out in the *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP). In particular, the REF should address mapping and characterisation of coastal and marine habitat types of Swansea Channel and surrounds of Lake Macquarie (especially littoral rainforests, wetlands, beaches, and shoals), and a description of their sensitivity and resilience.

9. BCD recommends that the updated REF considers the Sustainable Framework for Navigation in Swansea Channel in the design of a dredging regime.

10. BCD recommends that the updated REF consults with Crown Lands and Lake Macquarie City Council to consider how Action T 3-1, P4 from the Lake Macquarie CZMP has been implemented in the past, the success of the action, and its contribution to the design of the proposed dredging regime.

11. BCD recommends that the updated REF considers the feasibility of a sand slug configuration placement described in Action A3.9 from the draft Lake Macquarie CMP in the long-term design of the proposed dredging regime.

12. Based on Actions C4.1-4.5 from the draft Lake Macquarie CMP, BCD recommends that the updated REF considers the opportunities for dredged sand to be utilised in sand nourishment at priority locations, to assist in protection of the Little Tern breeding sites on the islands within Swansea Channel where spoil is proposed to be placed.

13. BCD recommends that the proposed activities within the updated REF meet the requirements for water quality management as described in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

General comment

14. BCD recommends that the management actions in this advice are included in the updated REF.

BCD's detailed comments

Proposed Swansea Channel Dredging – Advice on an updated Review of Environmental Factors and a proposed small dredging campaign

Biodiversity

1. **Dredging works must avoid impacts to the little tern**

The little tern (*Sternula albifrons*) is likely to be impacted by the proposed dredging campaign. The species is migratory, arriving in the NSW Central Coast usually between August and November and usually breeds between November and December. Chicks have normally fledged by February (https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10769). Little terns are known to breed on islands in the Swansea Channel, including Spoil Island and Elizabeth Island, where spoil from the proposed dredging campaign is planned to be placed. A key threat to the Little Tern is through disturbance of any nesting shorebirds and direct mortality of eggs. For this reason, dredging and spoil placement operations should not occur proximate to Little Tern nesting/roosting sites between November and February of any year.

Recommendation 1

BCD recommends that in order to avoid impacts, dredging and spoil placement operations should not occur proximate to Little Tern nesting/roosting sites between November and February of any year.

2. **The updated REF will need to consider current records of threatened biodiversity**

The updated Review of Environmental Factors (REF) will need to consider current records of threatened species. Since the original REF was prepared in 2014 this list of threatened species and threatened populations in NSW has changed. The final determinations of many threatened ecological communities have also changed, which may change their extent. New records of threatened species have been made in and around the Swansea Channel. For these reasons, BCD considers that the current REF presents a dated view of the potential impact of dredging actions on threatened biodiversity.

TfNSW should consider the use of current records of threatened species, populations and communities in the development of the REF to ensure that Part 2, Division 2 of the *Biodiversity Conservation Act 2016* (BC Act) relating to the harm of threatened species, ecological communities or their habitats is satisfied.

Recommendation 2

BCD recommends that the updated REF considers current records of threatened species, populations and communities that may be impacted by dredging campaigns in the Swansea Channel.

3. **Use an updated dataset of local threatened biodiversity records when planning all dredging campaigns**

All dredging campaigns will need to consider the current listing of threatened species, populations and communities in Schedule 1 of the BC Act, if impacts to them are to be avoided. With time the REF will not maintain a current view of local threatened biodiversity, and thus it will not contain all of the details needed to avoid impacts to threatened biodiversity. This can be rectified by the proponent, or their consultant, obtaining a current (no more than two months old) set of licenced records from the BioNet Atlas from within five kilometres of the site of proposed works. (Please note that the public access records will be incomplete for this purpose). The NSW Threatened Species Scientific Committee Final Determinations of local threatened ecological communities should also be checked to see if those determinations have

changed in a way that will affect how those communities are considered by dredging campaigns.

Recommendation 3

BCD recommends that the proponent obtain a current (no more than two-months old) set of threatened biodiversity records and checks the NSW Threatened Species Scientific Committee Final Determinations for local threatened ecological communities to update the REF. The potential impact of any proposed dredging campaigns will then be considered against a current dataset of local threatened biodiversity.

