

MARINE NATURAL VALUES ASSESSMENT FOR PROPOSED NATIVE OYSTER REEF RESTORATION AT DIXONS BEACH, TAROONA, TASMANIA

Reef Builder Southeast Tasmania Project



Report to
NRM South
April 2022



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Version	Author	Date reviewed	Reviewed by	Notes
1 of 2	A. Gilham, E. Callander	14/04/2022	C. Manicom	-
2 of 2	E. Callander	02/05/2022	P. Armstrong	Version 2 includes changes to project name as requested by client and other minor edits.

¹ Cover photo, Marine Solutions, March 2022

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1 EXECUTIVE SUMMARY

Marine Solutions conducted an environmental assessment of a proposed native oyster reef restoration activity at Dixons Beach, Tarooma in March 2022. The objective of the assessment is to determine if there are any ecological contraventions to the proposed native oyster reef restoration activity. The initial desktop protected matters assessment of the area identified two threatened and protected species. The spotted handfish (*Brachionichthys hirsutus*) and gunn's screwshell (*Gazameda gunii*) were identified in the search which indicated certain site survey requirements were necessary. Particle size analysis and bathymetry mapping were also conducted as part of the habitat assessment of the area.

The habitat assessment found the dominant benthic substrate to be sand and shell grit which was observed consistently throughout the site surveys. The bathymetric survey revealed a gradually sloping seabed with depths ranging from 5m inshore to 13 m offshore. Large amounts of the ascidian *Pyura stolonifera* were observed throughout the area. Particle size analysis found the sediment in the area to consist predominantly of fine sand. No spotted handfish nor gunn's screwshell were observed during the targeted handfish transect dives and screwshell grabs, respectively. The results from the environmental assessment indicate there are no ecological contraventions regarding the suitability of the proposed native oyster reef restoration at Dixons Beach, Tarooma.

2 INTRODUCTION

2.1 PROPOSAL BRIEF

Marine Solutions was engaged by NRM South to carry out marine environmental assessments at three proposed native oyster reef restoration sites in the Derwent Estuary and D'Entrecasteaux Channel (Figure 1). This report details the surveys undertaken at Dixons Beach, Taroona. A desktop environmental assessment was carried out to inform the scope of field surveys to be completed in the area. The proposed site was selected with the objective that the area would not contain benthic habitats that are currently inhabited or used by vulnerable or threatened species identified in the desktop environmental assessment.

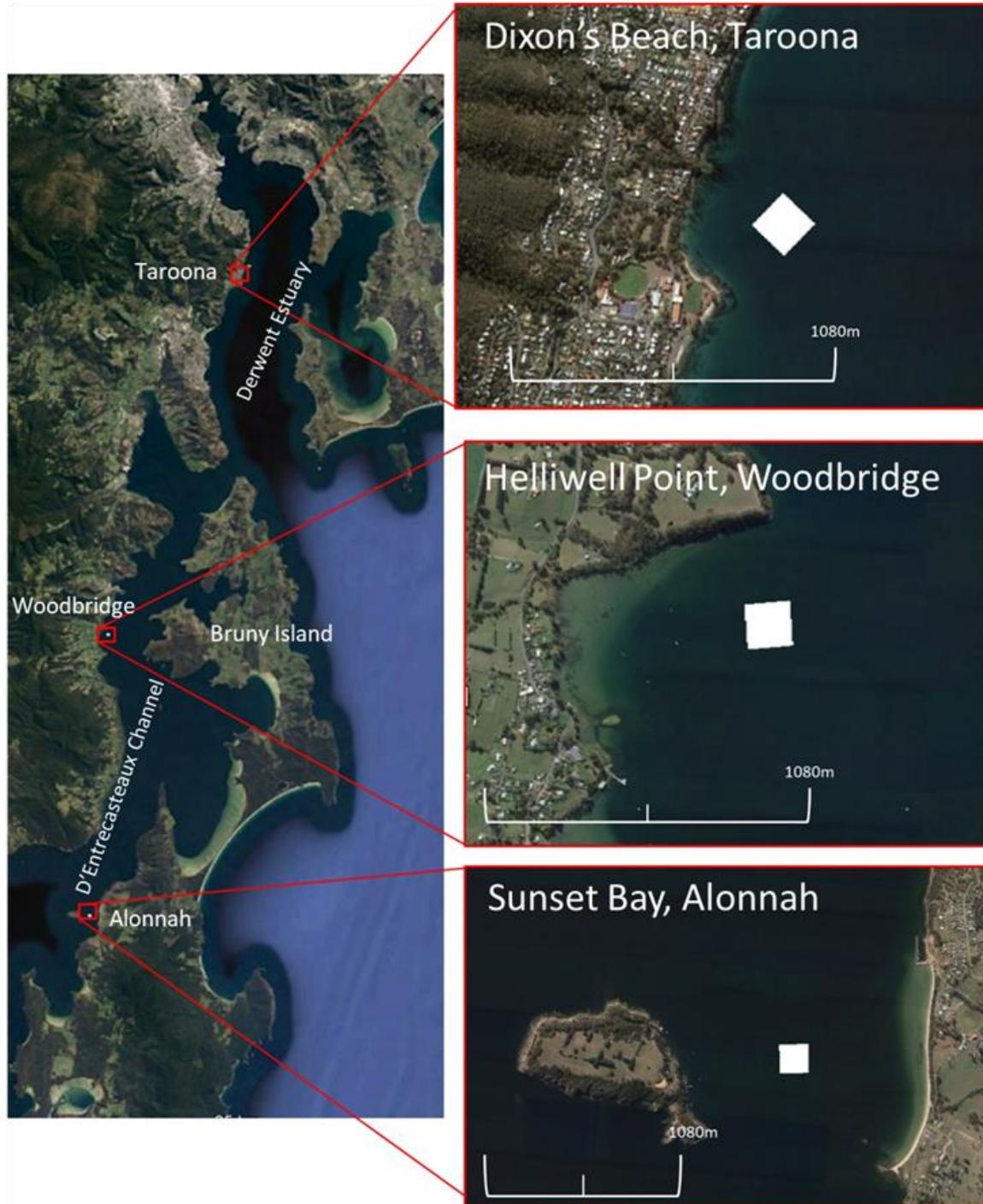


Figure 1. Map showing location of the proposed native oyster reef restoration sites at Dixons Beach Taroonna (top), Helliwell Point Woodbridge (middle) and Sunset Bay Alonnah (bottom) (base image source: Google Earth).

2.2 PURPOSE AND SCOPE

The purpose of this report is to detail the methods and findings of a marine natural values assessment and site survey at the site of a proposed native oyster reef restoration site in Dixons Beach, Taroona. The information presented in this report will feed into an Environmental Effects Report (EER) submission to the EPA, for proposed native oyster reef restoration at three sites in the Derwent Estuary and D'Entrecasteaux Channel.

The scope of this report extends to a detailed summarization of available information regarding natural values and ecology of the area. Please note that the scope does not extend to terrestrial or avian ecology.

Specifically, the project includes the following:

- Desktop-based Natural Values Assessment, including search results of the Natural Values Atlas (NVA) and Protected Matters searches tool (PMST)
- Bathymetric mapping of the reef permit area
- Ecological field surveys, including:
 - Underwater habitat characterisation
 - Sedimentary particle size analysis, to determine substrate composition and stability
 - Targeted handfish and gunn's screwshell survey aligning with NRE Tasmania's (formerly DPIPW) 2020 Guidelines for Natural Values Assessments.

2.3 STUDY AREA

The survey area at Dixons Beach (Figure 1) is located to the north of Taroona Beach. The area has previously been surveyed by Marine Solutions (and we have a record of the substrate consisting of soft sand and silt sediments. This prior knowledge combined with the NVA and PMST desktop assessment findings was used to inform the scope of field surveys to be completed in the area.

3 DESKTOP PROTECTED MATTERS SUMMARY

The *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* Protected Matters Search Tool (PMST) is a tool managed by the Department of Agriculture, Water and the Environment to help determine whether Matters of National Environmental Significance (MNES) or other matters protected by the *EPBC Act* are likely to occur in a given area of interest (Commonwealth of Australia 2022) (Table 1). The PMST was used to identify protected matters relating the study area, with a buffer of 5000 m. The full report is available upon request from Marine Solutions. Marine threatened and protected species, migratory species and invasive species are discussed in further detail in Section 4 below.

Table 1 Summary of findings of the *EPBC Act* PMST, applying 500 m and 5000 m buffer zones around the study area at Tarooma.

	Item	# ID'd by PMST		Notes
		Within 500 m	Within 5000 m	
Matters of National Environmental Significance	World Heritage Properties	None	None	
	National Heritage Places	None	None	
	Wetlands of National Importance (Ramsar)	None	1	
	Great Barrier Marine Park	None	None	
	Commonwealth Marine Area	None	None	
	Listed Threatened Ecological Communities	3	4	Including 1 marine community
	Listed Threatened Species	55	63	Includes 17 marine species (refer to section 4.1)
Listed Migratory Species	34	49		
Other Matters Protected by EPBCA	Commonwealth Lands	1	7	
	Commonwealth Heritage Places	None	1	
	Listed Marine Species	52	71	
	Whales and other Cetaceans	8	9	Refer to Section 4.1.1
	Critical Habitats	None	None	
	Commonwealth Reserves Terrestrial	None	None	
	Australian Marine Parks	None	None	
Habitat Critical to the Survival of Marine Turtles	None	None		
Extra Information	State and Territory Reserves	5	13	
	Regional Forestry agreements	1	1	

Item	# ID'd by PMST		Notes
Nationally important Wetlands	None	None	
EPBC Act Referrals	2	6	
Key Ecological Features (Marine)	None	None	
Biologically Important Areas	9	9	
Bioregional Assessments	None	None	
Geological and Bioregional Assessments	None	None	

4 AQUATIC FLORA AND FAUNA

4.1 THREATENED AND PROTECTED SPECIES/ECOLOGICAL COMMUNITIES

There are a number of marine species listed as threatened that may occur in the vicinity of the proposed native oyster reef restoration area. Threatened species are protected under the *Threatened Species Protection (TSP) Act 1995* (Tasmanian state legislation) and/or the *EPBC Act* (Australian Government legislation).

