



may seem like an 'offset', it is not the type of habitat that the proposed marina is likely to modify.

The proposed development will have an affect on macroinvertebrates at a local level. The driving in of pylons will have an immediate effect through direct physical disturbance, though this is unlikely to have a long-term effect on the macroinvertebrate assemblage within Dolans Bay.

In order to improve the local habitat, large nets or steel mesh can be used to provide habitat for protected Syngnathiformes and other fish. Swimming nets in Sydney Harbour have been shown to provide significant breeding habitat for seahorses (Harasti *et al.*, 2010). Providing netting or steel mesh provides a substrate for epibiota such as algae and sponges, which then provide a complex habitat that is suitable for species such as seahorses. Incorporating netting or steel mesh in the design of the proposed upgrade to the marina may result in an increased abundance of species such as protected seahorses.

Strapweed (Posidonia australis)

- 1.4 As the exact extent of the seagrass has not been accurately mapped, the effect of the proposed upgrade to the marina on the extent of the meadows of *P. australis* cannot be quantified. However, the replacement of swing moorings (which scour the sea floor) with an increased floating pontoon (no scouring) is not likely to be detrimental.

Direct Impacts

The direct impacts of the removal of the swing moorings and the upgrade of the marina:

- **Positive**
Removal of swing moorings, therefore reduced scouring.
- **Negative**
Initial increase of sedimentation due to pylon works and removal of swing moorings, therefore potentially reduced primary production rates and detrimental effects to meadows that may be close by. However, this one off event may be considered negligible when compared with daily scouring and re-suspension of sediments caused by the existing swing moorings.

Indirect Impacts

The indirect impacts of the removal of the swing moorings and the upgrade of the marina:

- **Positive**
Long-term reduction of continual disturbance of sediments.
- **Negative**
 - Increased wash due to higher boat numbers using the bay, therefore higher level of disturbance for *P. australis* located close to shore.
 - Higher levels of pollutants (oils, hydrocarbons etc)
 - Increased risk of pollution spills due to high water traffic



Figure 3 indicates the depth of the proposed marina extension to occur at approximately 6 – 11 m. Meadows of *P. australis* have only been mapped and observed in the shallow areas of Dolans Bay i.e. approximately less than 5 m. This, coupled with the fact that *P. australis* is a slow growing species that is unlikely to recolonize after heavy disturbance, makes it unlikely that the marina will have an effect on seagrass meadows in the general vicinity.

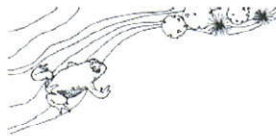
Protected and Threatened Species (FM Act 1997)

1.5 Protected and threatened species have already been identified in section 1.2 of this report

Aquatic Environmental Assessment

1.6

- (a) Scaled maps/survey diagrams by Michael S. Dunn Surveying, Toby Fiander & Associates and Abel Ecology.
- (b) Dolans Bay is the only water body to be affected by the proposed development.
- (c) Fish species that are likely to occur periodically in the area include yellowfin bream (*Acanthopagrus australis*), tarwhine (*Rhabdosargus sarba*), snapper (*Chrysophrys auratus*), mullet (Family: Mugilidae), dusky flathead (*Platycephalus fuscus*), sand whiting (*Sillago ciliata*), leatherjackets (Family: Monacanthidae), luderick (*Girella tricuspidata*) and large-tooth flounder (*Pseudorhombus arsius*)
- (d) Recreational fishers use the waters around Dolans Bay. This was observed during the initial site visit. The area directly around the marina is identified as a no fishing zone, as indicated by a sign at the front of the marina
- (e) Existing and proposed developments in the area
 - i. Abel Ecology is unaware of proposed developments within Dolans Bay
 - ii. According to the Port Hacking Integrated Environmental Management Plan (2007), Dolans bay has 69 private moorings and 25 commercial moorings (total 94).
 - iii. The cumulative effect of both the moorings and the boats within Dolans Bay is likely to be detrimental. However, it is still recommended that the removal of swing moorings (in the case of this proposal) will benefit the aquatic environment
- (f) The expected environmental change is likely to be negligible. Like other marinas, the upgrade will provide a greater surface area for sessile species such as oysters and Tunicate spp.
- (g)
 - i. If unexpected changes occur, further surveying and monitoring will be carried out to determine rates of change, remediation possibilities etc.
 - ii. Further information not required for the commencement of the operation
 - iii. Monitoring during construction is not required. Monitoring after construction is not required, though incidental observations of epiphytic growth around the proposed upgrade of the marina may indicate the expected growth.
 - iv. Controlled removal of the swing moorings (silt curtains)
 - v. Artificial reef habitat may be constructed beneath the current and proposed upgrade sections of the marina, providing habitat for epibiota, protected