4. **An Environmental Impact Statement is required if the proposed action is shown to have a significant impact on threatened biodiversity**

   If a proposed dredging campaign is likely to have a significant impact on threatened biodiversity, then an as per Section 5.7 of the *Environmental Planning and Assessment Act 1979*, an Environmental Impact Statement, rather than a REF will be required in order to gain approval for the activity. The test of significance is noted in Section 7.3 of the BC Act. If a proposed dredging campaign is considered likely to have a significant impact on local threatened biodiversity, then impacts to threatened biodiversity must be assessed either by application of the Biodiversity Assessment Method 2020 or a Species Impact Statement; the latter will also trigger a requirement for concurrence from BCD.

Recommendation 4

A REF will not cover actions that are likely to have significant impacts to threatened biodiversity. If significance is triggered then an Environmental Impact Statement will need to be prepared, in which impacts to threatened biodiversity must be assessed either by application of the Biodiversity Assessment Method 2020 or a Species Impact Statement.

Coastal Management

5. **The REF should consider the environmental factors set out in cl171(2) of the EP&A Reg 2021**

   An activity carried out under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) must consider the environmental factors set out in the Environmental Planning and Assessment Regulations 2021 (EP&A Reg). This includes guidelines that have been developed under cl170, or if no guidelines exist, the factors listed within cl171(2). As there are no relevant REF guidelines in place, the factors in cl171(2) will apply. In the context of the proposed works, these consist of:

a. the environmental impact on the community,

b. …

c. the environmental impact on the ecosystems of the locality

d. reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality,

e. the effects on any locality, place or building that has—

   i. aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance, or

   ii. other special value for present or future generations,

f. the impact on habitat of protected animals, within the meaning of the Biodiversity Conservation Act 2016,

g. the endangering of a species of animal, plant or other form of life, whether living on land, in water or in the air,

h. the long-term effects on the environment,

i. degradation of the quality of the environment,

j. risk to the safety of the environment,

k. reduction in the range of beneficial uses of the environment,

l. pollution of the environment,

…

o. the cumulative environmental effect with other existing or likely future activities,

p. the impact on coastal processes and coastal hazards, including those under projected climate change conditions,

q. applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1,

r. other relevant environmental factors.

Recommendation 5

BCD recommends that the updated REF considers the environmental factors set out in cl171(2) of the Environmental Planning and Assessment Regulations 2021 (EP&A Reg), including but not limited to; direct, indirect and cumulative impacts (beneficial and adverse) on coastal processes and hazards, especially:

a. sediment grain size, roundness and colour

b. sediment transport pathways at the extraction and deposition site/s

c. profile recovery and erosion buffer at the deposition site/s

d. water quality as a result of extraction and deposition activities

As well as direct, indirect and cumulative impacts (beneficial and adverse) on:

e. cultural heritage, including Aboriginal cultural heritage and site amenity, maritime historical heritage, and post-settlement cultural amenity

f. coastal infrastructure, shipping, defence and other coastal uses

g. social matters (e.g. access, recreational activities, fishing, visual amenity etc.)

h. economic costs and benefits.

6. The REF should consider the objects of the Coastal Management Act 2016

As the proposed activities are located within the coastal zone of New South Wales, the REF will need to address the objects of the Coastal Management Act 2016 (CM Act) and support the following:

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 co-ordinated 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 in order 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.

Recommendation 6

BCD recommends that the updated REF considers the objects of the Coastal Management Act 2016 (CM Act) in the design of the proposed activities.

7. The REF should respond to the management objectives for each coastal management area defined by the CM Act

The CM Act defines and sets out the management objectives for each of the coastal management areas. Swansea Channel is mapped as a combination of Coastal Wetlands and Littoral Rainforests Area, Coastal Environment Area, and Coastal Use Area and the below management objectives should therefore be met in the proposed activities:

Coastal Wetlands and Littoral Rainforests Area (CM Act cl 6(2))

a. to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity,

b. to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests,

c. to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration,

d. to support the social and cultural values of coastal wetlands and littoral rainforests,

e. to promote the objectives of State policies and programs for wetlands or littoral rainforest management.

Coastal Environment Area (CM Act cl 8(2))

a. to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity,

b. to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change,

c. to maintain and improve water quality and estuary health,

d. to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons,

e. to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place,

f. to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.

Coastal Use Area (CM Act cl 9(2))

a. to protect and enhance the scenic, social and cultural values of the coast by ensuring that—

   i. the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast, and

   ii. adverse impacts of development on cultural and built environment heritage are avoided or mitigated, and

   iii. urban design, including water sensitive urban design, is supported and incorporated into development activities, and

   iv. adequate public open space is provided, including for recreational activities and associated infrastructure, and

   v. the use of the surf zone is considered,

b. to accommodate both urbanised and natural stretches of coastline.

