Report to:
Maunsell Australia/Port of Melbourne Corporation

Channel Deepening Project

Supplementary Statement

Entrance Channel Depth

Marine Ecology

19 July 2007

Statement prepared by Scott Chidgey

Channel Deepening Project

Supplementary Statement
Entrance Channel Depth

Marine Ecology

Contents

Report to:
Christine Wyatt
Maunsell Australia

Report prepared by:
Scott Chidgey
CEE Consultants Pty Ltd
PO Box 201
Richmond VIC 3121

chidgey@cee.com.au

Channel Deepening Project

Supplementary Statement
Entrance Channel Depth
Marine Ecology

1 INTRODUCTION

The Port of Melbourne Corporation (PoMC) is currently submitting a Supplementary Environment Effects Statement (SEES) to an Inquiry set up by the Minister for Planning for the Port Phillip Bay Channel Deepening Project (CDP).

My reports within the SEES are:

- Technical Appendix 48. CEE (2007). Overview Impact Assessment - Plankton Communities. CEE Consultants, Richmond Victoria
- Technical Appendix 49. CEE (2007). Overview Impact Assessment - Sessile soft seabed communities. CEE Consultants, Richmond Victoria
- Technical Appendix 50. CEE (2007). Overview Impact Assessment - Seagrass. CEE Consultants, Richmond Victoria
- Technical Appendix 51. CEE (2007). Overview Impact Assessment – Shallow Reef Communities. CEE Consultants, Richmond Victoria
- Technical Appendix 52. CEE (2007). Overview Impact Assessment – Deep canyon. CEE Consultants, Richmond Victoria.

I have been asked to consider any implications on my conclusions in the original report based on an assumption of an Great Ship Channel Depth of RL-22m and the modelled hydrodynamic conclusions set out in Cardno Lawson Treloar supplementary report “Entrance Channel Depth” (CLT July 2007) and “Entrance Channel Depth - Waves” (July 2007). The consequences of additional scoured material on canyon biota is addressed in a separate report.

2 OBJECTIVE

The objective of this letter is to describe any potential impact on for Marine Ecology based on the assumption of a Great Ship Channel depth to RL-22m in comparison to the planned depth of RL-19.1m.

3 METHODOLOGY

The risk assessment methodology used follows that described in the technical reports listed in Section 1 above, and has been guided by URS as Risk Advisor to PoMC.

4 RESULTS

The changes to physical processes predicted by CLT as a result of the change in depth to RL-22m are summarised in the table below (from CLT 2007).

Process	Physical consequence
Tides and sea level	• Relative to the dredged case, the change in astronomical tides is approximately doubled north of the Sands and increased at Queenscliff and in the Sands, still very small, barely perceptible. • Relative to the existing conditions, the change in distribution of sea levels is increased, still a small change, estimate the change in the 2nd percentile at Williamstown -0.02 m, 98th percentile 0.012 m, at Queenscliff, 2nd percentile -0.03 m, 98th percentile 0.015 m
Flushing	• Decrease in flushing time over dredged case by less than 7% to give a total decrease in flushing time, on average, of less than 14% compared with existing conditions.
Currents in the Entrance	• Scouring leads to more flow in the Great Ship Channel and over Nepean Bank • Increase in current speeds in the channel, with a decrease on either side • Slight adjustment of eddy circulation outside the Entrance on the ebb tide • Increase in currents in scoured areas where material is removed
Currents in the Sands	• Slight increase in current speed in South Channel over the dredged case • Virtually no other changes in currents in the Sands compared with the dredged case • No change in residual currents in the Sands implying no change in sediment transport over the dredged case.

The consequence on relevant marine ecological components of the changes to these physical processes is discussed below.

4.1 Tidal range – change in sea level

The deeper eroded channel at the Entrance will result in a small change in the predicted tidal range in the Bay. The magnitude of change relative to the dredged case is very small and is additive on small increase in range predicted for the dredged case.