Syngnathiformes and other fish (see point 1.3 under 'Impact on Aquatic Fauna and Amelioration')

(h) See point 1.3 under 'Impact on Aquatic Fauna and Amelioration'

2. Draft Guidelines for Threatened Species Assessment under part 3A of the Environmental Planning and Assessment Act 1979 (DEC) 2005

Threatened fish that may use the site are covered in Point 1.2 of this report.

Total listing of threatened species (non-fish species) in the local area (5 km radius) (NSW Wildlife Atlas)

Australasian Bittern	New Zealand Fur-seal
Australian Fur-seal	Osprey
Beach Stone-curlew	Painted Snipe (Australian subspecies)
Black-browed Albatross	Pied Oystercatcher
Black-winged Petrel	Powerful Owl
Broad-billed Sandpiper	Purple-crowned Lorikeet
Broad-headed Snake	Red-crowned Toadlet
Bush Stone-curlew	Regent Honeyeater
Dugong	Rosenberg's Goanna
Eastern Pygmy-possum	Shy Albatross
Gang-gang Cockatoo	Sooty Owl
Giant Burrowing Frog	Sooty Oystercatcher
Green and Golden Bell Frog	Sooty Tern
Green Turtle	Southern Right Whale
Grey-headed Flying-fox	Speckled Warbler
Hooded Plover	Superb Fruit-Dove
Humpback Whale	Superb Parrot
Koala	Swift Parrot
Little Tern	Terek Sandpiper
Major Mitchell's Cockatoo	Wandering Albatross
Masked Owl	

The proposed upgrade to the marina is highly unlikely to have any affect on the majority of the threatened species listed, as no habitat is present. However, there are a number of threatened species that occur in the region that are likely to use the mud flat 30 m to the north of the marina. These species are waders (migratory and non-migratory).

While the mudflat is offsite, works for the proposed upgrade may have an impact on these species, in the form of noise and disturbance through construction works. A search of relevant literature and the NSW Wildlife Atlas, and knowledge of the threatened species indicated that the mudflat may be considered potential habitat for five threatened species:

- Broad-billed sandpiper *Limicola falcinellus*
- Painted Snipe (Australian subspecies) *Rostratula benghalensis*
- Pied Oystercatcher *Haematopus longirostris*
- Sooty Oystercatcher *Haematopus fuliginosus*
- Terek Sandpiper *Xenus cinereus*



The initial site investigation by Abel Ecology did not reveal the presence of these species, and the NSW Wildlife Atlas search did not show these species occurring in Dolans Bay. Despite this, the precautionary principal should be taken and assume that as suitable habitat is present, these species may occur at different times of the year. As such, works onsite should be constructed as such to create minimal impact on the mudflat.

3. Threatened Biodiversity Survey and Assessment: Guidelines for Development and Activities. Working Draft (DEC) 2004

These *Guidelines* do not relate to marine species under the Fisheries Management Act so are irrelevant. There is not expected to be any effect either directly or indirectly on migratory waders so these considerations are not required.

4. Threatened Species Assessment Guidelines: The Assessment of Significance (DECC) 2007

4.1 *Species under Fisheries Management Act 1994 (FM Act)*

A Seven-part Test has been carried out for the Green Sawfish (*Pristis zijsron*) or the Black Cod (*Epenephelus daemelii*). The Green Sawfish has not been seen in NSW since 1972 and its occurrence in Dolans Bay is considered highly unlikely. The Black Cod is a rocky reef species that may rarely swim into the Dolans Bay vicinity, but its occurrence is also considered highly unlikely.

A Seven-part test for Syngnathiformes was not carried out as species within this taxon are classed as 'Protected Species', which do not fall under the TSA Guidelines 2007.