Recommendation 7

BCD recommends that the updated REF meets the management objectives of the coastal management areas defined in the CM Act.

8. The REF should consider impacts to the coastal zone as described in the Resilience and Hazards SEPP

The following considerations for the coastal management areas stated in the State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) should be included in the assessment:

Coastal Wetlands and Littoral Rainforests Area (Resilience and Hazards SEPP cl 2.8)

The REF should consider and respond to any of the below adverse impacts on land identified as “proximity area for coastal wetlands” or “proximity area for littoral rainforest”:

a. the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or

b. the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

Coastal Environment Area (Resilience and Hazards SEPP cl 2.10)

The REF should consider and respond to any adverse impacts on:

a. the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment

b. coastal environmental values and natural coastal processes

c. the water quality of the marine estate

d. marine vegetation, native vegetation and fauna and their habitats

e. existing public open space and safe access to and along the foreshore and beach for members of the public, including persons with a disability

f. Aboriginal cultural heritage, practices and places

g. the use of the surf zone

Coastal Use Area (Resilience and Hazards SEPP cl 2.11)

The REF should consider and respond to any adverse impacts on:

a. existing, safe access to and along the foreshore and beach for members of the public, including persons with a disability

b. the visual amenity and scenic qualities of the coast

c. Aboriginal cultural heritage, practices and places

d. cultural and built environment heritage

Recommendation 8

BCD recommends that the updated REF considers the impacts of various environmental and cultural factors specific to the classification of each mapped area within the coastal zone as per the conditions set out in the State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP). In particular, the REF should address mapping and characterisation of coastal and marine habitat types of Swansea Channel and surrounds of Lake Macquarie (especially littoral rainforests, wetlands, beaches, and shoals), and a description of their sensitivity and resilience.

9. The REF should consider Action T 3-1, B1 in the existing Lake Macquarie CZMP

The REF should take into consideration Action T 3-1, B1 in the Lake Macquarie CZMP, which states that Crown Lands, with support from Lake Macquarie City Council, are to “implement dredging and sand placement in accordance with the Sustainable Framework for Navigation in Swansea Channel. Smaller episodes of navigational dredging may be required

at other locations, such as the entrances to Swan Bay or Black Neds Bay, which could supply sand for local nourishment."

Recommendation 9

BCD recommends that the updated REF considers the Sustainable Framework for Navigation in Swansea Channel in the design of a dredging regime.

10. The REF should consider Action T 3-1, P4 in the existing Lake Macquarie CZMP

The REF should take into consideration Action T 3-1, B4 in the Lake Macquarie CZMP, which states that Crown Lands, with support from Lake Macquarie City Council (LMCC), is to "establish a protocol with Crown Lands about how and when sand dredged from Swansea Channel to maintain navigation could be used for beach nourishment and placed for future use for beach protection works at Salts Bay or elsewhere as required. Sand could be stored in dunes constructed landward of the existing frontal dune system." The REF should therefore consider how this action has been implemented in the past, the success of the action, and its contribution to the design of a dredging regime.

Recommendation 10

BCD recommends that the updated REF consults with Crown Lands and Lake Macquarie City Council to consider how Action T 3-1, P4 from the Lake Macquarie CZMP has been implemented in the past, the success of the action, and its contribution to the design of the proposed dredging regime.

11. The REF should consider the proposed Action A3.9 from the draft Lake Macquarie CMP

The REF should take into consideration Action A3.9 from the draft Lake Macquarie CMP, which states that LMCC with assistance from DPE will "investigate the feasibility of a sand slug configuration placement for future dredging campaigns. If feasible, undertake monitored trial(s) of configuration placement of sand slugs as sand becomes available."

Recommendation 11

BCD recommends that the updated REF considers the feasibility of a sand slug configuration placement described in Action A3.9 from the draft Lake Macquarie CMP in the long-term design of the proposed dredging regime.