4.1.1 Habitats

The change in tidal characteristics will only effect the amplitude of tides but not the duration of tides. Tidal amplitudes will change by approximately 0.035 m at Williamstown and 0.045 m at Queenscliff where the present spring tide ranges are 0.8 m and 1.1 m, respectively. Wave conditions (wind waves) and atmospheric

influences (air pressure and prevailing winds) also naturally influence water levels and are likely mask any effect on most marine habitats due to the small predictable changes in submersion or emersion at the extreme ends of the tidal range. Hence:

- The small change in tidal range is unlikely to have any consequence on subtidal habitats such as seagrasses, reefs and soft seabeds.
- The effect of the small change is unlikely to have an effect on intertidal reef or soft seabed habitat where the effect will be indistinguishable from natural wind wave conditions.
- Any consequences on intertidal seagrass habitat which extends from approximately the mid tide level downward are likely to be negligible due to larger influence of waves in relation to the small change in immersion or emersion due to the change in tidal range.

Overall therefore the effect of change to tidal range on marine habitat is negligible

4.1.2 Ecosystem

As discussed above, the change in tidal characteristics will only effect the amplitude of tides but not the duration. The changes at the higher and lower tidal ranges are very small and marine biota at these extremes in the tidal range are adapted to such conditions. Wave conditions (wind waves) and atmospheric influences (air pressure and prevailing winds) also influence water levels and are likely mask any effect on most marine biota due to the small predictable changes in submersion or emersion at these elevations.

Overall, therefore, the consequence on the marine ecosystem of the small change in tidal amplitude relative to the existing tidal amplitude and other factors affecting sea level on a day to day basis is negligible.

4.2 Flushing

Flushing is one of numerous factors (including mixing, currents, inputs, temperature, salinity) affecting water quality, larval dispersal and survival and the general ecosystem. The relative consequence of increased flushing on water quality and larval dispersal are assessed separately by Longmore (PIRVic 2007a) and Jenkins (PIRVic 2007b), respectively.

The consequence on the ecosystem of the increase in rate of flushing on average due to channel deepening (7 percent) and further increase due to additional depth at the Entrance (less than 14 percent) should be considered in the context of the existing range in flushing rates around the Bay. The rate of flushing in Port Phillip Bay ranges from a relatively short period (hours to days) near the entrance to months and more than a year at the northern and western ends of the Bay, respectively.

The consequences of the increased flushing rates on the ecosystem in general are likely to be negligible in parts of the Bay with:

- long residence times (months) – where ecological characteristics are strongly influenced by local factors rather than exchange with Bass Strait and are therefore relatively unaffected by flushing or;
- short residence times (hours) - where ecological characteristics are already strongly influenced by high exchange rates with Bass Strait

Most of the Bay falls into one of these two categories due to the influence of the Great Sands on flushing. A small area of intermediate flushing times exists in the around the Great Sands, but the consequence of change in flushing rate on the marine ecosystem in this area is likely to be negligible compared to the dependence of the ecosystem in this area on environmental factors not influenced by flushing (such as habitat, water depth) and the overall influence of the mixing between the Bass Strait waters and Port Phillip Bay waters in this area.

Hence, the consequence of the increased flushing rates on the Bay ecosystem in general is likely to be negligible.

4.3 Currents

Current speed and direction will change a small amount in the Entrance and in the Sands area.

4.3.1 Currents in the Entrance

Existing currents in the Entrance are strong and tidal. The small effects on the spatial distribution of currents around the Entrance shipping channel are not sufficient to change my previous assessment of consequence on the ecosystem of the Entrance.

4.3.2 Currents in the South Channel

Existing currents in South Channel are strong and tidal. The marine biota of the Channel are adapted to mobile sands and are periodically affected by dredging. The small increase in current speeds in South Channel are not sufficient to change my previous assessment of consequence on the ecosystem of the Entrance.

4.4 Waves

There are predicted to be minor changes to the wave patterns in the proximity of the Great Shipping Channel. These changes are not sufficient to change my previous assessment of consequence on the ecosystem of the Entrance.

4.5 Coastal Processes

There are predicted to be minor changes to coastal processes in relation to sediment transport in the Lonsdale Bight area. CLT 2007b and discussion with Dr Provis indicates that changes to marine habitats are likely to be undetectable and there will be no detectable change in sediment movement characteristics in the *Amphibolis* beds in Lonsdale Bight. Hence any predicted changes to coastal processes are unlikely to affect the marine ecosystem in this area.

5 CONCLUSION

The incremental changes in physical processes due to progressive increase in entrance channel depth are still small relative to existing ranges in physical conditions. The changes in physical processes are very minor influence on the characteristics of the marine ecosystem. Overall the predicted changes in physical processes due to progressive increase in entrance channel depth are likely to have negligible consequence to biogenic habitat (seagrasses) and marine ecosystem components in general.