Under the *TSP Act*, no listed species is allowed to be collected, disturbed, damaged or destroyed without a permit. Under the *EPBC Act*, any action with significant impact on a listed threatened species and/or community is prohibited without approval (Section 18 and 18A).

In addition to threatened species legislation, the Fisheries (General and Fees) Regulations 2006 under the Living Marine Resources Management Act 1995 (LMRMA) prohibits the taking/possession of a number of marine species, including Syngnathids (seahorses, seadragons and pipehorses), handfish, threespin blennies, limpets/false limpets of three superfamilies, and five species of shark. Additional species are protected by the schedules of the Wildlife (General) Regulations 2010 (Regulations under the Nature Conservation Act 2002), under which a person must not take, buy, sell or have possession of any protected wildlife or any product of any protected wildlife without a permit. Threatened species that could potentially occur within the vicinity of the study area are discussed in greater detail in this section.

In a search of the Natural Values Atlas (NRE Tas (formerly DPIPWE), 2022) and EPBC PMST (Commonwealth of Australia 2022), 15 threatened marine species were identified as possibly occurring in the area or known to occur in the area (Table 2). Verified records of one threatened species within a 500 m radius of the study area were found (NRE Tas 2022) (Table 2).

Table 2 Summary of threatened marine species and communities identified in a search of the Natural Values Atlas and the EPBC PMST for Dixons Beach, Tarooona. Note that the scope does not extend to terrestrial or avian biota.

	Species/ Community	Listing		NVA findings	EPBC PMST findings
		EPBC Act	TSP Act		
Marine Mammals	Sub antarctic fur seal (<i>Arctocephalus tropicalis</i>)	Vulnerable	Endangered	Verified record within 5000m	Species or species habitat known to occur in area (500m)
	Humpback whale (<i>Megaptera novaeangliae</i>)	Vulnerable	Endangered	Verified record within 5000m	Foraging, feeding or related behaviour known to occur in area (500m)
	New Zealand fur seal (<i>Arctocephalus forsteri</i>)	N/A	Rare	Verified record within 5000m	Species or species habitat may occur within area (500 m)
	Southern right whale (<i>Eubalaena australis</i>)	Endangered	Endangered	Verified record within 500m	Breeding likely to occur in area (5000m)
	Blue Whale (<i>Balaenoptera musculus</i>)	Endangered	N/A	-	Species or species habitat likely to occur in area (500m)
	Australian grayling (<i>Prototroctes maraena</i>)	Vulnerable	Vulnerable	May occur within 5000m (based on range boundaries)	Species or species habitat likely occur within area (500 m)
Fish/elasmobranchs	Great White shark (<i>Carcharodon carcharias</i>)	Vulnerable	N/A	-	Species or species habitat known to occur within area (500m)
	School shark (<i>Galeorhinus galeus</i>)	Conservation Dependent	N/A	-	Species or species habitat likely to occur within area (500m)
	Spotted handfish (<i>Brachionichthys hirsutus</i>)	Critically Endangered	Endangered	May occur within 500m (based on range boundaries) Verified records within 5000m	Species or species habitat likely to occur within area (500m)
	Red handfish (<i>Thymichthys politus</i>)	Critically Endangered	N/A	-	Species or species habitat may occur within area (500m)
	Blue warehou (<i>Serirolella brama</i>)	Conservation Dependent	N/A	Verified record within 5000m	Species or species habitat known to occur within area (500m)

	Southern bluefin tuna (<i>Thunnus maccoyii</i>)	Conservation dependent			Species or species habitat likely to occur within area (500m)
	Gunns-screw shell (<i>Gazameda gunnii</i>)	N/A	Vulnerable	Verified record within 5000m	-
Invertebrates	Tasmanian live-bearing seastar (<i>Parvulastra vivipara</i>)	Vulnerable	N/A	-	Species or species habitat may occur within area (500 m)
Communities	Giant Kelp Marine Forests of South East Australia ecological community	Endangered	N/A	-	Community may occur within area

4.1.1 Marine Mammals

The Humpback whale, Blue whale and Southern Right whale were all identified in the NVA and PMST findings for Dixons Beach, Tarooona. However, all species are likely to be at low risk of impact from the proposed native oyster reef restoration activity. The proposed activity is unlikely to impact any foraging or feeding grounds or related behaviour nor any important habitat used. Therefore, it is unlikely that the native oyster reef restoration will have a significant impact on any cetaceans in the area.

New Zealand fur seals and the Sub-Antarctic fur seals were both identified within the desktop assessment as verified records of sighting within 5000 m. Current processes threatening seals include entanglement in fishing equipment, competition for food with commercial fishing operations and incidental capture by commercial fishing operations. The proposed native oyster reef restoration is unlikely to impact seal species.

4.1.2 Fish/Sharks

Sharks

The Elasmobranchs identified in the NVA and PMST (Great white shark and school shark) are pelagic predatory feeders rather than benthic, and therefore unlikely to have any habitat or feeding grounds in the region of the proposed reef area. Thus, it is of low likelihood that they will be impacted by the native oyster reef restoration activity.

Southern bluefin tuna

The Southern bluefin tuna are known to migrate through the D'Entrecasteaux Channel seasonally. Their migratory patterns are unlikely to be reliant on benthos such as that found in the area of the proposed reef area. It is therefore unlikely that the Southern Bluefin Tuna will be impacted by the proposed native oyster reef restoration activity.

Blue warehou

The blue warehou is a mid-size schooling fish, sought after within commercial sectors. Their populations are susceptible to overfishing. The most common distribution of this species is on the coastal shelf, upper continental slope and seamounts. The proposed native oyster reef restoration activity should therefore be of low impact to the species breeding, feeding and migratory habits/habitats.

Australian grayling

The Australian grayling is native to Tasmania and southeast mainland Australia. Australian grayling have a diadromous lifecycle, inhabiting fresh water streams as adults, and migrating to coastal seas as larvae. Spawning takes place in late spring/early summer (Bryant and Jackson 1999). Larvae are transported to sea in stream/river currents and return as migrating juveniles approximately 4-6 months later (Bryant and Jackson 1999). While little is known about the Tasmanian population, it is believed that the range of the species has reduced. The main threat to the species is the construction of dams and weirs restricting migration to and from the sea. No negative impacts to the species are foreseen as a result of the proposed native oyster reef restoration, as it will not introduce any barriers to the Australian grayling's migration.

Red handfish

The Red handfish are endemic to south-east Tasmania, with known sightings limited to very few locations. Their habitat is mostly on top of rocks amongst macro-algae, in sandy areas between rocks and weed clumps near reefs in depths between 1 and 20m (DEE 2015). Any developments that may cause disturbance to the benthic sandy habitat should be considered as a potential risk to Red handfish populations.

Any development activity which disturbs the benthic substrate may have impacts on any undetected handfish populations in the direct development footprint or surrounding environment due to physical

habitat disturbance, smothering of eggs and spawning substrata (i.e., seagrass beds) and possible resuspension of pollutants and/or nutrients and subsequent water quality issues.

Red handfish was identified within the PMST assessment for this area as species or species habitat possibly occurring in the area, however there are no verified records in the vicinity of the proposed development. For Red handfish, survey requirements are currently limited to Fredrick Henry Bay, and the entirety of Norfolk Bay. The nearest known red handfish population is over 40 km away; therefore, it is considered highly unlikely that they may be impacted by the proposed development. A survey for red handfish is not considered necessary, in accordance with the *Guidelines for Natural Values Surveys – Estuarine and Marine Development Proposals* (NRE Tas 2020).

Spotted handfish

The Spotted handfish (*Brachionichthys hirsutus*) is endemic to Tasmania. The current published distribution of the Spotted handfish is restricted to sand, silt, and shell-grit environments of the Lower Derwent Estuary between approximately 2 and 30m depth, south of the Tasman Bridge (NRE Tas 2020a). The desktop assessment indicated that species or species habitat are likely to occur within 500 m of the proposed reef area, and a verified record of a Spotted handfish was recorded within 5000 m of the site in 2021 (NRE Tas 2022); therefore, it was deemed necessary to perform a targeted handfish habitat assessment at this site, in accordance with the *Guidelines for Natural Values Surveys – Estuarine and Marine Development Proposals* (NRE Tas 2020).

4.1.3 Invertebrates

The live-bearing seastar inhabits rocky substrate in the intertidal zone and are not deemed to be at risk from the native oyster reef restoration (NRE Tas 2012). The development will not be within 50 m of any intertidal area, and no intertidal impacts are foreseen, therefore impacts to these species are deemed highly unlikely and targeted surveys are not deemed necessary.

There is a verified record of the gunn's screwshell within 5000 m of the proposed development area from 2008 (NRE Tas 2022). This finding meant that an assessment for the presence of gunn's screwshell was required in the area. The gunn's screwshell is a small species of mollusc of ~60 mm length that lives subtidally and offshore on sand (Grove 2018). They are known to compete with the New Zealand screwshell, *Maoricolpus roseus*.