12. The REF should consider the proposed Actions C4.1-4.5 from the draft Lake Macquarie CMP

The REF should take into consideration the following actions from the draft Lake Macquarie CMP:

a. Action C4.1 states that Transport for NSW (TfNSW) is to "implement dredging and sand placement in accordance with the Sustainable Framework for Navigation in Swansea Channel (SFNSC). Small episodes of navigation dredging may be required at Black Neds Bay (sand to be used to provide build dune resilience)."

b. Action C4.2 states that TfNSW is to "conduct regular hydro-survey of Swansea Channel in accordance with the SFNSC."

c. Action C4.3 states that TfNSW, with assistance from LMCC, is to "update the SFNSC to include channel evolution and impact of dredging on the natural environment."

d. Action C4.4 states that Crown Lands, TfNSW, and LMCC are to collaboratively carry out the action to "utilise dredged sand for nourishment at priority locations and in accordance with dune management plans and foreshore areas along the channel."

e. Action C4.5 states that Council and TfNSW, with support from Crown Lands, NSW Fisheries, and DPE, are to "investigate the feasibility of a west channel diversion to reconfigure and train the navigation channel via the Airforce Channel, to address scour, navigation and maintenance issues."

Recommendation 12

Based on Actions C4.1-4.5 from the draft Lake Macquarie CMP, BCD recommends that the updated REF considers the opportunities for dredged sand to be utilised in sand nourishment at priority locations, to assist in protection of the Little Tern breeding sites on the islands within Swansea Channel where spoil is proposed to be placed.

13. The REF should consider the requirements of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality

The updated REF should consider the impact of the proposed activities on water quality within and adjacent to the project site and include a description of relevant water quality objectives to protect environmental values as set out in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, including existing water quality at the dredging and deposition sites.

Recommendation 13

BCD recommends that the proposed activities within the updated REF meet the requirements for water quality management as described in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

General comment

14. Include BCD's recommendations in the updated Review of Environmental Factors

Recommendation 14

BCD recommends that the management actions in this advice are included in the updated REF.

DOC22/940400-1

Transport for NSW
Maritime Infrastructure Delivery Office

By email: kevin.morton@transport.nsw.gov.au

Attention: Mr Kevin Morton

Dear Mr Morton

Swansea Channel Dredging – Statutory Consultation – Invitation to Comment

I refer to your letter emailed on 24 October 2022 (**the Letter**) regarding an invitation for the Environment Protection Authority (**EPA**) to comment on the proposed Swansea Channel dredging and provide input for a Review of Environmental Factors (**REF**).

Transport for NSW advised in the Letter a dredging campaign planned for November and December 2022 to remove approximately between 20 000 and 25 000 cubic metres of sand from near the southern entrance to Swan Bay. The sand will be deposited at three locations within the channel. The EPA is the appropriate regulatory authority for the proposed works under Chapter 1, section 6(2)(c) of the *Protection of the Environment Operations Act* (**POEO Act**).

Extractive activities, such as dredging, are scheduled activities if they involve the extraction of more than 30 000 cubic metres of extractive materials per year. Based on the information provided, this campaign is not considered a scheduled activity and as such does not require and Environment Protection Licence.

The EPA reminds you; all activities must be conducted in a manner that does not cause pollution of waters. Additionally, in carrying out the Review of Environmental Factors (REF), you should refer to any relevant EPA guidelines and industry codes of practice to ensure it is sufficiently comprehensive and detailed.

If you have any questions about this matter, please contact Jenny Lange on (02) 4908 6891.

Yours sincerely

Jenny Lange
Unit Head
Regulatory Operations

1 November 2022

Phone 131 555 **TTY** 133 677 Locked Bag 5022 6 Parramatta Square **info@epa.nsw.gov.au**
Phone +61 2 9995 5555 **ABN** 43 692 285 758 Parramatta 10 Darcy St, Parramatta **www.epa.nsw.gov.au**
(from outside NSW) NSW 2124 Australia NSW 2150 Australia

7 November 2022

Mr Kevin Morton
Principal Manager Maritime Infrastructure Programs (North)
Transport for NSW – Maritime
kevin.morton@transport.nsw.gov.au

Dear Kevin

Subject: Swansea Channel Dredging - Statutory Consultation Response

We refer to your letter of 24 October concerning your invitation for Council to comment on Swansea Channel Dredging Statutory Consultation, and provide the following response:

Consistency with Lake Macquarie Coastal Zone Management Plan

The proposed dredging works are broadly consistent with the certified Lake Macquarie CZMP. However, the proposed sand placement (particularly at Elizabeth Island and Spoil Island) lack consistent with the CZMP.