4.2 *Species under Threatened Species Conservation Act 1995 (TSC Act)*

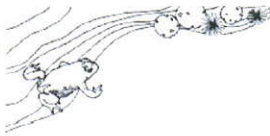
Mudflat Wader Species

Broad-billed sandpiper *Limicola falcinellus*
 Painted Snipe (Australian subspecies) *Rostratula benghalensis*
 Pied Oystercatcher *Haematopus longirostris*
 Sooty Oystercatcher *Haematopus fuliginosus*
 Terek Sandpiper *Xenus cinereus*

Seven-part test for Mudflat Wader Species

- a) **in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.**

These five species are all known to forage in mudflats, though they also forage in other areas such as beaches, tidal lagoons, rocky shores etc. None of these species breed in mudflats. While foraging may occur in the mudflat offsite (30 m north), it is highly unlikely that the proposed development, or the subsequent works involved will have an effect on the life cycle of these species.



- b) **in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,**

Not applicable. This test is for a group of threatened species.

- c) **in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

- (i) **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**

Not applicable. This test is for a group of threatened species.

- (ii) **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable. This test is for a group of threatened species.

- d) **in relation to the habitat of a threatened species, population or ecological community:**

- (i) **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**

No habitat is likely to be removed with the proposed upgrade of the marina. A modification in the level of noise onsite is likely to increase during the construction phase, though the increase will not be maintained long-term.

- (ii) **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

No. No fragmentation or isolation will occur.

- (iii) **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,**

Negligible. The proposed works are highly unlikely to have a long-term effect on these species.

- e) **whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),**

No critical habitat has been identified for these species.

- f) **whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,**

No recovery plans have been established for these species. However, 3 priority actions have been identified for the Broad-billed Sandpiper, 1 priority action has been identified for the Painted Snipe, 13 priority actions have been identified for the Pied Oystercatcher, 7 priority actions have been identified for the Sooty Oystercatcher and 4 priority actions have been identified for the Terek Sandpiper. The proposed action is consistent with the priority actions.

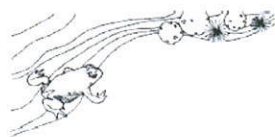


- g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

No.

Conclusion

No significant effect is anticipated from the proposal. Therefore a Species Impact Statement is not recommended.



References

Aquanaut, 2010. Letter to Harry Standen.

Harasti D, Glasby TM, Martin-Smith KM, 2010. 'Striking a balance between retaining populations of protected seahorses and maintaining swimming nets', *Aquatic Conservation: Marine and Freshwater Ecosystems* 20:159 – 166.

Meehan AJ and West RJ, 2002. 'Experimental transplanting of *Posidonia australis* seagrass in Port Hacking, Australia, to assess the feasibility of restoration', *Marine Pollution Bulletin* 44:25 – 31.

Poiner I and Peterken C, 1996. Seagrasses. In: *State of the Marine Environment Report for Australia. The Marine Environment – Technical Annex 1*, (ed. Zann LP). Great Barrier Reef Marine Park Authority.

The Ecology Lab, July 2008. 'Environmental Assessment for Reconfiguration of Cronulla Marina – Aquatic Ecology Component'.

Walker DI, Lukatelich RJ, Bastyan G and McComb AJ, 1989. 'Effect of boat moorings on seagrass beds near Perth, Western Australia', *Aquatic Botany* 36:69 – 77



Appendix 1. Company Profile

Abel Ecology has been in the floral and faunal consulting business since 1991, starting in the Sydney Region, and progressively more state wide in New South Wales since 1998, and now also in Victoria. During this time extensive expertise has been gained with regard to Master Planning, Environmental Impact assessments including flora and fauna, bushfire reports, Vegetation Management Plans, Management of threatened species, Review of Environmental Factors, Species Impact Statements and as Expert Witness in the Land and Environment Court. We have done consultancy work for industrial and commercial developments, golf courses, civil engineering projects, tourist developments as well as residential and rural projects. This process has also generated many connections with relevant government departments and city councils in NSW. Our team consists of four scientists and two administrative staff, plus casual assistants as required.

Licences

NPWS s132C Scientific licence number is S10557 expires 22 Jan 2010

NPWS GIS data licence number is CON95034

DG NSW Agriculture Animal Care and Ethics Committee approval AW 95/082

DG NSW Agriculture Animal Research Authority AW 95/082

The Consultancy Team

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- M.A. (Macquarie University, 1991)
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- Herpetological Techniques Certificate (Sydney Technical College, 1986)
- Applied Herpetology Certificate (Sydney Technical College, 1980)
- Dip Ed. (University of New England, 1978)
- B.Sc. (University of New England - Triple Majors in Zoology, incl. Ecological Zoology, 1974)

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- Certificate of Horticulture (Richmond TAFE, 1995)
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