4.1.4 Threatened Communities – Giant Kelp Marine Forests

Giant Kelp Marine Forests are known to be present in the southeast of Tasmania, including Derwent Estuary and D’Entrecasteaux Channel. These forests grow on rocky reefs and are classified as threatened under the EPBC Act when forming a closed or semi-closed canopy and are over 8 m in length. The main cause of giant kelp decline is broadscale changes to ocean hydrodynamics. The proposed native oyster reef restoration area is sandy and is very unlikely to support giant kelp, therefore the proposed native oyster reef restoration at this location is deemed highly unlikely to impact Giant kelp or Giant kelp marine forests.

5 BATHYMETRY

5.1 METHODS

Bathymetric mapping was conducted on 16 March 2022 throughout the proposed development area and surrounding regions to characterise the seafloor and highlight any benthic features.

The study area was mapped using a CHIRP enabled broadband sounder and Garmin EchoMAP plotter, logging GPS positions and water depth every two seconds. This information was logged at sufficient resolution, such that representative interpolations between data points could be made, to produce accurate bathymetric data of the given area to the Australian hydrographic survey requirements. Depths were measured to the nearest tenth of a metre, and tidally and barometrically corrected for Chart Datum (CD) using tide charts and observations from the Bureau of Meteorology. The resultant files were interpolated using GIS software Surfer 11.0 to create a bathymetric profile of the area.

5.2 RESULTS

The bathymetry across the study area consists of gently sloping seabed (Figure 2). Depth ranged from 5 m close to shore, increasing gradually to 13 m offshore.

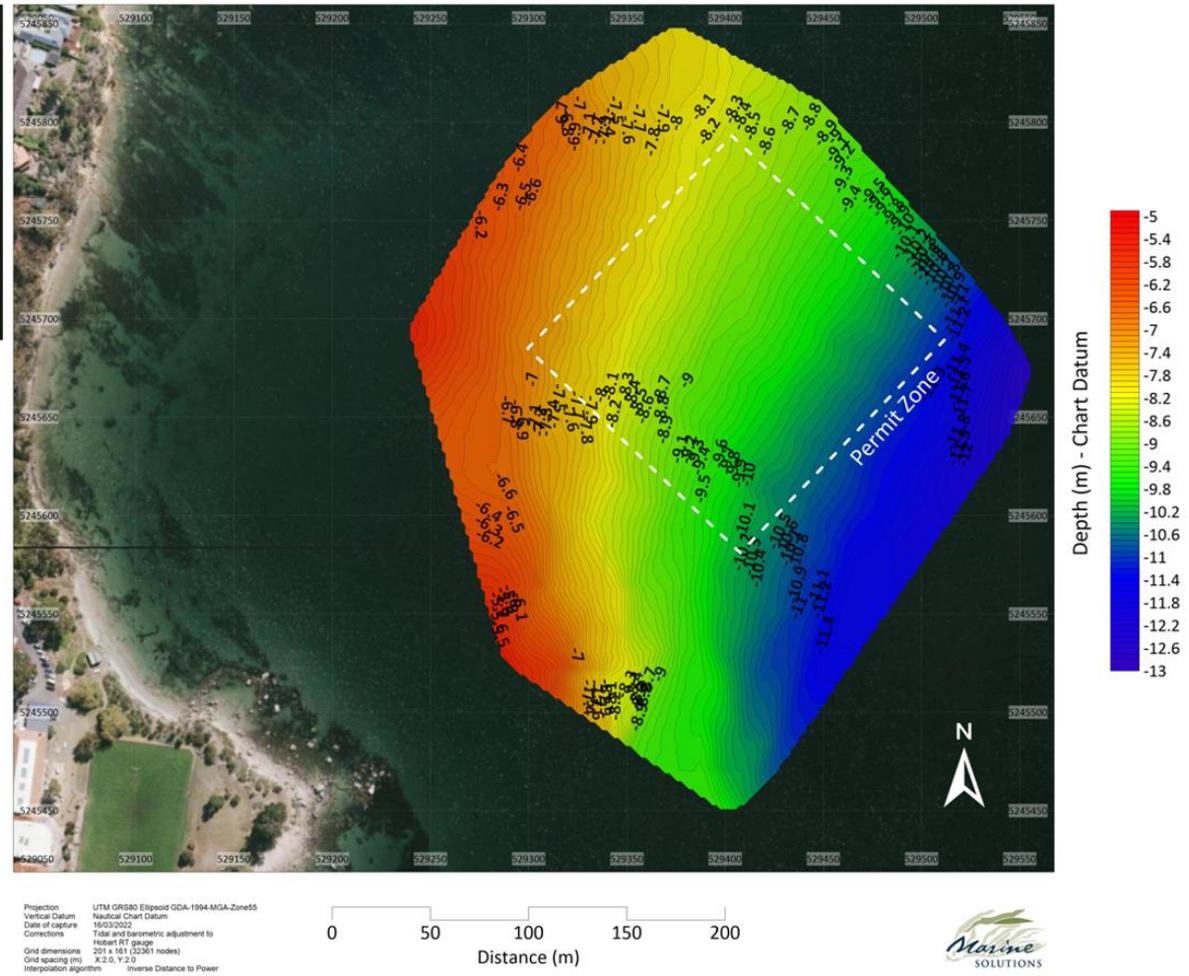


Figure 2. Bathymetric contour map of the seabed of the survey area (proposed reef area (150m x 150m) boundaries indicated by white dotted line) at Dixons Beach, Tarooma. Corrected to Chart Datum. To the left is a schematic of the tracks during the bathymetric survey.

6 UNDERWATER HABITAT CHARACTERISATION

6.1 METHODS

An underwater habitat survey was conducted by divers in the Dixons Beach area at Taroona on 16 March 2022. Four transects were swum by divers and filmed using a Sony NEX-5 camera in an Aquapazza housing (Figure 3). Videos taken of the transects were assessed post hoc for habitat characterization.



Figure 3. Map showing location of habitat survey diver transects (yellow) and sediment sample sites (red), relative to the proposed native oyster reef restoration area (in white).

6.2 RESULTS

The substrata was relatively consistent throughout the transects with habitat consisting of soft sand and silt. There were patches of substrate densely covered in the ascidian species *Pyura stolonifera*. Patches of mostly dead New Zealand screwshell were also observed, with several live specimens found within. Dead scallop shells were also observed within these patches (Figure 4).

There was minimal rocky structure noted during habitat surveys. Therefore, there is limited to no suitable structure for the forming of Giant kelp marine forests, and the proposed native oyster reefrestoration will have negligible impact on surrounding Giant kelp forest habitat.

For a full list of species observed during benthic habitat surveys, see Appendix 3. The list of video files is provided in Appendix 4 and available from Marine Solutions upon request.



Figure 4. Images from video transects from the habitat survey at Dixons Beach, Tarooona.

7 SEDIMENT PARTICLE SIZE CHARACTERISATION

7.1.1 Methods

Sediment samples were collected at five sites in the proposed reef area (Figure 5). A sample of the top ~10 cm of sediment at each site was collected by divers into screw-top glassware, and analyzed post-hoc by Marine Solutions for particle size distribution.



Figure 5. Locations of sampling completed at Dixons beach, see points SED 1 – SED 5 (red) for locations of sediment particle size samples.

Particle size distribution was assessed volumetrically for each site by wet sieving sediment samples through a series of stainless-steel sieves (4 mm, 2 mm, 1 mm, 500 μm , 250 μm , 125 μm and 63 μm). The content of each sieve was drained and transferred to a measuring cylinder, beginning with the coarsest sediment fraction (4 mm) and working down to the finest (63 μm). The volume of sediment in the measuring cylinder was recorded for each size class. The sediment fraction < 63 μm was assumed to be the total volume of the sample minus the combined volume of all other size classes.

7.1.2 Results

Particle size analysis indicated that sediments at the Dixons Beach site were predominantly fine sand with a small proportion of silt (Figure 6), typical of an area with low hydrodynamic energy.

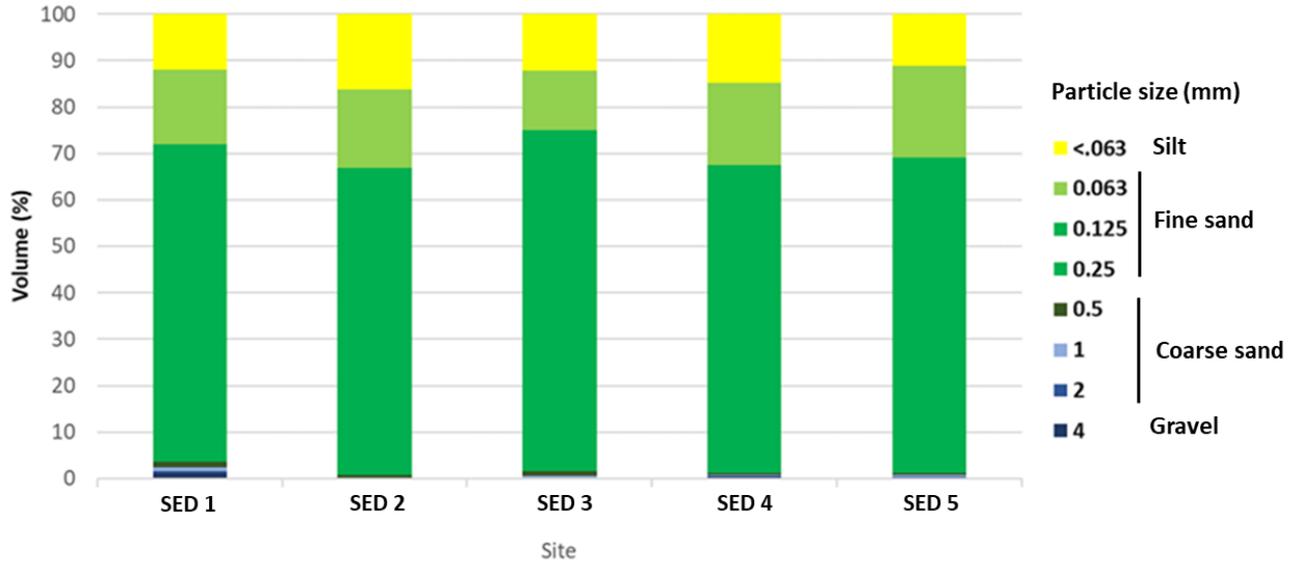


Figure 6. Results from particle size analysis at each of the five sites, Tarooma.