Actions 3.2 of Part A (Coastline) of the CZMP states:

Conduct beach management works such as beach scraping to reshape dunes and increase dune volume/recovery after storms if necessary. This involves using earthmoving equipment to move sand from the swash zone (between Mean Low water and Mean High Water) to the frontal dune. There may be potential to place sand extracted from Swansea channel at these locations, subject to agreement with Trade and Investment – Crown Lands Division and contractual arrangements for managing Swansea Channel

Location: Blacksmiths Beach, Redhead Beach, Caves Beach, Near Belmont WWTP & Golf Course

Action B.1 of Part C (Channel) of the CZMP states:

Implement dredging and sand placement in accordance with the Sustainable Framework for Navigation in Swansea Channel. Smaller episodes of navigational dredging may be required at other locations, such as the entrances to Swan Bay or Black Neds Bay, which could supply sand for local nourishment. Sand dredged from Swansea Channel is a suitable source for nourishment of soft foreshores such as Salts Bay, Black Neds Bay and Pelican.

126-138 Main Road
Speers Point NSW 2284
Box 1906 HRMC NSW 2310

T 02 4921 0333
E council@lakemac.nsw.gov.au
W lakemac.com.au

lakemac lakemaccity ourlakemac

ABN: 81 065 027 868

Aquatic Ecology Assessment

Council staff had reviewed the Aquatic Ecology Assessment (AEA) report provided, particularly the section relating to wader birds. In light of this assessment, Council recommends that the recommendation of AEA be followed and there be no spoil placement on Elizabeth or Spoil Islands during the Little Tern breeding season (ie., until the last Little Terns have departed in late Summer as confirmed by an experienced ecologist).

Spoil Placement

It remains Council preference that dredge sand be used in a manner consistent with CZMP, being nourishment at Nine Mile Beach (current priority location for nourishment is adjacent to Maneela St, Blacksmiths).

A recent East Ward Councillor Site Inspection was held at Blacksmiths beach which will make the following recommendation at an upcoming Council meeting:

That Council write to Transport for NSW requesting that sand spoil material sourced from the upcoming emergency dredging works in Swansea Channel be utilised for beach nourishment purposes on the southern portions of Blacksmiths beach.

Council staff also wish to highlight the potential hazard posed by sand placement/stockpiling that results in steep batters. Unconsolidated sandy slopes can be unstable and hazardous to children playing and digging in the sand (which is known to occur in area).

Utilisation of Council Managed Assets

We seek confirmation if the proposal will involve TfNSW or its contractors utilising Council managed assets (such as the Naru Point site). Whilst Council has no objection to the appropriate use of these areas, we wish confirmation to enable us to prepare the necessary licence agreements in a timely manner to avoid any potential delays to the proposed works.

Should you require further information, please contact me on +61 2 4921 0393.

Yours faithfully,r

Symon Walpole
Principal Environmental Strategist
Environmental Systems

27 March 2023

David Hopper
Senior Officer Programs
Maritime Infrastructure Delivery Office
Dave.Hopper@transport.nsw.gov.au

Dear David

Subject: Swansea Channel Dredging - Statutory Consultation Response

We refer to our meeting of 20 March 2023 concerning Swansea Channel Dredging statutory consultation, and provide the following response:

Communication and engagement strategy:

We request that TfNSW prepare and implement a communication and engagement strategy for the project, and commence implementation as soon as possible. Stakeholders in this strategy should include our Mayor and Councillors, the Lake Macquarie Aquatic Services Committee, and Lake Macquarie Coastal Zone Management Committee.

Note: the next meeting of the Coastal Zone Management Committee is scheduled for 5 April 2023. Please confirm if you wish to have a TfNSW rep attend (online or in-person) or provide a written update.

Dredging location

We understand from the information provided that the proposed dredging location only addresses the shoaling in the North-South navigation channel (North of the dog-leg). Council requests that consideration also be given to including the shoaling at the Eastern end of the Air-force channel within the scope of the project.

We wish to highlight that Council does not wish for our suggested additional dredging location to result in any further delays to the commencement of dredging works. This additional dredging site should only be considered if it can be accommodated within the existing timeframe for the project.

126-138 Main Road
Speers Point NSW 2284
Box 1906 HRMC NSW 2310

T 02 4921 0333
E council@lakemac.nsw.gov.au
W lakemac.com.au

lakemac lakemaccity ourlakemac

ABN: 81 065 027 868

Spoil Placement

At its meeting of 12 December 2022, Lake Macquarie City Council resolved to request that TfNSW utilise sand spoil material sourced from the emergency dredging works in Swansea Channel for beach nourishment purposes on the southern portions of Blacksmiths Beach.

It remains Council preference that dredged sand (or a portion of the dredging spoil) be used for nourishment at Blacksmiths Beach with the current priority location being adjacent to Maneela Street.

However, we wish to highlight that Council does not wish for our preferred nourishment at Blacksmiths to result in any additional delays to the commencement of dredging works. This alternate nourishment site should only be considered if it can be accommodated within the existing timeframe for the project.

