Aquatic Ecology Assessment: Addendum

Koolewong Marina Development

Job Number: 59915035

Prepared for
Marmong Marina Properties Pty Ltd

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1 Background

Cardno was commissioned by Marmong Marina Properties Pty Ltd to revise a previous aquatic ecology assessment (Cardno Ecology Lab 2011) following a reconfiguration of a proposed 50 berth marina at Koolewong. This report forms an addendum to the previous aquatic ecology assessment and as such should be considered in consultation with the earlier report. The proposed marina will form an addition to the existing restaurant 'The Boathouse' and associated jetty. Koolewong is situated along the western shore of Brisbane Water, a relatively shallow and tidal northern arm of Broken Bay, just south of Gosford, NSW.

The proposed reconfiguration does not result in any change to the number of berths provided or the overall footprint of the marina. The main alteration is to bring the marina configuration closer to shore by replacing the existing jetty with a shorter and wider jetty than was previously proposed and provision of a gangway linking the jetty to the floating pontoons.

The earlier assessment by Cardno Ecology Lab (2011) identified the seagrass species *Zostera capricorni* and *Posidonia australis* along the shoreline on either side of the existing jetty, but shoreward of the proposed marina. Given the importance of seagrass for fish habitat, and the extended time period since the distribution of seagrass was confirmed, the proponent (Marmong Marina Properties Pty Ltd) was advised by Cardno to conduct a field based assessment of the current seagrass extend to ensure that no substantial changes to the distribution have occurred in the intervening period since the previous assessment.

2 Methods

Habitat mapping was initially undertaken for the original proposal on 28 July 2010 as part of a preliminary assessment of environmental risk of the proposed Koolewong Marina development. This mapping was extended on a site revisit on 31 August 2010. As a result of the reconfiguration of the proposed marina design, the previous mapping was verified during the site visit on 26 August 2014. Map verification concentrated on either side of the existing jetty as well as on the seaward extent of the seagrass habitat in the immediate vicinity of the jetty. The marine vegetation in the survey area was observed using snorkel, and habitat boundaries were recorded using a handheld GPS towed by the surveyor.

Survey conditions for the August 2014 fieldwork were overcast with water visibility of approximately 0.5 - 1 m. At the time of the survey the tide was rising to a high of 1.42 m at 11:00 AM. GPS coordinates taken during the survey were plotted onto a georectified plan of proposed marina structure (provided by Pacific Pontoon & Pier on 08 September 2014) using MapInfo Professional (version 10.5). As information on seagrass characteristics (i.e. leaf length and density) were not collected in the August 2014 survey, the mapping was simplified to show seagrass species information only.

3 Revised Assessment

3.1 Updated Seagrass Mapping

During the site visit on 26 August 2014, the verification of previous mapping indicated that the composition and extent of seagrass beds remained largely unchanged since the earlier surveys (see Cardno Ecology Lab 2011) with only slight changes to the seaward extent (**Figure 1**). Z. capricorni was still present underneath the existing jetty close to the shoreline under a section where boards have been replaced with seagrass friendly mesh, however, it was not present where it also previously extended under the jetty mid-point . The principle change occurred in terms of the area occupied by the invasive algae *Caulerpa taxifolia*. The previous mapping found a small patch of *C.taxifolia* to be present between piles 5 and 6 toward the end of the jetty and a more extensive area of sparse *C. taxifolia* was also observed approximately 10 m seaward (north-east) of the existing jetty. *C.taxifolia* was not observed during the current survey.