8 THREATENED AND PROTECTED SPECIES SURVEY

Based on the known likelihood of threatened and protected species to occur within the proposed native oyster reef restoration area (refer to Section 4.1), it was determined that targeted species-specific surveys are required at this site for the following threatened and protected species:

- Gunn's screwshell (*Gazameda gunii*)
- The Spotted handfish (*Brachionichthys hirsutus*)

Surveys were conducted in accordance with the *Guidelines for Natural Values Surveys – Estuarine and Marine Development Proposals* (NRE Tas, 2020).

8.1 SURVEY FOR GUNN'S SCREWSHELL

8.1.1 Methods

On the 16 March 2022, the field team used a Ponar grab to gather five sediment samples from within the reef permit area at Dixons Beach, Tarooma at the same sites sampled for particle size (GAZ 1 being the same sample location as SED 1, (Figure 5). Samples were sieved through a 2mm mesh to assess the presence/absence of gunn's screwshell in the area.

8.1.2 Results

Gunn's screwshell were not identified from any of the samples collected at Dixons Beach, Tarooma (Figure 7). The samples consisted mostly of shell fragments and shell grit. These shell fragments were difficult to identify on a species specific level due to their small size, however some fragments of the invasive New Zealand screwshell *Maoricolpus roseus* were likely present. Sample GAZ 5 contained a piece of ascidian (*Pyura stolonifera*, observed in abundance in handfish surveys, see Section 6.2). Samples GAZ 3, 4 and 5 all contained whole mollusc and bivalve shells, but no live specimens (Figure 7).

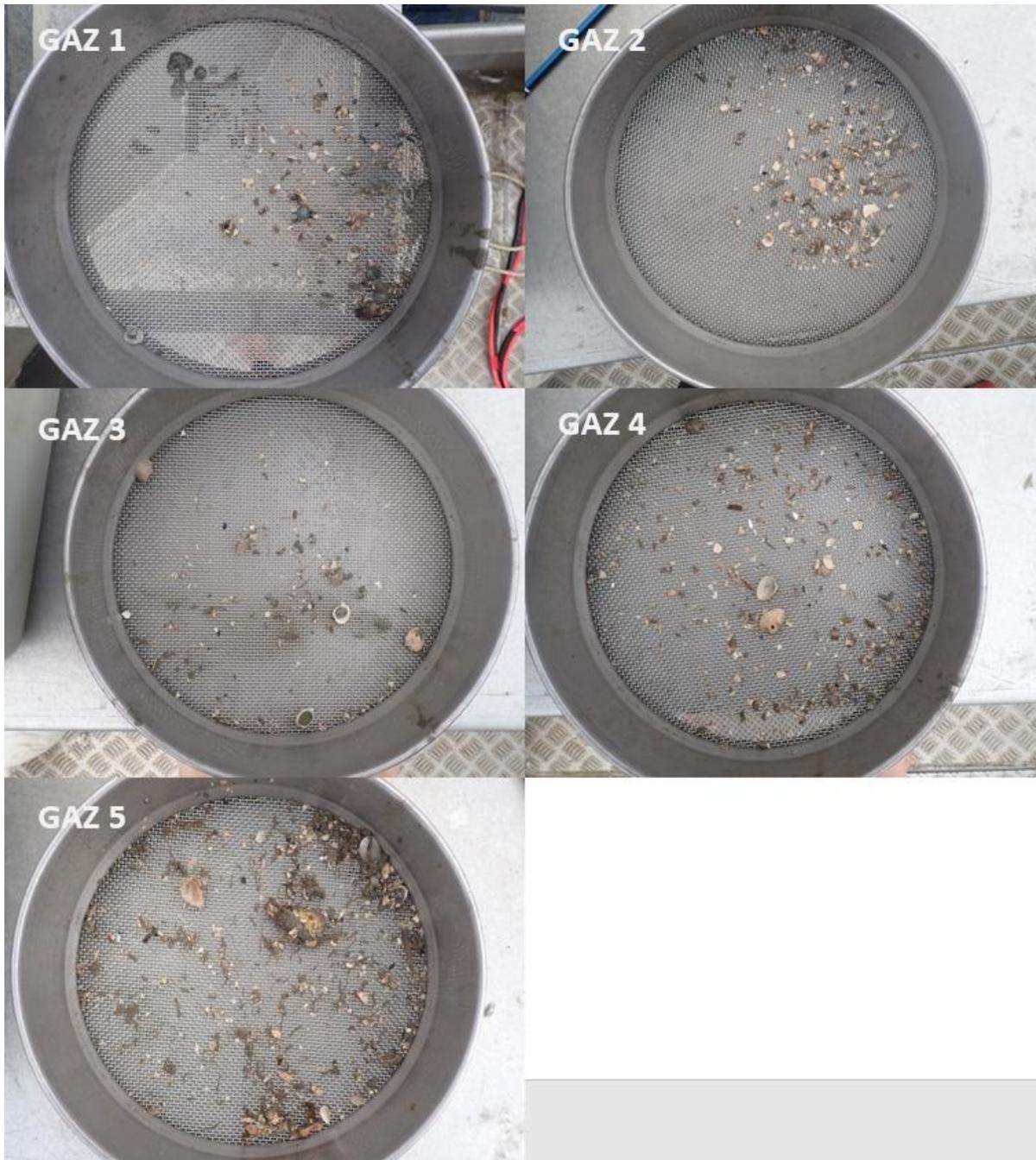


Figure 7 Images of benthos samples from targeted *Gazameda gunnii* grabs at Dixons Beach, Taroon.

8.2 SURVEY FOR SPOTTED HANDFISH

8.2.1 Methods

A survey for spotted handfish was also undertaken at the Tarooma site on 16 March 2022. The survey was conducted in accordance with the *Guidelines for Natural Values Surveys – Estuarine and Marine Development Proposals* (NRE Tas 2020). The reef permit area totaling an estimated 22,500 m² was surveyed by divers. The same transects were surveyed for spotted handfish as for underwater habitat characterisation, refer to Figure 8. Three contiguous 50 m transects were swum along each of the four transect lines (T1 – T4, see Figure 3), giving a total of 12 50 m transects surveyed.

Paired divers searched 4 m-wide belts along transects, with one diver filming and the other diver recording data. The use of diver-towed GPS units was adopted so that the locations of any individual handfish, breeding substratum and any egg masses could be accurately recorded, by matching the time stamps of photographs to the time-synced GPS units.

Following NCH (NRE Tas 2020) guidelines, the following information was recorded during survey:

- The presence, number and density of spotted handfish individuals, including information on the size, position along the transect and the time of identification.
- The presence of vertical structures that could provide potential substratum appropriate for attachment of handfish eggs, including
 - Stalked ascidians
 - *Caulerpa* alga
 - Seagrass
- The presence, number and density of Northern Pacific seastars (*Asterias amurensis*).

A total of 2,400 m² was searched along fixed transects. Details of individual transect length, width, and surveyed area can be found in Appendix 5.

8.2.2 Results

No spotted handfish were found during targeted handfish surveys. Refer to Appendix 5 for full field notes from the handfish survey. Spotted handfish (*Brachionichthys hirsutus*) are known to inhabit areas

with sedimentary structures such as that observed at the Dixons beach, Tarooma site, however were not observed during field operations.



Figure 8: Locations of sampling completed at Dixons Beach, see T1 – T4 (yellow transect lines) for location of habitat survey diver transects.

9 CONCLUSION

On the basis of the habitat features present and Marine Solutions not identifying any sensitive receptors including any threatened species, Dixons Beach, Tarooma is deemed a suitable for the proposed native oyster reef restoration. There are no contradictions present to indicate that native oyster reef restoration will have any significant impact on threatened species and communities at the Dixons beach site, Tarooma.

10 REFERENCES

- Bryant S., Jackson J. (1999) Tasmania's Threatened Fauna Handbook: what, where and how to protect Tasmania's threatened animals. Threatened Species Unit, Parks and Wildlife Service, Hobart.
- Commonwealth of Australia (2022) EPBC Act Protected Matters Report for Dixons Beach, Tarooona, Buffer 500 and 5000 m. Report created 9/03/2022.
- Department of the Environment (2015) Recovery Plan for Three Handfish Species: Spotted handfish *Brachionichthys hirsutus*, Red handfish *Thymichthys politus* and Ziebell's handfish *Brachiopsilus ziebelli*
- Department of Natural Resources and Environment Tasmania (NRE Tas; formerly DPIPWE) (2022) Natural Values Atlas Report: Authoritative, comprehensive information on Tasmania's natural values. GDA94: 529367.0, 5245744.0, Buffer min: 500 m, max: 5000 m. Report created: 2:40pm 16/02/2022.
- NRE Tas - Threatened Species Section (2020a). Listing Statement for *Brachionichthys hirsutus* (spotted handfish). NRE Tas.
- Grove, S.J. (2018). A Guide to the Seashells and other Marine Molluscs of Tasmania NRE Tas (2020) Natural and Cultural Heritage Division Guidelines for Natural Values Surveys – Estuarine & Marine Development Proposals. NRE Tas (Formally Department of Primary Industries, Parks, Water and Environment)
- NRE Tas - Threatened Species Section (2012). Listing Statement for *Parvulastra vivipara* (Tasmanian Live-bearing Seastar). NRE Tas.