Consistency with Lake Macquarie Coastal Zone Management Plan

The proposed dredging works are broadly consistent with the certified Lake Macquarie CZMP. However, the potential sand placement site at Elizabeth Island lacks consistency with the CZMP.

Action B.1 of Part C (Channel) of the CZMP states:

Implement dredging and sand placement in accordance with the Sustainable Framework for Navigation in Swansea Channel. Smaller episodes of navigational dredging may be required at other locations, such as the entrances to Swan Bay or Black Neds Bay, which could supply sand for local nourishment. Sand dredged from Swansea Channel is a suitable source for nourishment of soft foreshores such as Salts Bay, Black Neds Bay and Pelican.

Actions 3.2 of Part A (Coastline) of the CZMP states:

Conduct beach management works such as beach scraping to reshape dunes and increase dune volume/recovery after storms if necessary. This involves using earthmoving equipment to move sand from the swash zone (between Mean Low water and Mean High Water) to the frontal dune. There may be potential to place sand extracted from Swansea channel at these locations, subject to agreement with Trade and Investment – Crown Lands Division and contractual arrangements for managing Swansea Channel.

Location: Blacksmiths Beach, Redhead Beach, Caves Beach, Near Belmont WWTP & Golf Course

Utilisation of Council Managed Assets

We request written confirmation if the dredging contractors intend to utilise any Council managed assets (such as the Naru Point site). Whilst Council has no objection to the appropriate use of these areas, we wish confirmation to enable us to prepare the necessary licence agreements in a timely manner to avoid any potential delays to the proposed works.

Should you require further information, please contact me on +61 2 4921 0393.

Yours faithfully,

Symon Walpole
Principal Environmental Strategist
Environmental Systems

Kevin Morton
Principal Manager Maritime Infrastructure Programs (North)
Maritime Infrastructure Delivery Office

Via email: Kevin.Morton@transport.nsw.gov.au

Re: Swansea Channel Dredging
Statutory Consultation – Invitation to Comment26

26 October 2022

Dear Kevin Morton,

Thank you for your letter dated 24 October 2022 requesting NSW Maritime provide comment on the proposed Swansea Channel dredging campaign to commence 21 November 2022 until 25 December 2022.

In accordance with *Marine Safety Act 1998* and *Marine Safety Regulation 2016* ("the regulation"), NSW Maritime is the responsible licensing official for aquatic activities ("activity") in or on any navigable waters, and that restrict the availability of those waters for normal use by the public. As such, a licence or written approval to conduct an activity shall be required by a person unless otherwise excluded by the regulation. Further, NSW Maritime is the relevant authority for approval of works on structures in, on or over the bed of any waters under the *Ports and Maritime Administration Act 1995.*

In consideration of the information contained within your letter of request, NSW Maritime (North) has no objections to the commencement of the proposed activity and provides this letter as written approval subject to the following conditions:

1. All work vessels must comply with the *Marine Safety (Domestic Commercial Vessel) National Law Act 2012*, the *Marine Safety Act 1998,* and all relevant subordinate legislation.

2. All work vessels must exhibit lights and shapes in accordance with the *International Regulations for Preventing Collisions at Sea 1972 (COLREGs).*

3. Prior to the commencement of any work, the development and implementation of a Vessel Traffic Management Plan (VTMP) must be undertaken by the contractor in consultation with the local Boating Safety Officer.

4. All pipes and associated equipment which will restrict or vary existing navigation conditions must 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.

5. It is the contractor's responsibility to supply, install, maintain, and remove all navigation aids that are required by the VTMP over the duration of the works, which may include:
    a) Navigation channel lateral marks,
    b) Channel blocked/closed signals,
    c) Navigation marks or signage required by NSW Maritime to ensure the safe and

d) efficient operation of the navigation channel or channels through or around the works, and
e) Temporary removal, relocation, or covering of any existing contradictory or superfluous signs, buoyage, or navigation marks.

6. The dredge Master shall maintain a radio listening watch on VHF channel 16 at all times.

7. Any marine pollution resulting from a work vessel must be reported to Transport for NSW by phoning 13 12 36, along with notifying the Senior Boating Safety Officer.

8. Notification shall be provided to NSW Maritime if the proposed works duration will likely extend beyond the above mentioned date.

9. All item(s) including vessel, plant, machinery, and auxiliary equipment must be removed from NSW State waters on completion of the works unless they otherwise hold an appropriate licence.