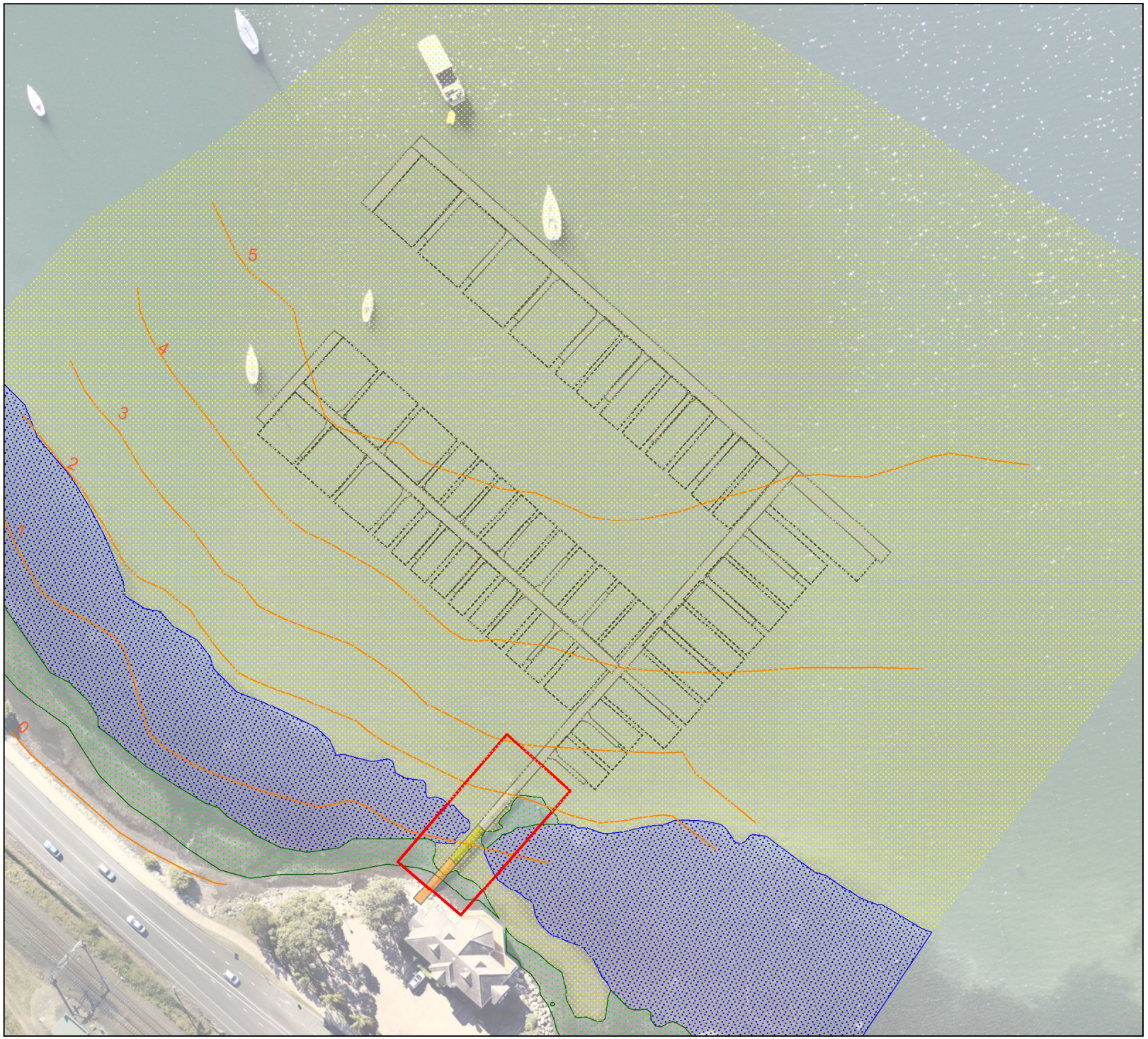
3.2 Alterations to Marina Configuration

The main alterations:

- Replace the existing jetty (including piles) with a 12 m x 2 m (24 m^2) jetty constructed from seagrass friendly mesh which is shorter and wider than the previously approved 35 m x 1.5 m (52.5 m^2) layout;
- Inclusion of a 10 m x 2 m gangway made of seagrass friendly mesh linking the jetty with the floating pontoons;
- Marina configuration brought closer to the shore including replacement of the last 13m of the existing jetty by floating pontoons with a concrete deck.

Additional important considerations of the revised layout include:

- The use of concrete deck for floating structures in place of mesh.
- The use of concrete piles and/or hollow steel piles;
- The size and position of larger vessels in the revised layout.



Seagrass Distribution

KOOLEWONG MARINA
REVISED ECOLOGICAL ASSESSMENT

Legend

Bathymetry Contours (m)

Proposed Marina:

- Pockets
- Pontoon
- Jetty
- Gangway

Seagrass:

- *Posidonia australis* (Seagrass)
- *Zostera capricorni* (Seagrass)
- Sand
- Area Surveyed 26 August 2014

N
W
E
S

Scale 1:1,200 Scale at A4

Metres
0 7.5 15

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (2812)
Date: 9 September 2014
Coordinate System: Zone 56 MGA/GDA 94
59915035_G1001_SeagrassDistribution.mxd 01

Figure 1: Revised marina layout and updated seagrass map

3.3 Assessment of Revised Marina Configuration

3.3.1 Marina Construction

The revised marina configuration includes the complete removal of the 16 existing piles, and installation of up to 8 piles for the new jetty. The previous ecological assessment was based on the existing piles being retained. The installation of new piles has the potential to directly displace *Z. capricorni* seagrass at the shoreline depending on the exact installation position. However the amount of *Z. capricorni* displaced would be minimal relative to the amount of *Z. capricorni* present.