11 APPENDICES

Appendix 1. GPS Positions of sampling locations (WGS 84)

Site	Latitude	Longitude	Notes
T1 Start	-42.941787	147.36052	Start of transect T1
T1 Finish	-42.94076064	147.3592443	End of transect T1
T2 Start	-42.940682	147.359386	Start of transect T2
T2 Finish	-42.94169931	147.3607127	End of transect T2
T3 Start	-42.940387	147.360166	Start of transect T3
T3 Finish	-42.940933	147.361693	End of transect T3
T4 Start	-42.94097	147.361675	Start of transect T4
T4 Finish	-42.939749	147.360033	End of transect T4
SED 1	-42.941598	147.360958	Also site of sample GAZ 1
SED 2	-42.941122	147.360269	Also site of sample GAZ 2
SED 3	-42.940079	147.359452	Also site of sample GAZ 3
SED 4	-42.940329	147.360136	Also site of sample GAZ 4
SED 5	-42.940254	147.360966	Also site of sample GAZ 5

Appendix 2. Operational Summary

Date	16/03/2022
Personnel	A. Gilham, E. Callander, M. Cameron
Time (start – end)	09:00 - 14:00
Cloud	7/8
Rain	Light drizzle
Swell	Wind chop (0-1m)
Wind	10 – 15 knots
Tide	Low
Current	Low
Works conducted	<ul style="list-style-type: none"> - Bathymetric mapping - Underwater habitat characterisation - Targeted handfish survey - Sediment collection for particle size

Appendix 3. Species List

The table below shows all species observed in field investigations on 24/03/2022. Note that list is not to be considered exhaustive, but rather a snapshot of species observed through the duration of the field survey.

		Common Name	Scientific Name	Status notes*
Algae & Seagrasses		'Scuzzy' brown drift algae	Unidentified	
		Serrated Caulerpa	<i>Caulerpa scalpelliformis</i>	
		Fine filament Caulerpa	<i>Caulerpa longifolia</i>	
		Undaria kelp	<i>Undaria pinnatifida</i>	
Invertebrates	Annelids	Fan worm	<i>Myxicola infundibulum</i>	Introduced
	Molluscs	Sea hare	<i>Aplysia</i> sp.	
	Echinoderms	Biscuit star	<i>Tosia</i> sp.	
		Heart urchin	Brissidae	
		Granular sea start	<i>Uniophora</i> sp.	
	Other	Scallop sp. varied (deceased)		
Sea pen		Pennatulacea		

		Ascidian	<i>Pyura stolonifera</i>	
Vertebrates		Pipefish	<i>Stigmatopora sp.</i>	
		Flathead	<i>Platycephalus sp.</i>	
		Hermit crab	<i>Stigopagurus stigimanus</i>	
		Banded stingaree	<i>Uropholus cruciatus</i>	
		Cowfish	<i>Aracana aurita</i>	

Appendix 4. Video Files

Video footage is available from the following files

- *Transect 1_1.mp4*
- *Transect 1_2.mp4*
- *Transect 2_1.mp4*
- *Transect 2_2.mp4*
- *Transect 3.mp4*
- *Transect 4.mp4*

Appendix 5. Spotted handfish Survey Notes

	Transect Length (m)	Transect Width (m)*	Area surveyed (m ²)	Handfish count	Stalked Ascidian count	NPSS count	Seagrass cover / density	Caulerpa cover / density
T1	50 m	4 m	200	0	0	4	0 %	0 %, not observed
T2	50 m	4 m	200	0	0	2	0 %	<5 %, very sparse
T3	50 m	4 m	200	0	0	5	0 %	<5 %, very sparse
T4	50 m	4 m	200	0	0	0	0 %	0 %, not observed
T5	50 m	4 m	200	0	0	4	0 %	0 %, not observed
T6	50 m	4 m	200	0	0	1	0 %	0 %, not observed
T7	50 m	4 m	200	0	0	6	0 %	0 %, not observed
T8	50 m	4 m	200	0	0	4	0 %	0%, very sparse
T9	50 m	4 m	200	0	0	4	0 %	0 %, not observed
T10	50 m	4 m	200	0	0	5	0 %	0 %, not observed
T11	50 m	4 m	200	0	0	4	0 %	0 %, not observed
T12	50 m	4 m	200	0	0	10	0 %	0 %, not observed
	TOTAL		2400 m²	1	0	0	0 %	0 - 5%

MARINE NATURAL VALUES ASSESSMENT FOR PROPOSED NATIVE OYSTER REEF RESTORATION AT HELLIWELLS POINT, WOODBRIDGE, TASMANIA

Reef Builder Southeast Tasmania Project



Report to
NRM South
April 2022



www.marinesolutions.net.au

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Version	Author	Date reviewed	Reviewed by	Notes
1 of 1	A. Gilham	14/04/2022	C. Manicom	-
2 of 2	E. Callander	02/05/2022	P. Armstrong	Version 2 includes changes to project name as requested by client and other minor edits.

¹ Cover photo, Marine Solutions, March 2022.

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1 EXECUTIVE SUMMARY

Marine Solutions was engaged by NRM South to perform an environmental assessment of Helliwells point, Woodbridge for suitability of native oyster reef restoration at this location. Following a desktop assessment of protected matters Search Tools and Natural Values Assessments it was deemed that *Gazameda gunii* was the only species requiring specific addressing in the field, along with bathymetric surveys of the benthos and underwater habitat characterization.

The Bathymetric survey identified a sloping seabed between 5-11m deep, increasing in depth away from the shore. The underwater habitat assessments found there to be fine silt benthic habitat with significant cover of shell debris, notably high amounts of scallop shell debris and patches of deceased *Maoricolpus roseus*. The particle size analysis was consistent with the underwater habitat characterization, in that the most abundant sediment was that of fine silt (<.063mm). The *Gazameda gunnii* grabs did not identify any in the individuals.

Following the desktop and field analysis, Marine Solutions recommends that the site at Helliwells point, Woodbridge would be an appropriate site for the proposed native oyster reef restoration.

2 INTRODUCTION

2.1 PROPOSAL BRIEF

Marine Solutions was engaged by NRM South to carry out marine environmental assessments at three proposed native oyster reef restoration sites in the Derwent Estuary and D'Entrecasteaux Channel (Figure 1). This report details surveys undertaken at Helliwells Point, Woodbridge. The report provides a summary of field operations following an initial desktop threatened and protected matters search tool and a natural values assessment of the area, and the findings of the field assessments conducted on the 17th of March 2022.

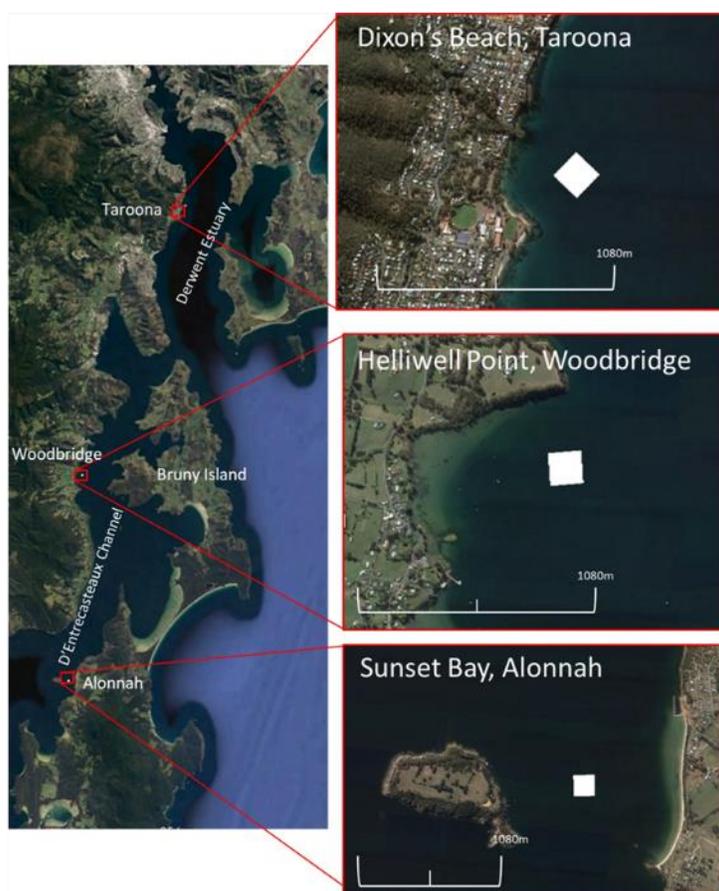


Figure 1 Map showing location of the proposed native oyster reef restoration sites at Dixons Beach Taroonna (top), Helliwell Point Woodbridge (middle) and Sunset Bay Alonnah (bottom) (base image source: Google Earth).

2.2 PURPOSE AND SCOPE

The purpose of this report is to detail the methods and findings of a marine natural values assessment and site survey at the site of a proposed native oyster restoration site at Helliwells Point, Woodbridge. The information presented in this report will feed into an Environmental Effects Report (EER) submission to the EPA, for proposed native oyster reef restoration at three sites in the Derwent Estuary and D'Entrecasteaux Channel.

The scope of this report extends to a detailed summarization of available information regarding natural values and ecology of the area. Please note that the scope does not extend to terrestrial or avian ecology.

Specifically, the project includes the following:

- Desktop-based Natural Values Assessment, including search results of the Natural Values Atlas (NVA) and Protected Matters searches tool (PMST)
- Bathymetric mapping of the reef permit area
- Ecological field surveys, including:
 - Underwater habitat characterisation
 - Sedimentary particle size analysis, to determine substrate composition and stability
 - Targeted search results for the area of *Gazameda gunii*

2.3 STUDY AREA

The Helliwells Point location is in the D'Entrecasteaux Channel at (Figure 1). The region has in its surrounds both residential and agricultural properties. Its estuarine nature makes the area slow moving and tidal, with currents determining its main water flow. Riverine input is likely the primary deposition of sediments into the system.

3 DESKTOP PROTECTED MATTERS SUMMARY

The *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* Protected Matters Search Tool (PMST) is a tool managed by the Department of Agriculture, Water and the Environment to help determine whether Matters of National Environmental Significance (MNES) or other matters protected by the *EPBC Act* are likely to occur in a given area of interest (Commonwealth of Australia 2022) (Table 1). The PMST was used to identify protected matters relating the study area, with a buffer of 5000 m. The full report is available upon request from Marine Solutions. Marine threatened and protected species, migratory species and invasive species are discussed in further detail in Section 4 below.

Table 1 Summary of findings of the *EPBC Act* PMST, applying 500 m and 5000 m buffer zones around the study area at Woodbridge.

	Item	# ID'd by PMST		Notes
		Within 500 m	Within 5000 m	
Matters of National Environmental Significance	World Heritage properties	None	None	
	National Heritage properties	None	None	
	Wetlands of international Importance (Ramsar)	None	None	
	Great Barrier Reef Marine Park	None	None	
	Commonwealth Marine Area	None	None	
	Listed Threatened Ecological Communities	3	3	Includes 1 marine community
	Listed Threatened Species	54	55	Includes 12 marine species
	Listed migratory species	35	35	
Other Matters Protected by EPBCA	Commonwealth Lands	None	2	
	Commonwealth Heritage Places	None	None	
	Whales and Other Cetaceans	52	52	
	Critical Habitats	9	9	
	Commonwealth Reserves Terrestrial	None	None	
	Australian Marine Parks	None	None	
	Habitat Critical To the Survival of Marine Turtles	None	None	
Extra Information	State And Territory Reserves	None	11	
	Regional forest Agreements	1	1	
	Nationally important Wetlands	None	1	
	EPBC Act Referrals	2	3	
	Key Ecological Features (Marine)	None	None	
	Biologically Important Areas	7	9	
	Bioregional Areas	None	None	
Geological and Bioregional Assessments	None	None		

4 AQUATIC FLORA AND FAUNA

4.1 THREATENED AND PROTECTED SPECIES/ECOLOGICAL COMMUNITIES

There are a number of marine species listed as threatened that may occur in the vicinity of the proposed development. Threatened species are protected under the *Threatened Species Protection (TSP) Act 1995* (Tasmanian state legislation) and/or the *EPBC Act* (Australian Government legislation).

Under the *TSP Act*, no listed species is allowed to be collected, disturbed, damaged or destroyed without a permit. Under the *EPBC Act*, any action with significant impact on a listed threatened species and/or community is prohibited without approval (Section 18 and 18A).

In addition to threatened species legislation, the Fisheries (General and Fees) Regulations 2006 under the Living Marine Resources Management Act 1995 (LMRMA) prohibits the taking/possession of a number of marine species, including Syngnathids (seahorses, seadragons and pipehorses), handfish, threespin blennies, limpets/false limpets of three superfamilies, and five species of shark. Additional species are protected by the schedules of the Wildlife (General) Regulations 2010 (Regulations under the Nature Conservation Act 2002), under which a person must not take, buy, sell or have possession of any protected wildlife or any product of any protected wildlife without a permit. Threatened species that could potentially occur within the vicinity of the study area are discussed in greater detail in this section.

In a search of the Natural Values Atlas (NRE Tas (formerly DPIPW), 2022) and EPBC PMST (Commonwealth of Australia 2022), 12 threatened marine species were identified as possibly occurring in the area or known to occur in the area (Table 2). Verified records of 4 threatened species within a 5000 m radius of the study area were found (NRE Tas (formerly DPIPW), 2022) (Table 2).

Table 2 Summary of threatened marine species and communities identified in a search of the Natural Values Atlas and the EPBC PMST for Helliwells Point, Woodbridge. Note that the scope does not extend to terrestrial or avian biota.

	Species/ Community	Listing		NVA findings	EPBC PMST findings
		EPBC Act	TSP Act		
Marine Mammals	Southern elephant seal (<i>Mirounga leonine</i>)	Vulnerable	Endangered	Verified record within 5000m	-
	Southern right whale (<i>Eubalaena australis</i>)	Endangered	Endangered	Verified record within 5000m	Breeding likely to occur within area (500m)
	New Zealand fur seal (<i>Arctocephalus forsteri</i>)	N/A	Rare	-	Species or species habitat may occur in area (500m)
	Blue Whale (<i>Balaenoptera musculus</i>)	Endangered	N/A	-	Species or species habitat likely to occur in area (500m)
Fish/elasmobranchs	Australian grayling (<i>Prototroctes maraena</i>)	Vulnerable	Vulnerable	May occur within 500m (based on range boundaries)	Species or species habitat likely occur within area (500m)
	Spotted handfish (<i>Brachionichthys hirsutus</i>)	Critically Endangered	Endangered	May occur within 500m (based on range boundaries). Verified record within 5000m	Species or species habitat may occur within area (500m)
	Red Handfish (<i>Thymichthys politus</i>)	Critically Endangered	N/A	-	Species or species habitat may occur in area (500m)
	Blue warehou (<i>Seriolella brama</i>)	Conservation Dependent	N/A	-	Species or species habitat known to occur within area (500m)
	Great White Shark (<i>Carcharodon carcharias</i>)	Vulnerable	N/A	-	Species or species habitat known to occur within area (500m)
	School shark (<i>Galeorhinus galeus</i>)	Conservation Dependent	N/A	-	Species or species habitat likely to occur within area (5000m)
	Southern bluefin tuna (<i>Thunnus maccoyii</i>)	Conservation dependent	N/A	-	Species or species habitat likely to occur within area (500m)
Invertebrates	Live-bearing seastar (<i>Parvulastra vivipara</i>)	Vulnerable (unofficial)	Vulnerable (Unofficial)	Verified record within 5000m	Species or species habitat likely occur within area (500m)
	Gunns screwshell (<i>Gazameda gunii</i>)	N/A	Vulnerable	Verified within 5000m	-
Communities	Giant Kelp Marine Forest of South East Australia	Endangered	N/A	-	Community may occur within area (500m)

4.1.1 Marine Mammals

New Zealand fur seals and the Southern elephant seals were all identified within the same desktop assessment. These species are also deemed to be low risk of impacts from the proposed native oyster reef restoration activity. Due to the proposed native oyster reefs being placed on the benthos, it is unlikely that the development will impact any habitat important to the pinniped species found in the areas.

The Blue whale and Southern Right whale were identified in the NVA and PMST findings for Helliwells Point, Woodbridge. However, these species are likely to be at low risk of impact from the proposed native oyster reef restoration. The native oyster reef restoration activity is unlikely to impact any foraging or feeding grounds or related behaviour, nor any important habitat used. Therefore, it is unlikely that it will have a significant impact on any cetaceans in the area.

New Zealand fur seals were identified as species or species habitat possibly occurring in the area, and Southern elephant seal have been observed within 5000 m of the area. Current processes threatening seals include entanglement in fishing equipment, competition for food with commercial fishing operations and incidental capture by commercial fishing operations. The proposed native oyster reef restoration is unlikely to impact seal species.

4.1.2 Fish/Sharks

Sharks

The Elasmobranchs identified in the NVA and PMST (Great white shark and school shark) are pelagic predatory feeders rather than benthic, and therefore unlikely to have any habitat or feeding grounds in the region of the proposed native oyster reef restoration area. Thus, it is of low likelihood that they will be impacted by the proposed activity.

Blue warehou

The blue warehou is a mid-size schooling fish, sought after within commercial sectors. Their populations are susceptible to overfishing. The most common distribution of this species is on the coastal shelf, upper continental slope and seamounts. The native oyster reef restoration activity should therefore be of low impact to the species breeding, feeding and migratory habits/habitats.

Australian grayling

The Australian grayling is native to Tasmania and southeast mainland Australia. Australian grayling have a diadromous lifecycle, inhabiting fresh water streams as adults, and migrating to coastal seas as larvae. Spawning takes place in late spring/early summer (Bryant and Jackson 1999). Larvae are transported to sea in stream/river currents and return as migrating juveniles approximately 4-6 months later (Bryant and Jackson 1999). While little is known about the Tasmanian population, it is believed that the range of the species has reduced. The main threat to the species is the construction of dams and weirs restricting migration to and from the sea. No negative impacts to the species are foreseen as a result of the proposed native oyster reef restoration, as it will not introduce any barriers to the Australian grayling's migration.

Red Handfish

The Red handfish are endemic to south-east Tasmania, with known sighting limited to very few locations. Their habitat is mostly on top of rocks amongst macro-algae, in sandy areas between rocks and weed clumps near reefs in depths between 1 to 20 m (DEE 2015). Any developments that may cause disturbance to the benthic sandy habitat should be considered potential risk to Red handfish populations.

Red handfish was identified within the PMST assessment for this area as species or species habitat possibly occurring in the area, however there are no verified records in the vicinity of the proposed development. For Red handfish, survey requirements are currently limited to Fredrick Henry Bay, and the entirety of Norfolk Bay. The nearest known red handfish population is over 40 km away; therefore, it is considered highly unlikely that they may be impacted by the proposed development. A survey for red handfish is not considered necessary, in accordance with the *Guidelines for Natural Values Surveys – Estuarine and Marine Development Proposals* (NRE Tas 2020).

Spotted handfish

The Spotted handfish (*Brachionichthys hirsutus*) is endemic to Tasmania. The current published distribution of the Spotted handfish is restricted to sand, silt, and shell-grit environments of the Lower Derwent Estuary between approximately 2 and 30m depth, south of the Tasman Bridge (NRE Tas 2020a). The desktop assessment indicated that species or species habitat may occur within 500 m of the

development area, and a verified record of a Spotted handfish was recorded within 5000 m of the site in 1964 (NRE Tas 2022); therefore, it was not deemed necessary to perform a targeted handfish habitat assessment at this site, in accordance with the *Guidelines for Natural Values Surveys – Estuarine and Marine Development Proposals* (NRE Tas 2020).

4.1.3 Invertebrates

4.1.3.1 Sea stars

Live-bearing seastar (*Parvulastra vivipara*) inhabits rocky substrate in the intertidal zone and are not deemed to be at risk from impact from the native oyster reef restoration activity (NRE Tas 2012). The proposed reef permit area will not be within 50 m of any intertidal area, and no intertidal impacts are foreseen, therefore impacts to these species are deemed highly unlikely and targeted surveys for these species are not deemed necessary.

4.1.3.2 Gunn's Screw Shell

Gunn's Screwshell (*Gazameda gunii*) was found in the NVA to have verified records within 5000m of the proposed area from 1970 (NRE Tas 2022). This finding meant that an assessment of presence of Gunn's screwshell was necessary in the area. The results of this survey are further detailed in section 8. The Gunn's screwshell is a small species of mollusc ranging between 30-69mm in length. They are known to compete with the New Zealand screwshell *Maoricolpus roseus*.

4.1.4 Threatened Communities – Giant Kelp Marine Forests

Giant Kelp Marine Forests are known to be present in the southeast of Tasmania, including Derwent Estuary and D'Entrecasteaux Channel. These forests grow on rocky reefs and are classified as threatened under the EPBC Act when forming a closed or semi-closed canopy and are over 8m in length. The main cause of giant kelp decline is broadscale changes to ocean hydrodynamics. The proposed reef permit area is very unlikely to support giant kelp, therefore the proposed native oyster reef restoration reef habitat at this location is deemed highly unlikely to impact Giant kelp or Giant kelp marine forests.

5 BATHYMETRY

5.1 METHODS

Bathymetric mapping was conducted on 17th of March 2022 throughout the proposed development area and surrounds to characterize the seafloor and highlight any benthic features.

The study area was mapped using a CHIRP enabled broadband sounder and Garmin EchoMAP plotter, logging GPS positions and water depth every two seconds. This information was logged at sufficient resolution, such that representative interpolations between data points could be made, to produce accurate bathymetric data of the given area to the Australian hydrographic survey requirements. Depths were measured to the nearest tenth of a metre, and tidally and barometrically corrected for Chart Datum (CD) using tide charts and observations from the Bureau of Meteorology. The resultant files were interpolated using GIS software Surfer 11.0 to create a bathymetric profile of the area.

5.2 RESULTS

The bathymetry across the study area consists of gradually sloping seabed that follows the shape of the shoreline. (Figure 2). Depth ranged from 5 m inshore, to 10 m offshore, and presents suitable depths for the proposed native oyster reef restoration.

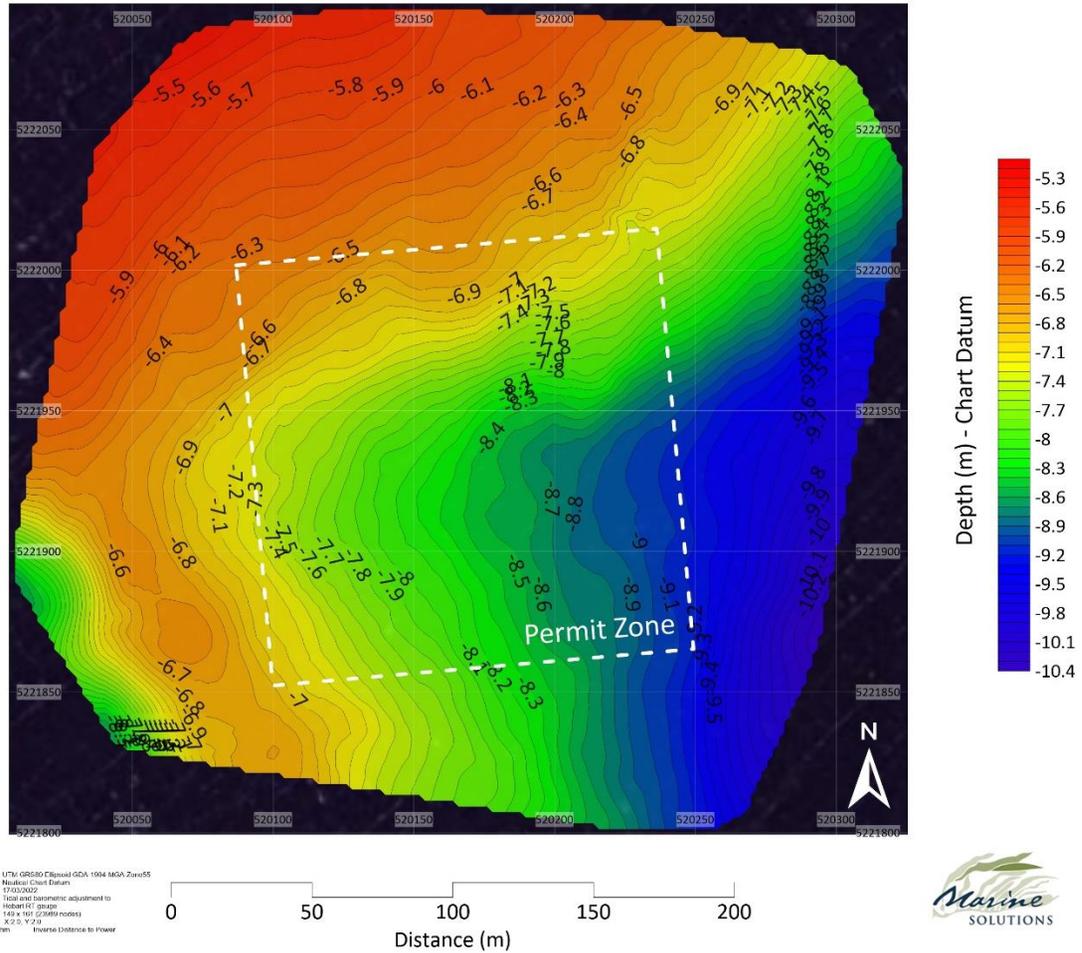
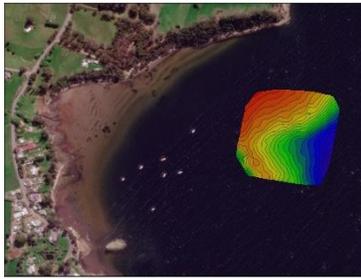


Figure 2. Bathymetric contour map of the seabed of the survey area (proposed reef area (150m x 150m) boundaries indicated by white dotted line) at Helliwells Point, Woodbridge, corrected to Chart Datum.



6 UNDERWATER HABITAT CHARACTERISATION

6.1 METHODS

An underwater habitat survey at Helliwells Point, Woodbridge was conducted by divers on 17th of March 2022. Twelve contiguous 50 m long transects (three transects along each line) were swum by divers covering a 4 m-wide swathe either side of the transect (Figure 3). Video footage was captured using a Sony NEX-5 camera in an Aquapazza housing.

6.2 RESULTS

Sand and silt made up the substrate on all transects, with the surface often covered in a layer of shell grit. The bottom was very soft and light silt was easily disturbed. There was a dense cover of dead scallop shells on all transects and fan worms (*Myxycola infundibulum*) were common. No threatened species were observed in the underwater habitat survey. No suitable substrata was identified for Giant kelp marine forests to form. The full list of species identified during the habitat survey is included in Appendix 3. Video files are listed in Appendix 4 and are available from Marine Solutions on request.



Figure 3 Location of the dive transects (yellow) and sediment grabs (red) relative to the reef permit area at Helliwells Point, Woodbridge

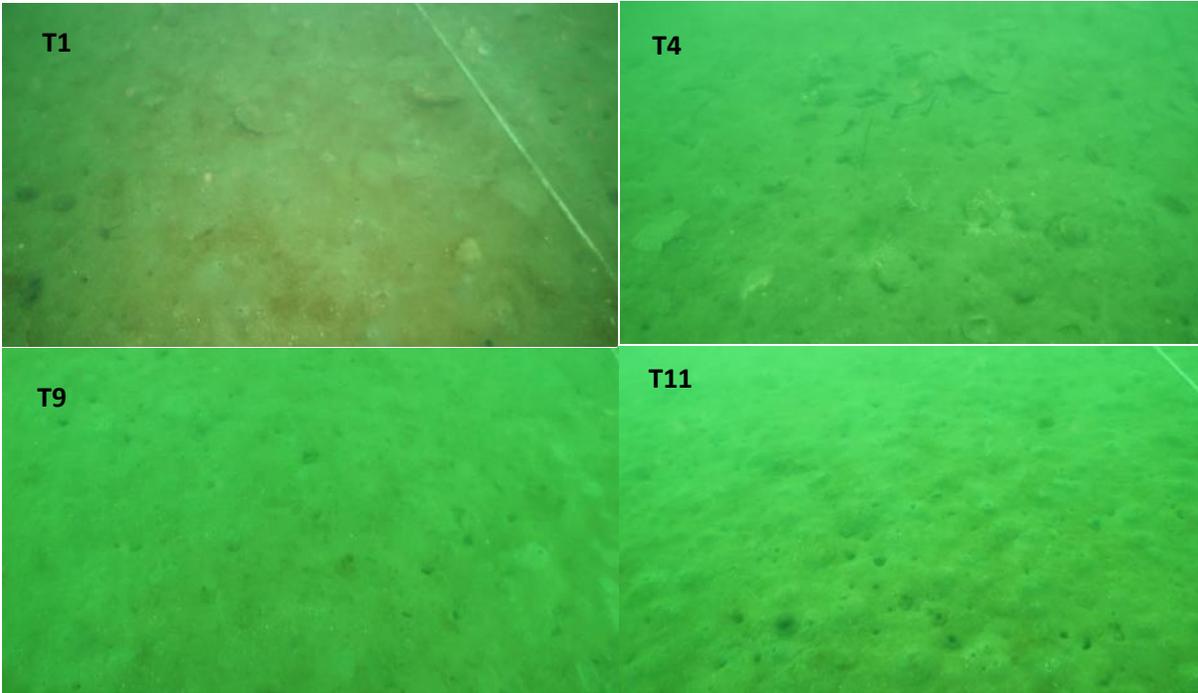


Figure 4 Images of benthic habitats throughout reef permit area at Woodbridge.