Prior to the commencement of the works, NSW Maritime may:

1. Publish a Marine or Gazette Notice to provide safety advice to vessel operators.

2. Request Marine Rescue NSW announce a Sécurité navigation safety message.

For on-water matters and VTMP contractor support, please contact Senior Boating Safety Officer:

- Brett Boehm on 0428 626 603 (until 23 November 2022), or
- James Lawson on 0428 322 316 (after 23 November 2022).

Information may also be supplied via email to navigationadvicenorth@transport.nsw.gov.au

If you have any further questions, please contact me on 0427 241 252 (until 07 November 2022), or Mike Baldwin on 0419 751 853 (after 7 November 2022).

Sincerely,

Paul Hearfield
A/Manager Waterways Operations Hunter
NSW Maritime

From: Cherie Colyer-Morris <cherie.colyer-morris@dpi.nsw.gov.au>
Sent: Friday, 5 May 2023 1:30 PM
To: Renae Martin <Renae.MARTIN@transport.nsw.gov.au>
Cc: Clare Naylor <Clare.Naylor@transport.nsw.gov.au>; Dave Hopper <Dave.Hopper@transport.nsw.gov.au>
Subject: RE: Dredging of Swansea main channel

Hi Renae,

As discussed, the main things to flag in your assessment are impacts to marine vegetation and threatened species.

Provided no impacts are identified then DPI Fisheries does not object to the proposed dredging activity.

Kind regards,

Cherie
Cherie Colyer-Morris (she/her) | Fisheries Manager – Coastal Systems Unit
NSW Department of Primary Industries | Fisheries
Port Stephens Fisheries Institute | Taylors Beach Road, Taylors Beach, NSW 2316
ALL MAIL TO: DPI Fisheries, Attn: M.Coughran,1243 Bruxner Hwy, Wollongbar NSW 2477
M: 0472 713 714 E: cherie.colyer-morris@dpi.nsw.gov.au

Appendix D: AHIMS and PACHCI Results

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : 2223/28

Client Service ID : 765260

Date: 20 March 2023

Lisa Proctor

PO Box 65

Cundletown New South Wales 2430

Attention: Lisa Proctor

Email: lisa@blueskyplanning.com.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -33.0688, 151.6201 - Lat, Long To : -33.0509, 151.651, conducted by Lisa Proctor on 20 March 2023.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

1	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Level 6, 10 Valentine Ave, Parramatta 2150
Locked Bag 5020 Parramatta NSW 2124
Tel: (02) 9585 6345

ABN 34 945 244 274
Email: ahims@environment.nsw.gov.au
Web: www.heritage.nsw.gov.au

19 April 2023

Dave Hopper
Project Manager
Transport for NSW

Dear Dave,

Preliminary assessment results for the Swansea Channel Dredging Minor Works based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation* (the procedure).

The project, as described in the Stage 1 assessment checklist, 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 works are within the Swansea channel and an Island where no impacts to Aboriginal cultural heritage are expected
- The project is unlikely to harm known Aboriginal objects or places (AHIMS site 45-7-0229).
- The AHIMS search indicated that there is one recorded Aboriginal site within the works areas.
- The study area does 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 Roads and Maritime Services' procedure, however, the cultural heritage potential of the study area appears to be unlikely due to the works being carried out in the channel on an Island where sand dredging spoil has been deposited previously.
- 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 Renae Martin to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Transport for NSW *Unexpected Heritage Items Procedure*.

For further assistance in this matter do not hesitate to contact me.