In addition, the pile removal and installation works have the potential to indirectly disturb the seagrass habitat in the immediate vicinity of the existing jetty through mobilisation of sediment during pile removal and installation. Additionally, for structural reasons, concrete piles may be used in the revised marina configuration in place of hollow steel piles originally planned. This may cause slightly more sediment mobilisation during pile installation. The use of suitable sediment control devices to minimise sediment dispersion was previously recommended (Cardno Ecology Lab 2011), however the use of silt curtains in inshore areas, may not be possible due to the limited area to deploy them without directly damaging seagrass. Overall, the potential for impact to seagrass habitat through sediment mobilisation during construction is considered to be minimal given the short duration of any turbidity increase. Further, the seagrass present is likely to have a natural tolerance to short term elevation in turbidity associated with natural drivers such as wind, waves and rainfall.

The removal and installation of piles from the inshore area also poses a risk to seagrass as a result of increased vessel movements and activities over seagrass habitat (e.g. propeller scars and anchor damage). The likelihood of damage to seagrass can be easily minimised by suitable control measures during construction such as not deploying anchors within seagrass beds and ensuring adequate vessel clearance from the seabed is maintained. These control measures have been identified in the construction management plan (ADW Johnson 2011).

3.3.2 Ongoing Presence

The proposed 12 m x 2 m jetty will directly cover an additional area of seagrass of approximately 1.5 m^2 where it currently passes under the existing jetty along the shoreline. Importantly, this section currently has seagrass friendly mesh installed which indicates that the use of similar mesh in the proposed jetty is unlikely to have an adverse effect on the seagrass present through shading.

The 10 m gangway connecting the jetty to the floating pontoons is also to be constructed of light penetrating mesh. The area traversed by the gangway currently has no marine vegetation, however the *Z. capricorni* bed comes to between 0 - 2 m of the proposed gangway. The use of mesh for the gangway should allow greater light penetration than the existing timber jetty, meaning that shading of the adjacent seagrass should be negligible. Further, the use of mesh may allow future colonisation by seagrass under this section.

To better withstand wave action, the revised marina configuration will use concrete decking for all floating pontoons. Although the use of concrete decking will reduce light penetration, the majority of the floating structure is outside of the seagrass habitat zone, covering a silty seafloor with minimal marine vegetation, so any reduction in primary productivity will be negligible. Where the pontoon extends into the seagrass zone, there is also no direct cover of seagrass by the pontoons. However, a *Z. capricorni* bed comes to within 0.5 m to the south-east of the pontoon, so there is potential for some additional shading along the edge of this bed due to the increased width of the pontoon. However, the reduced height of the pontoon to the seabed compared to the existing jetty should also reduce the distance that the shadow is cast, which may at least partially compensate

for the increased shading footprint. Importantly, the *P. australis* bed is located over 2.5 m to the south-east of the pontoon, so there should be no risk of shadow casting to this bed. Overall, the area of potential shading would be small relative to the total area of *Z. capricorni* present in the vicinity of the proposed marina, and is also compensated by the increased light penetration through the use of mesh for the proposed jetty and gangway, which may allow seagrass expansion in these areas.

As a conservative measure the previous aquatic ecology assessment (Cardno Ecology Lab 2011) recommended that larger vessels be housed on the outer arm of the marina to minimise the risk of sediment mobilisation due to propeller action. The revised configuration has the potential for vessels of up to 18 m in length to be housed on the main arm to a depth of approximately -3 m AHD. Vessels of this size would generally have a draft of up to 1.5 m, resulting in a clearance of approximately 1.5 m from the seabed. Although it is possible that the movement of vessels of this size may mobilise fine sediments, such effects are expected to be of short duration (i.e. only while vessels are departing/berthing) and intermittent depending on frequency of vessel usage. The short duration and infrequent nature of these disturbance events indicate that they are likely to have less influence on turbidity than natural sediment mobilising forces such as wind, waves and tidal currents. Further, the existing jetty has historically been frequented by the M.V. Lady Kendall II, a 34 m long timber cruiser, which would operate in depths of approximately -2 m AHD to berth at the existing jetty. Any sediment mobilisation effects of the smaller 18 m vessels proposed for the marina are likely to be considerably less than a vessel of this size.

3.4 Conclusions

Overall, the revised configuration of the proposed Koolewong Marina is considered unlikely to have any ecologically significant impacts on the seagrass habitat and other marine ecosystems present in the vicinity of the proposed development. Any potential loss of the seagrass *Z. capricorni* through direct displacement (jetty piles) and shading are likely to be small relative to the overall area of seagrass present. Any losses may also be compensated by expansion of seagrass into areas currently devoid of seagrass due shading, as a result of the proposed use of seagrass friendly mesh for the jetty and gangway.

Importantly, the approximately 1200 m^2 of floating pontoons and at least 30 additional piles will create artificial habitat for a variety of organisms, including macroalgae, invertebrates and fish (Glasby 1999; Connell 2000 and 2001) in an area which previously contained minimal hard substrata for growth of marine biota or complex structures suitable as fish habitat.

4 References

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