7 SEDIMENT PARTICLE SIZE CHARACTERISATION

7.1.1 Methods

Sediment samples were collected at five sites in the reef permit area using a Ponar grab (Figure 3). Particle size distribution was assessed volumetrically for each site by wet sieving sediment samples through a series of stainless-steel sieves (4 mm, 2 mm, 1 mm, 500 µm, 250 µm, 125 µm and 63 µm). The content of each sieve was drained and transferred to a measuring cylinder, beginning with the coarsest sediment fraction (4 mm) and working down to the finest (63 µm). The volume of sediment in the measuring cylinder was recorded for each size class. The sediment fraction < 63 µm was assumed to be the total volume of the sample minus the combined volume of all other size classes.

7.1.2 Results

Particle size analysis indicated the majority of sediments were mostly fine silt at < 0.063 mm particle size (Figure 5). The deposition of sediments in this area are therefore likely mostly from riverine deposition upstream and runoff from surrounding lands.

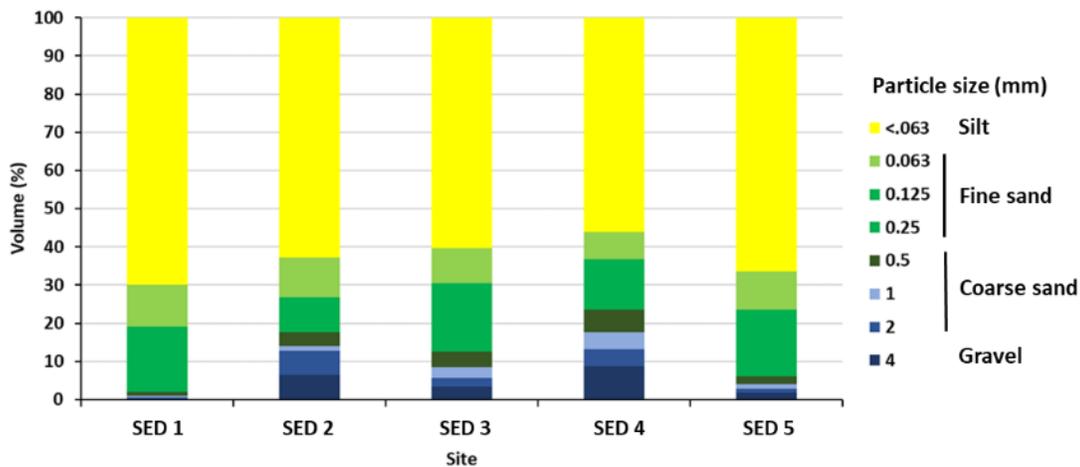


Figure 5. Results from particle size analysis at each of the five sites at Helliwells Point, Woodbridge.

8 THREATENED AND PROTECTED SPECIES SURVEY

Based on the known likelihood of threatened and protected species to occur within the proposed development area (refer Section 4.1), it was determined that targeted species-specific surveys were required for the Gunn's screwshell (*Gazameda gunnii*).

8.1 SURVEY FOR GUNN'S SCREWSHELL

8.1.1 Methods

On the 17th of March 2022, the field team used a Ponar grab to gather five benthic infauna samples from within the reef permit area at Heliwell's Point, Woodbridge in accordance with the *Guidelines for Natural Values Surveys – Estuarine and Marine Development Proposals* (NRE Tas, 2020) for a 2 ha area. Sample locations were the same as sediment sampling locations (Figure 3). Samples were sieved through a 2mm mesh to assess the presence/absence of *Gazameda gunnii* in the area.

8.1.2 Results

No *Gazameda gunnii* identified in any of the samples collected at Helliwells Point, Woodbridge (Figure 6). The grabs consisted mostly of shells, shell fragments and shell grit. These shell fragments were difficult to identify on a species-specific level due to their small size, however some fragments and whole individuals of the invasive New Zealand screwshell, *Maoricolpus roseus* were identified. There was a significant quantity of scallop shell debris also observed in all the samples, consistent with the observations made by divers in Section 6.2. Sample 1 also contained fragments of heart urchin (*Echinocardium cordatum*) (Figure 6).



Figure 6 Images of the sieves of *Gazameda gunnii* grabs at Helliwells point, Woodbridge.

9 CONCLUSION

The proposed site proved to be of a suitable depth for the proposed native oyster reef restoration, with depths observed up to 10 m. The benthic habitat at the site consisted of with a fine silt with bioturbation and a coverage of scallop shells and sand worms. No threatened or protected species were observed in the vicinity of the proposed development.

On the basis of the habitat features present and Marine Solutions not identifying any sensitive receptors including any threatened species, Helliwells point, Woodbridge is deemed a suitable site for the proposed native oyster reef restoration. There are no contradictions present to indicate that native oyster reef restoration will have any significant impact on threatened species and communities in the area.

10 REFERENCES

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- Department of Natural Resources and Environment Tasmania (NRE Tas; formerly DPIPWE) (2022) Natural Values Atlas Report: Authoritative, comprehensive information on Tasmania's natural values. GDA94:518934.0, 5203821.0. Buffer min: 500 m, max: 5000 m. Report created: 2:44pm 16/02/2022.
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- Department of the Environment (2015) Recovery Plan for Three Handfish Species: Spotted handfish *Brachionichthys hirsutus*, Red handfish *Thymichthys politus* and Ziebell's handfish *Brachiopsilus ziebelli*
- Grove, S.J. (2018). A Guide to the Seashells and other Marine Molluscs of Tasmania NRE Tas (2020) Natural and Cultural Heritage Division Guidelines for Natural Values Surveys – Estuarine & Marine Development Proposals. NRE Tas (Formally Department of Primary Industries, Parks, Water and Environment)
- NRE Tas - Threatened Species Section (2012). Listing Statement for *Parvulastra vivipara* (Tasmanian Live-bearing Seastar). NRE Tas.

11 APPENDICES

Appendix 1. GPS Positions of sampling locations (WGS 84)

Name	Latitude	Longitude	Comments
T1START	-43.1542	147.2487	Start of transect T1
T1FINISH	-43.1556	147.2485	End of transect T1
T2START	-43.1556	147.2483	Start of transect T2
T2FINISH	-43.1543	147.2486	End of transect T2
T3START	-43.1543	147.2479	Start of transect T3
T3FINISH	-43.1557	147.2478	End of transect T3
T4START	-43.1556	147.2476	Start of transect T4
T4FINISH	-43.1543	147.2477	End of transect T4
SED 1	-43.1554	147.2471	Also site of sample GAZ 1
SED 2	-43.1551	147.2473	Also site of sample GAZ 2
SED 3	-43.155	147.2485	Also site of sample GAZ 3
SED 4	-43.1543	147.2484	Also site of sample GAZ 4
SED 5	-43.1548	147.2468	Also site of sample GAZ 5

Appendix 2. Operational Summary

Date	17/03/2022
Personnel	A. Gilham, S. Ibbott
Time (start – end)	11:00 – 15:00
Cloud	6/8
Rain	Light drizzle
Swell	Wind chop (0-1m)
Wind	10 – 15 knots
Tide	Low
Current	Low
Works conducted	<ul style="list-style-type: none">- Bathymetric mapping- Underwater habitat characterisation- Sediment collection for particle size- <i>Gazemada gunni</i> grabs using Ponar

Appendix 3. Species List

The table below shows all species observed in field investigations on 17/03/2022. Note that list is not to be considered exhaustive, but rather a snapshot of species observed through the duration of the field survey.

		Common Name	Scientific Name	Status notes*
Algae & Seagrasses		Turfing brown algae	ID N/A	
Invertebrates	Annelids	Fan worm	<i>Myxycola infundibulum</i>	
	Molluscs	Cowrie	<i>Cypraea hesitata</i>	
		New Zealand screwshell	<i>Maoricolpus roseus</i>	Introduced
	Echinoderms	Venus shell (various)	<i>Veneridae (varied)</i>	
		Northern Pacific seastar	<i>Asterias amurensis</i>	Introduced
		Sea cucumber	ID N/A	
		Heart urchin	<i>(Echinocardium cordatum).</i>	
Other	Yellow sponge	<i>Unknown</i>		
Vertebrates	Sand Flathead	<i>Playcephalus sp.</i>		
	Flounder	<i>Rhombosolea tapirina</i>		

Appendix 4. Video Files

Video footage is available from the following files upon request

- T1-T2-T3.MP4
- T4-T5-T6.MP4
- T7-T8-T9.MP4
- T10-T11-T12.MP4