Transport for NSW

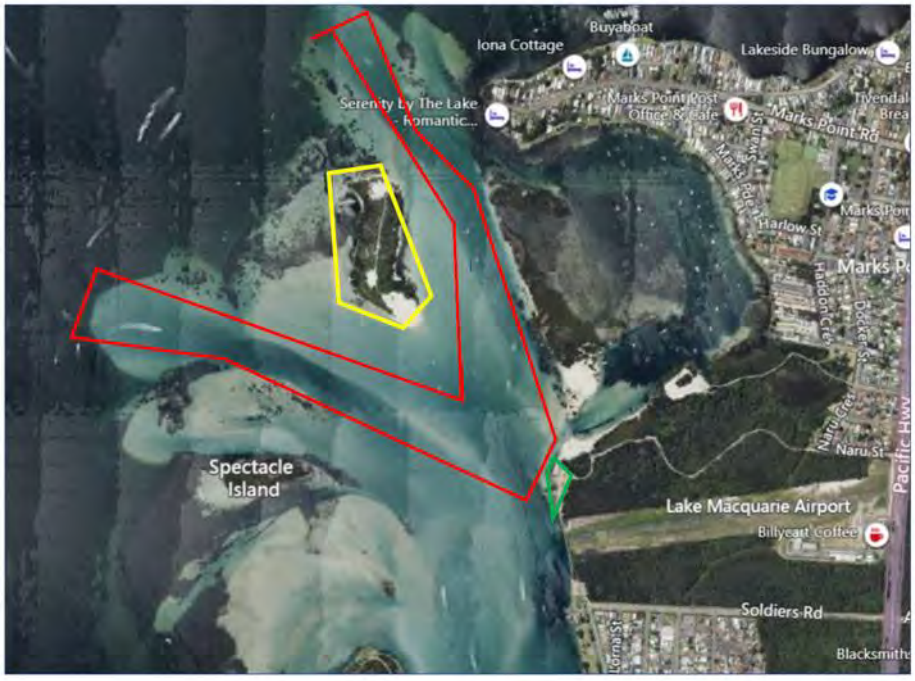
T 0428 683 845 **| E** lee.davison@transport.nsw.gov.au

Yours sincerely

Lee Davison

Lee Davison
Aboriginal Community and Heritage Partner

Project study area



Dredge Cut from locations within the marked navigation channels located within the Red area.

Sand Placement within the Yellow area.

Site compound within the green area.

Additional areas may be explored during the assessment process to allow more flexibility.

Appendix E: Noise Estimator

Transport for NSW

Noise Estimator (Individual Plant)

Please input information into yellow cells

Please pick from drop-down list in orange cells

Project name	Swansea Navigation Channel Maintenance Dredging
Scenario name	dredging of navigation channel
Receiver address	2 Lakeview Parade Pelican
Select area ground type	Water
Select type of background noise level input	Representative Noise Environment

Noise area category		Representative Noise Environment	User Input
		R3	
RBL or L_{A90} Background level (dB(A))	Day	50	
	Evening	45	
	Night	40	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	Day	60	
	Day (OOHW)	55	
	Evening	50	
	Night	45	

Is all plant at the same representative distance to the receiver? Y/N	Y	
Representative distance (m)	170	*All at Representative Distance*

Steps:

1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select the type of background noise level input - Representative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Is all plant at the same representative distance to the receiver? Select Y or N (cell C24):
   (a) where Y is selected - enter the representative distance in cell C25.
   (b) where N is selected - go to step #7
7. For the scenario (e.g. shallow excavation), select plant from the drop-down list in cells A28 to A47 (e.g. dump trucks + excavator).
   (a) enter quantity for each selected plant in cells D28 to D47.
   (b) where N is selected from step #6 - enter the distance to receiver for each individual plant in cells E28 to E47.
   (c) is there line of sight to receiver? select from drop down list in cells F28 to F47. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 57 to 62).
9. Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 63 to 65).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

Type/ model plant (See Sources Sheet)	SWL L_{Aeq} (dB(A))	SPL @7m (dB(A))	Quantity	Individual distance to receiver (m)	Is there line of sight to receiver? Y/N	Quantity correction (dBA)	Shielding correction (dBA)	Distance used in calculation (m)	Contribution SPL (dB(A))
Delivery Truck	108	83	1	170	Yes	0	0	170	54
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888
					Yes	0	0		-888

Total SPL $L_{Aeq(15minute)}$ (dB(A))	**54**

		Residential receiver	*Non-residential receivers*						
			Classroom at schools and other educational institutions	*Hospital wards and operating theatres*	*Place of worship*	*Active recreation*	*Passive recreation*	*Industrial premise*	*Offices, retail outlets*
Noise Management Level (dB(A))	Standard hours	60	55	65	55	65	60	75	70
	Day (OOHW)	55	55	65	55	65	60	75	70
	OOHW Period 1	50		65	55	65	60	75	70
	OOHW Period 2	45		65	55			75	70
Level above background (dB(A))	Standard hours	4							
	Day (OOHW)	4							
	OOHW Period 1	5							
	OOHW Period 2	10							
Level above NML (dB(A))	Standard hours								
	Day (OOHW)								
	OOHW Period 1	5							
	OOHW Period 2	5							
Additional mitigation measures	Standard Hours	-	-	-	-	-	-	-	-
	Day (OOHW)	-	-	-	-	-	-	-	-
	OOHW Period 1	-		-	-	-	-	-	-
	OOHW Period 2	V, N, R2, DR		-	-			-	-

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification