MARINE POLLUTION RESEARCH PTY LTD

Marine, Estuarine and Freshwater Ecology, Sediment and Water Quality Dynamics

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AQUATIC ECOLOGY ASSESSMENT FOR THE PERMANENT USE OF THE BERTHING AND PONTOON FACILITIES AT 38 CABARITA RD, AVALON BEACH.

Figure 1 Oblique drone view of the waterfront facilities and berth at 38 Cabarita Rd, Avalon Beach.

1 INTRODUCTION

Marine Pollution Research Pty Ltd (MPR) was requested by **Shaw Reynolds Lawyers** to provide an aquatic ecology impact assessment for the permanent use of the existing pontoon and berthing facilities at 38 Cabarita Rd, Avalon Beach. The site is located on the eastern side of Stokes Point in Careel Bay, Avalon (**Figure 1**). The property faces ENE and is open to winds from the north through to the east south east, and the largest fetch is approximately 1.64km north across to Palm Beach. The seabed offshore from the site slopes from the inshore intertidal to approximately 7m below ISLW approximately 150m offshore. Careel Bay has an eight knot vessel speed limit and a high density of moorings (see **Figure 2**), and accordingly the site is mainly open to wind waves. with smaller but quite frequent wash waves from vessels transiting at the speed limit.

1.1 Available Aquatic Habitat Information

In terms of existing aquatic ecological habitat information, the 2005 DPIRD Fisheries key fish habitat mapping noted an absence of seagrass offshore from the wharf at 38 Cabarita Rd, with inshore shallow water seagrass predominantly *Zostera* to the north of the site and primarily bare sediment plus shallower *Posidonia* seagrass to the south (**Figure 2**).

Figure 2 Portion of DPIRD Fisheries NSW Marine Vegetation Map 2005 for Pittwater showing *Posidonia* (red) and *Zostera* (Blue) seagrass.

The most recent DIPRD Fisheries NSW marine vegetation habitat map for Pittwater from 2019 indicates a continuous band of *Posidonia* offshore from the waterfront properties with a fragmented band of *Zostera* seagrass inshore (**Figure 3)**.

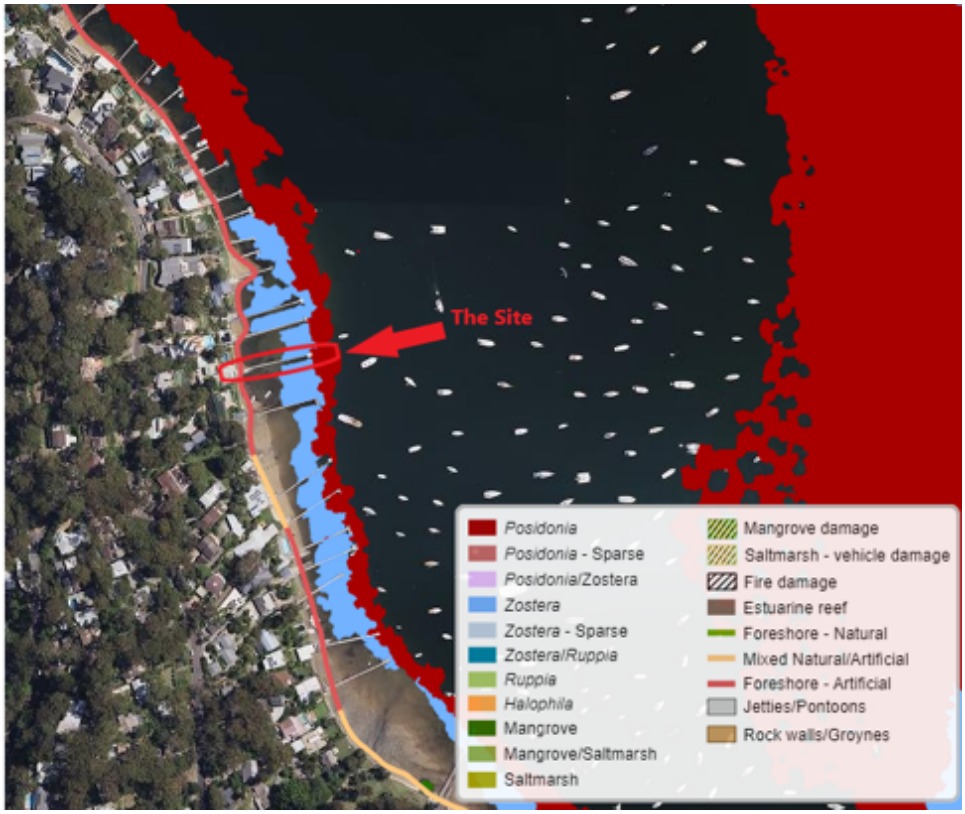

Figure 3 Portion of DPIRD Fisheries NSW Marine Vegetation Map 2019 for Pittwater showing *Posidonia* (red) and *Zostera* (Blue) seagrass.

2 AQUATIC HABITATS AND ECOLOGY

A dive and walkover survey of the site was undertaken by MPR Aquatic Scientists on 28 January 2025 and CMS Surveyors Pty Ltd (CMS) undertook a hydro-survey of the site on 25 February 2025. The aquatic ecology survey was undertaken on a low tide and the inshore waters were generally turbid with poor underwater visibility, particularly inshore. **Appendix A** provides a copy of the CMS Hydrosurvey and Appendix B provides the MPR drone aquatic habitat mapping with the CMS hydro-survey overlay. **Figure 4** below provides the drone view of the site with the main aquatic habitats at the location and the hydrosurvey data left off for better habitat clarity. Aquatic habitats at the site are described as follows:

- The riparian zone comprises reclamations with a grassed area and boatshed retained by a sandstone block seawall (**Figures 4 and 5**).
- There is some exposed basement rock under the seawall to the south and there is stacked rock rubble under the ramp and inner portion of the jetty (**Figures 4 to 6**).

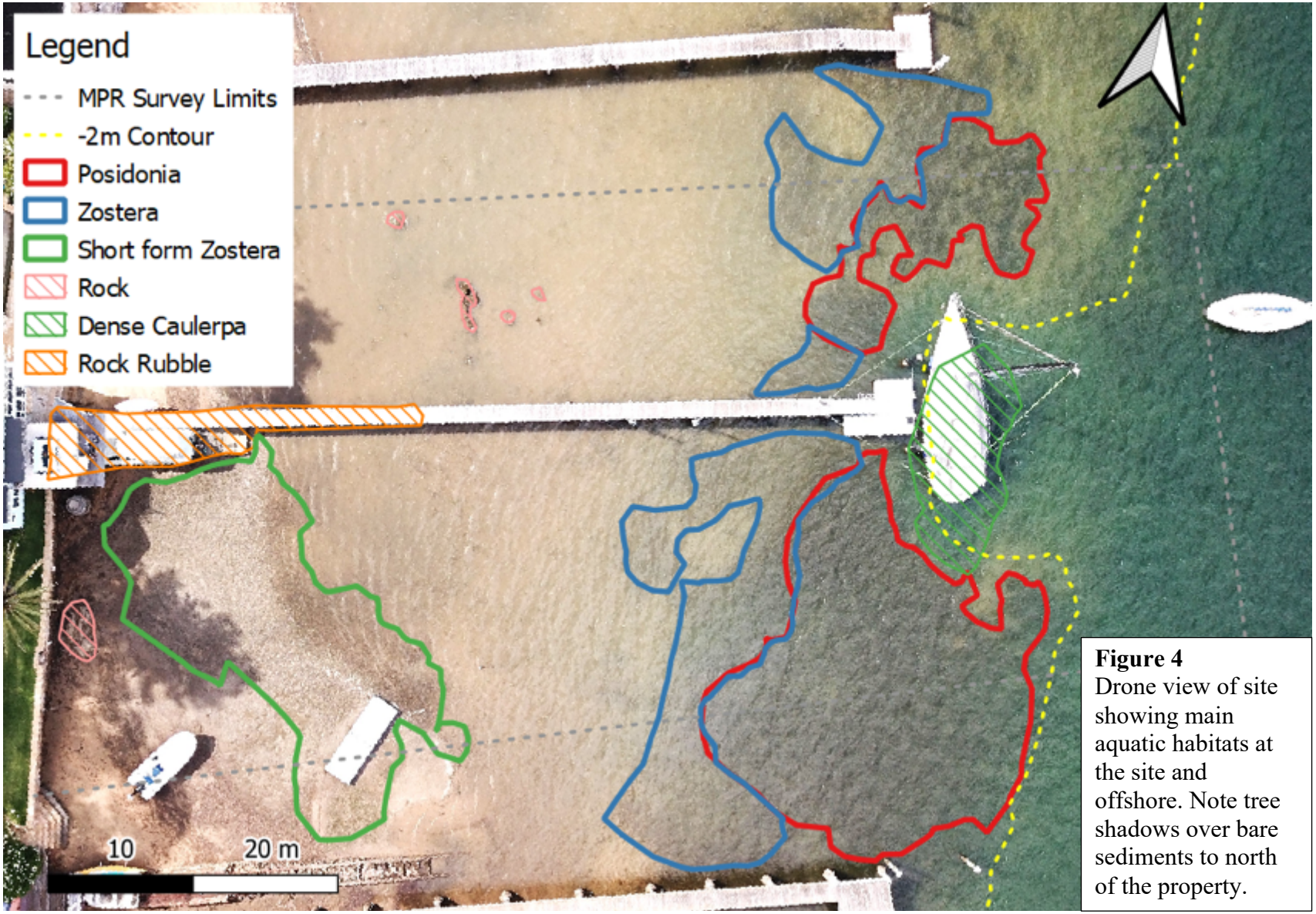

Figure 4
Drone view of site showing main aquatic habitats at the site and offshore. Note tree shadows over bare sediments to north of the property.

Figure 5 Sandstone block seawall retaining grassed area. with some exposed basement rock to the south and stacked rock rubble under the Ramp. Note sewer inspection structure alongside the seawall at the site. Note also short form intertidal *Zostera* in foreground.

Figure 6 Intertidal oysters on rock rubble and intertidal short-form *Zostera* on south side (see also **Figure 8**).

Figure 7 High intertidal bare sandy beach habitat on north side of jetty formed against the stacked intertidal rock rubble extending out from the seawall under the jetty/ The rock rubble supports an oyster assemblage and no algae growth inshore but with small amounts of Neptune's necklace *Hormosira banksia* on the outermost rocks. Note sandstone seastairs in right lower corner of the photograph,

- The intertidal wetted surfaces of the sandstone seawall and intertidal rock rubble supported an oyster-based assemblage with no macro algae and a variety of gastropods, mainly *Morula sp., Bembicium sp*. & *Austrocochlea sp*. (**Figure 7**).
- There is a distinct bed of short-form *Zostera* (green line in **Figure 4**) on the south side of the facility between about -0.4 and -0.6m ISLW (**Figure 8**).
- Un-grassed sediments offshore from the northern sandy beach on **Figure 7** and between the intertidal short form *Zostera* and the shallow sub-tidal *Zostera* beds offshore transitioned from sandy to silty sands with depth and there was a small portion of low intertidal exposed rock (see **Figure 4**) to the north that supported oysters, Neptunes Necklace and some *Sargassum sp*.

Figure 8 There is short form intertidal *Zostera* habitat immediately inshore on the south side of the jetty and ramp and no bare sandy beach, and only a small fillet of beach sand south confined between the portion of inshore basement rock and the rock ramp facility to the south.

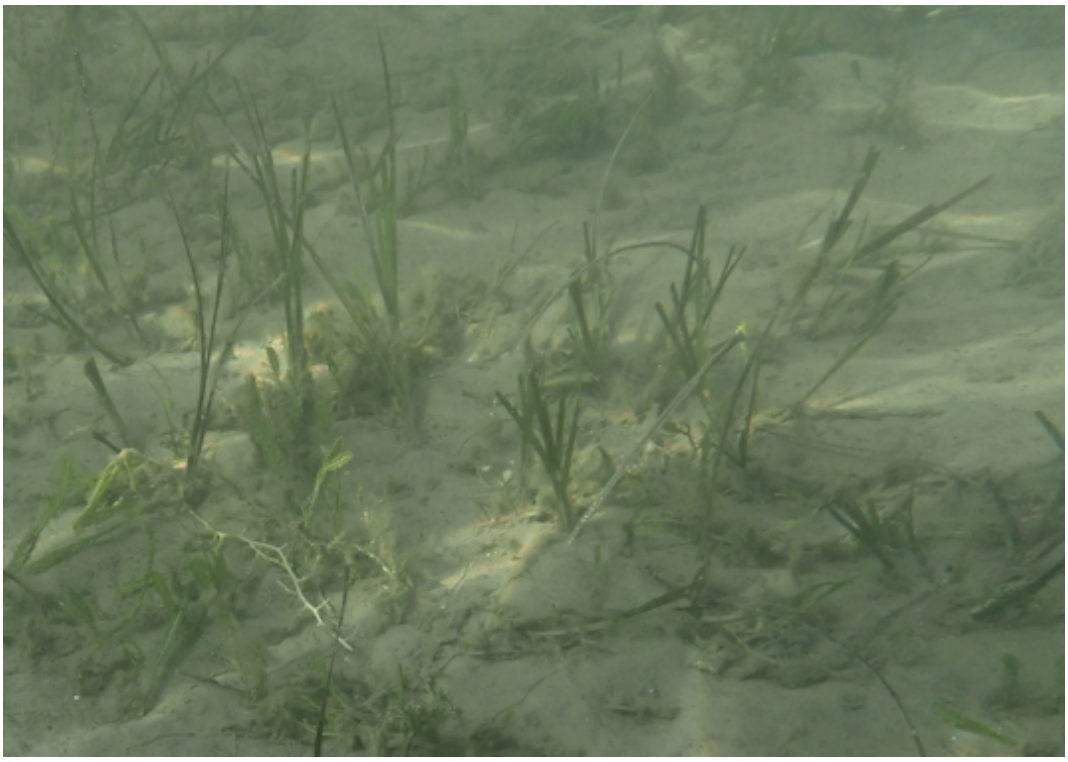

Figure 9 Shallow sub-tidal *Zostera* seagrass with *Caulerpa taxifolia*. The *Zostera* bed became progressively denser and even with depth offshore.

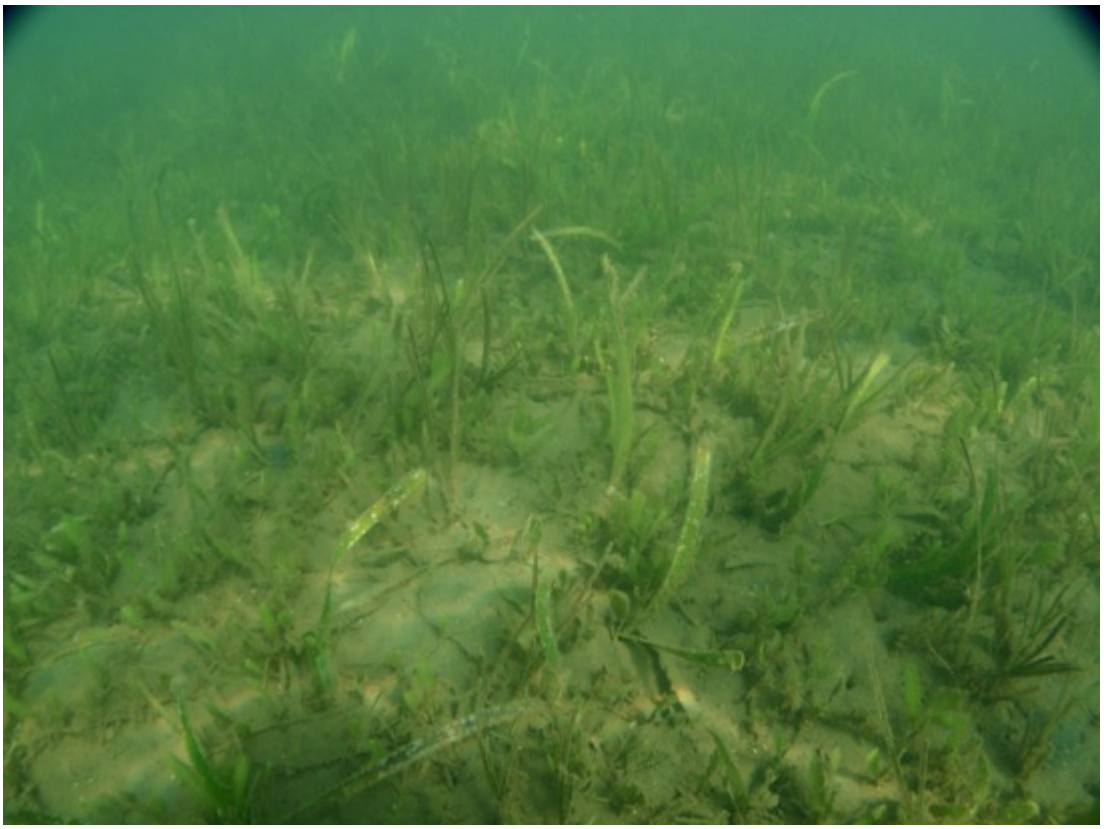

Figure 10 Sparse *Posidonia* and *Caulerpa* habitat (red line area in **Figure 4**).

Figure 11 There was dense *Caulerpa taxifolia* growth in the depression at the end of the existing pontoon and under the yacht.

- The offshore shallow *Zostera* beds to the north and south of the outer jetty shown as a blue line on **Figure 4** (from about -0.9m to about -1.2m ISLW) comprised sparse and uneven normal-length *Zostera* shoots interspersed with sparse listed pest algae *Caulerpa taxifolia* (**Figure 9).**
- The *Zostera* bed transitioned from medium density *Zostera* to sparse to medium density *Posidonia* seagrass (**Figure 10** and red lines on **Figure 4**) between -1.0 to -1.9m ISLW with individual *Posidonia* shoots observed to about -2 m depth.
- *Caulerpa taxifolia* was present throughout the outer seagrass beds and into deep waters beyond the *Posidonia* limit to about -23.4m ISLW, and the scour hole depression in the mooring pen (green cross hatched area in **Figure 4**) supported a high density cover of *Caulerpa taxifolia* with no seagrass evident (**Figure 11**).
- The intertidal portions of piles supported an oyster-based assemblage with little or no attached biota in deeper waters and the pontoon vertical wetted surfaces supported a simple oyster based assemblage with some Codium algae (**Figure 12**).

Figure 12 Oyster growth on intertidal pile sections, plus *Codium* on pontoon waterline.

2.1 Threatened Species, Endangered Ecological Communities & Protected Species

The NSW *Fisheries Management Act 1994* (FMA), NSW *Biodiversity Conservation Act 2016* (BCA) and the Commonwealth EPBC Act 1999 require that any proposed activity be assessed with respect to its potential impact on species or ecological communities listed as threatened under the Threatened Species Schedules of the Acts or listed as migratory species under the EPBC Act.

The FMA and EPBC Act list a number of marine and estuarine shark and teleost fish species as Vulnerable Species under Schedule 5 of the Act. Syngnathiformes (seahorses, sea-dragons, pipefish, pipe-horses and sea-moths) are protected, under both the EPBC Act and the FMA, with Whites Seahorse *Hippocampus whitei* listed as *endangered* under the FMA. Seagrasses are protected under the FMA, and *Posidonia australis* seagrass is listed under both the FMA and EPBC Act as an *Endangered Ecological Community* in Pittwater.

There are three FMA threated species (Grey Nurse Shark, Great White shark plus Black Rock Cod) known from coastal waters at the mouth of Pittwater and White's Seahorse (listed as Threatened under the FMA) is known from Pittwater:

- The two shark species could conceivably visit the area from time to time,and would only be expected in the vicinity of the site when in pursuit of mobile prey species.
- The Black Rock Cod *Epinephelus daemelli* is known from the outer Pittwater, however there was no suitable rock cave or crevice habitat found at the site.
- AMBC (2007) listed four Syngnathids from Pittwater; two seahorse species (White's Seahorse *Hippocampus whitei,* Bigbelly Seahorse *Hippocampus abdominalis*) and three pipefish (Wide-body Pipefish *Stigmatopora nigra*, Stick Pipefish *Trachyrhamphus bicoarctatus* and Hairy Pipefish *Urocampus carinirostris).* White's seahorse populations have declined significantly over the past decade, which resulted in them being listed as *Endangered* under the NSW Fisheries Management Act in 2019. In 2020 this species was also listed as *Endangered* under the Commonwealth EPBC Act. The present *Zostera* offshore seagrass and outer *Posidonia* seagrass beds could support Whites seahorses. whilst the pile attached biota habitats plus the inshore short-form Zostera habitats and all the bare sand habitats would not provide suitable shelter or feeding habitats for White's seahorse.
- Of the three seagrass species recorded from Pittwater and at this site, *Zostera capricorni* and *Halophila* ovalis (the latter noted as very sparse at this site*),* are protected under the FM Act and *Posidonia australis* seagrass is listed under both the FM and EPBC Acts as an *Endangered Ecological Community* in Pittwater.

With regard to other aquatic species or ecological communities listed under the NSW *BCA* and the Commonwealth *EPBC Act,* Little Penguins have a nesting colony on Lion Island at the mouth of Pittwater and are observed fishing and feeding throughout Pittwater and would be expected to visit the site from time to time.

Various listed cetaceans (whales and dolphins), marine mammals (seals and sea lions), marine reptiles (turtles and sea-snakes) and sea-birds (ocean birds and waders) are known from Pittwater and are known to penetrate the area to and beyond the study site. Of the species that may occur in the vicinity of the site, most would be utilising the bait fish resources of the inshore shallows or the adjacent waters as transients or opportunistic feeders.

It is concluded that, other than the Whites seahorse and other Syngnathiformes, it is unlikely that there would be any threatened species listed under the FMA, BCA and EPBC Act residing within the locality.

2.2 Key Fish Habitat Assessment

With regard to the DIPRD Fisheries NSW waterway classification scheme as shown in Table 2 of the NSW Fisheries 2013 Policy and Guidelines document, Careel Bay is a Class 1 “Major key fish habitat” (KFH) by virtue of it being an estuarine waterway. In regard to the sensitivity classification of the specific habitats within Careel Bay (as defined in Table 1 of Fisheries NSW 2013):

- The *Zostera* and *Posidonia* seagrass beds identified for this proposal in **Figure 4** are Type 1 “highly sensitive KFH”.
- The small, exposed rock habitats to the north of the jetty in sub-tidal shallows (may be considered Type 2 "moderately sensitive KFH, due to the presence of some sub-tidal algae.
- The un-vegetated marine silt-sands and the pocket beach sand on the north side of the jetty are Type 3 “minimally sensitive” KFH.
- The intertidal to shallow sub-tidal rock rubble habitat under the inshore deck, ramp and jetty can be considered Type 2 "moderately sensitive KFH, due to the presence of some sub-tidal algae for the outermost shallow rock, and combined with the innermost rock rubble, provide valuable habitat for oyster and crustacean based biotic assemblages, enhanced by the shading protection afforded by the deck, ramp and jetty timber structures.

3 IMPACT ASSESSMENT

The original 1957 permissive occupancy was for a boatshed, landing, timber slipway and timber jetty, and the present application is for the regularising of unauthorised structures beyond the original 1957 PO via a Building Information Certificate (BIC) plus a Development Application for the existing pontoon facility and an associated mooring pen and mooring piles. **(Figures 13).**

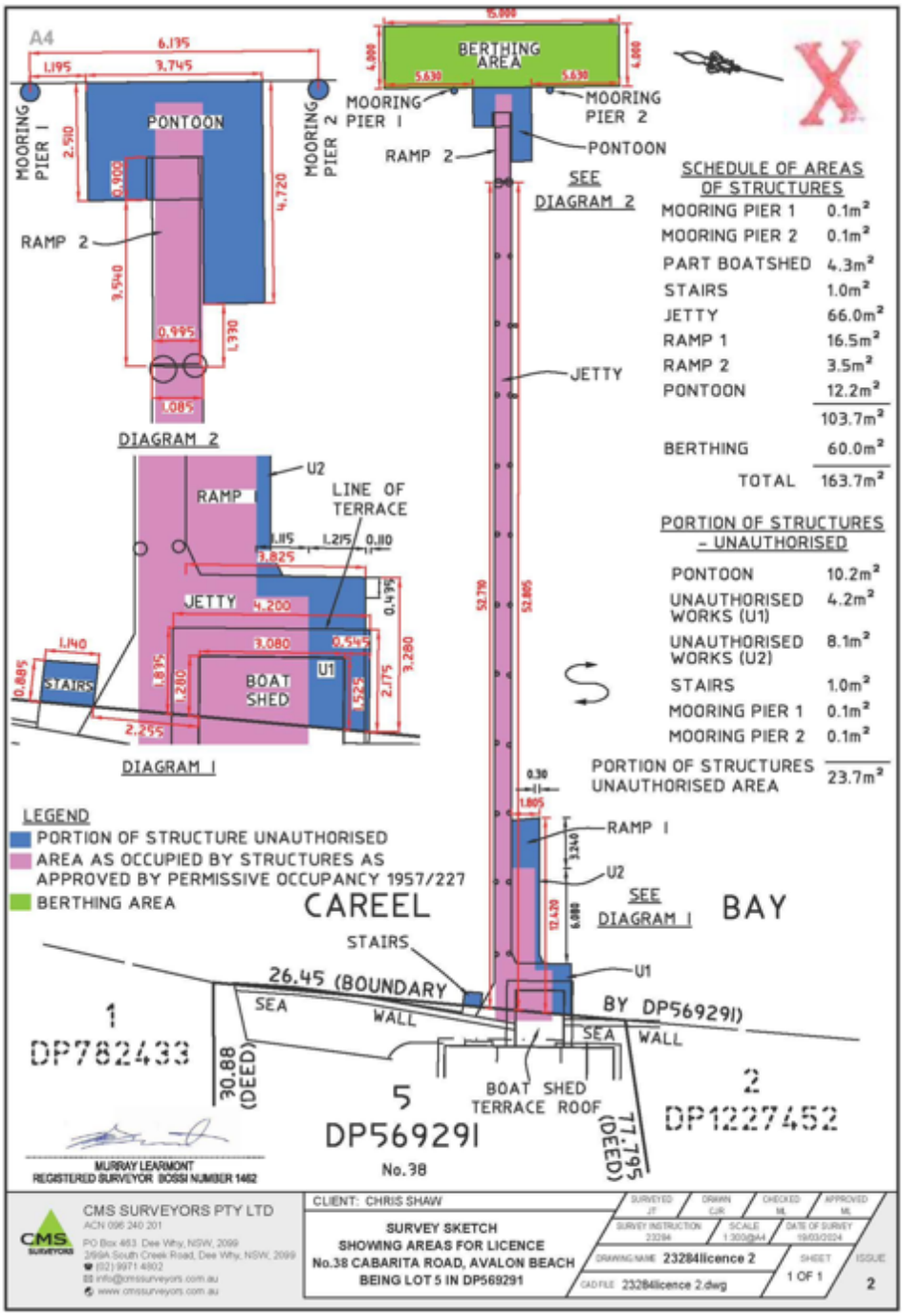

Figure 13 19 March 2024 Survey detailing approved and unapproved structures the pontoon facility and the proposed berthing pen

The present berthing use is for mooring a cruiser/racer yacht (**Figures 1 and 4**) with the following dimensions; 14m length, 1.8m draft to under keel, with propulsion at 0.75m depth below water line - measured at bottom of propeller). From direct observation the thrust from the propeller is straight back and not angled downwards.

Figure 14 Drone view of existing boatshed, sea stairs and the intertidal deck plus ramp and jetty facilities in relation to the intertidal rock rubble habitats, the pocket sandy beach to the north and the intertidal to shallow sub-tidal Short Form *Zostera* seagrass bed to the south.

3.1 Inshore Intertidal Amendments

Figure 14 provides an inshore drone image of the property that includes all the inshore amendment elements. The BIC elements for intertidal structures are the widened section of inshore deck under the approved boatshed and extending out a small distance offshore, the widening of the approved ramp (both to the south of the existing approved structures (see also **Figures 5** and **6**), and sandstone sea stairs immediately north of the approved jetty (also **Figure 7**).

The southern deck widening abuts a concrete sewer inspection structure (**Figure 14**) and there is rock rubble habitat under the approved and extended intertidal structures:

- The widened southern portions of the inshore deck and timber ramp are both located over shallow tidal rock rubble habitat and provide some additional shading for that habitat in mid-summer whilst not impacting on the short form *Zostera* habitat that abuts the rock rubble on the south side (**Figure 4**).
- As this shading is beneficial for the rock rubble molluscs and crustaceans this impact is considered beneficial for overall aquatic ecology of the site and of Careel Bay.
- The stone seastairs are built onto an intertidal sandy pocket beach and provide some intertidal wetted surfaces for molluscs. The imposition of the sea stairs is not considered to have materially impacted the possible beach invertebrate fauna which would be expected to be minimal in any case due to both its small size and probable instability due wave mediated mobilisation.

It is concluded that the inshore intertidal amendments can be approved as they provide neutral to beneficial impacts for the aquatic ecology and no impact on water quality.

3.2 Pontoon and Mooring Piles Facility

Figure 15 below shows the main seagrass bed habitat mapping superimposed over the CMS 25 February 2025 bathymetric survey. This indicates that for the most part the *Posidonia* seagrass is presently constrained between the -1.1m and -1.6m contours and thus could be expected to occur within the current footprint of ramp and pontoon facility. However. the pontoon and mooring pile facility is located over essentially bare sediment habitat with *Posidonia* beds either side.

Further consideration of this gap width indicates that the north-south separation of the two beds is much greater and more symmetrical than would be expected from jetty/pontoon shading alone, and is also more in line with overall north to south bed separation limits for this location indicated on the DIPRD Fisheries *Posidonia* and *Zostera* habitat mapping for the location for 2005 (see **Figure 16** below) which also indicates a similar wide break around the outer jetty and pontoon at this location.

Whilst this explanation is plausible, it does not sit well with the more recent DIPRD 2019 seagrass mapping that indicates a continuous cover of inshore *Zostera* and offshore *Posidonia* at the site. Either the two DIPRD mappings at this particular site plus the 2025 mapping for this report indicate quite radical change in seagrass beds at this location or, considering the present mapping is more in line with 2005 mapping, the 2019 mapping may have overestimated *Posidonia* bed continuity and overall width along this shore at this site.

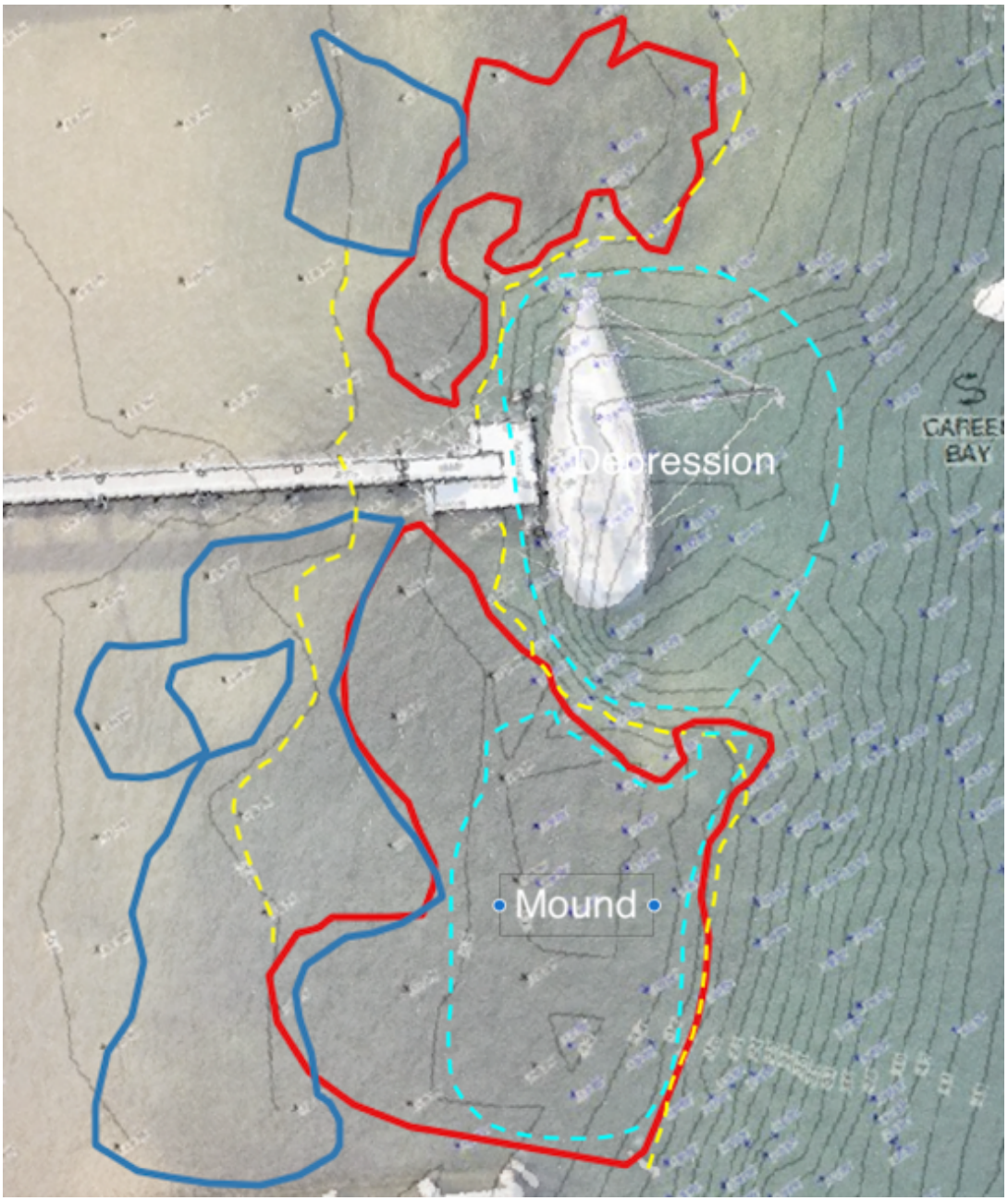

Figure 15 Main outer seagrass habitats superimposed onto the CMS February 2025 Hydrosurvey. Dark Blue is *Zostera* bed limit, Red is present *Posidonia* limit. Yellow line is current (and approximate) *Posidonia* inner and outer depth limits, and the light blue lines indicate the depression and mound locations based on the bathymetric survey data.

Figure 16

Detail of DIPRD Fisheries 2005 seagrass mapping in Careel Bay showing a distinct boundary at the subject property for predominantly inshore *Zostera* beds to the north, and predominantly *Posidonia* bed to the south.

In relation to the approval of the existing pontoon and mooring pile facility as, for the most part the pontoon and mooring piles are located over slightly deeper waters than the present *Posidonia* bed outer bed depth limit the continued use of the pontoon would not be expected to have any impact on present seagrass cover and could be approved.

3.3 Mooring Pen

The **Figure 15** CMS hydrosurvey superimposed over the seagrass mapping presented above indicates a distinct depression under the existing vessel and a corresponding but less distinct mound located to the south of the depression that together suggest that the mooring pen has

been scoured out in the past. Inspection of past Google Earth imagery indicates that this or a similar sized yacht has occupied this location since at least 2005 (20 years ago) indicating that the scour hole most likely predates that time and is consistent with the DIPRD 2005 seagrass mapping (as detailed in **Section 3.2** above).

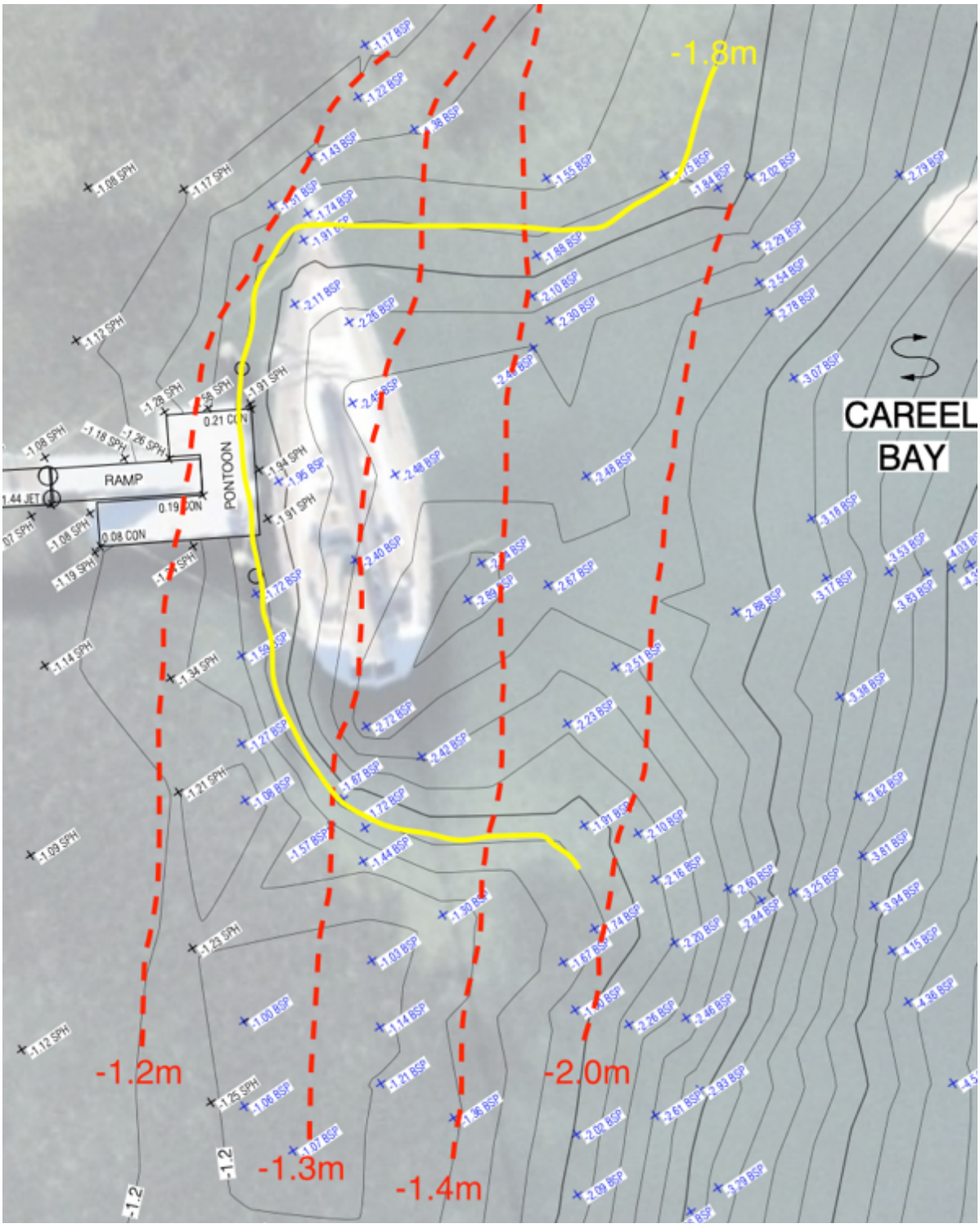

Figure 17 Estimated probable contour lines (red) prior to scour event with present -1.8n depth contour limit (at LAT) for present 1.8m draft yacht indicated in yellow.

Figure 17 above provides a rough estimate of where the seabed contours may have been located prior to the presumed scouring event(s) and in regards to the present vessel (and presumably for the similar sized yachts shown at the site since at least 2005 in the mooring pen) it is not possible that such a vessel can have contributed to this scouring either deliberately or inadvertently as at Lowest Astronomical Tide (0m ISLW) the moored vessel would even now would be stranded in the depression hole with more than 1.8m depth and consequently more than 1m water depth between the propeller wash and the seabed. Before the scour hole was there, there would not have been sufficient depth to bring such a deep draft vessel into the mooring at LAT and vessel entry would have been limited to tides above 1.8m which is a very limited high tide event close to the HAT of 2.0m ISLW.

As per the aquatic ecological survey this scour hole is now habitat for a listed pest species *Caulerpa taxifolia* that is currently found throughout the combined offshore *Zostera* and *Posidonia* beds and slightly further offshore from the present *Posidonia* outer depth limit. As this algae species is very prone to fragmentation from propeller thrust, the presence of the bed attests to the fact that the scour hole is stable and has not been scoured in recent times.

In terms of denying approval for use of a mooring pen in relation to the possibility of valuable and natural seagrass regrowth into the scour hole by having no vessel shading in the hole, it is considered that as *Posidonia* seagrass along this Careel Bay shore is presently constrained between the -1.1m and -1.6m contours (see **Figure 15** above) this would be ineffective as the depths in the scour hole are all more than -1.8m ISLW.

In terms of approval for use of a mooring pen for the present vessel it is clear that this vessel has not contributed to scouring or invasion of the scour hole by the listed pest algae species, it is clear that the manoeuvring of this vessel in and out of this scour hole has not disturbed the listed pest species and it is clear that manoeuvring can be achieved by a competent skipper who is aware of the size and dimensions of the scour hole.

In this respect if the mooring pen is to be approved it is imperative that the mooring piles be also approved as these are used by a skipper to 'spring' a vessel out from a confined space - as is a common practice in many marinas where vessels have to be sprung out from between vessels moored fore and aft.

3.4 Fisheries Management Act Permit Requirements

Part 7 of the Fisheries Management Act 1994 (FMA) sets out the conditions under which permits are required for various construction activities, and the conditions under which a permit may be granted are specified in the Fisheries NSW Policy and Guidelines (NSW Fisheries 2013). With respect to estuarine activities, permits are required *inter alia* for the "*taking or harming of marine vegetation"* or for "*reclamation or dredging works"*.

- The present proposal does not include activities that fall under the definition of dredging or reclamation.
- The proposal does not have any additional structures directly over any seagrass or algal reef habitats, therefore there will be no increase in marine vegetation shading impact and it is concluded there will be no *taking or harming marine vegetation*.

4 CONCLUSIONS

The continuing use of the existing landings, sea stairs, jetty ramp and pontoon plus mooring piles and associated mooring facility at 38 Cabarita Road Avalon does not present a risk of long-term impact on aquatic habitats at the site and the removal of some currently unapproved inshore elements would likely have an adverse impact on present aquatic ecology by removing valuable shading of intertidal rock rubble habitat that is too shallow to support marine algae growth in any case.

The outer jetty and ramp plus the vessel do not directly shade any significant marine vegetation and the vessel only shades the listed pest algae *Caulerpa taxifolia* which is considered beneficial.

Whilst the scour hole at the mooring pen location has more likely been manufactured many years ago (i.e., at least more than 20 years ago) it would appear to have been sufficiently stable to the extent that additional scouring has not occurred and approvals for the continued use of the scour hole as a mooring pen could be made contingent on say bi-annual hydrosurvey to demonstrate scour hole natural stability.

Accordingly, the proposal would not require a permit under the NSW Fisheries Management Act 1994 to *harm marine vegetation* or for *dredging or reclamation*.

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