Section 6

CONCLUSIONS AND RECOMMENDATIONS

Storm Damage at Shelley Beach - West

1 Beach erosion is most pronounced during the winter months when there is a net movement of sand from west to east.

2 Winter erosion is further exacerbated by storm waves caused by strong northerly waves that can erode sand from the beach and move it offshore.

3 The extent of erosion has increased over the years, or at least since about 1950 so that now there is practically no beach during winter and the beach width in summer has reduced by 20 to 50 metres.

4 The recently constructed timber retaining wall probably accelerates the loss of sand from the beach.

5 The progressive loss of sand from the western end of the beach is likely to continue.

Shelley Beach Sand Losses

6 The overall volume of sand on Shelley Beach appears not to have changed significantly. The sand loss from the western end of the beach has been accompanied by considerable accretion along the eastern portion of the beach.

7 There is a seasonal sand movement from west to east in winter and from east to west in summer.

8 The sand in the bank and offshore bars appears to have decreased noticeably off the western end of the beach. Such a sand loss it not clearly evident off the eastern part of the beach.

9 Sand losses off the bank could and should be quantified by undertaking a hydrographic survey and comparing the results with the 1981 survey.

The Cause of Erosion at Shelley Beach

10 There is no simple explanation for the beach erosion at the western end of the beach. Recent erosion may have been exacerbated by the construction of the timber retaining wall. Note the beach accretes along its eastern portion.

11 The physical factors controlling beach stability, namely waves and currents, are very complex off Shelley Beach. High currents run in the deep channels and significant movements of banks and

channels off Shelley Beach and extending out to South Channel have been mapped back to 1864.

12 It is unlikely that even very sophisticated study and mathematical modelling of waves, currents and sediment transport would conclusively yield an answer as to why the erosion is occurring.

13 The erosion is probably a natural phenomena resulting from the proximity of Shelley Beach to complex bathymetry and strong tidal currents and the changes in the bathymetry due to those strong currents.

14 Waves resulting from ships in South Channel, called wakes, are unlikely to be the cause of any erosion.

15 It is not possible to determine whether the deepening of the shipping channel at The Rip and in South Channel will affect Shelley Beach. Deepening the channel could in fact reduce the magnitude of tidal currents and the mobility of sand features.

16 The boat sheds themselves are not a cause of erosion provided the floor level is sufficiently high that the waves can pass beneath the boat shed during storms.

Cliff Stability

17 Cliffs that were previously behind a beach are now becoming exposed to wave action.

18 Some cliffs are composed of sandy soil and when waves reach the toe of the cliff, the cliff will just collapse as it did recently in June 2003.

19 Cliffs composed of stiff clay and rock may be undermined before they collapse.

20 The toes of cliffs need to be protected to prevent undermining and cliff collapses.

Boatsheds and Bathing Boxes

21 These structures were traditionally constructed above the highest water mark. At Shelley Beach two sheds were constructed over the water.

22 Erosion of the western portion of Shelley Beach prompted local occupants to construct a timber seawall to protect their boatsheds. This wall is providing temporary protection, but has not halted the erosion process.

23 When the boatsheds were originally constructed the depth of founding piles was arbitrary when the boatshed was located above the high water line. As erosion has occurred and undermined these

structures, the owners have extended their foundations to deeper founding levels.

24 It appears that the level of a hard substrate upon which piles would ideally be founded lies at a variable level and may be several metres below the present ground level. Based on limited data, it is suggested that if boatsheds are to be reconstructed, following destruction by storms in June 2002, they should be founded 4 metres below the seabed.

25 The floor levels of new boatsheds and refurbished boatsheds in the western portion of Shelley Beach should be at 2.4m AHD or higher.

26 Since the erosion process is continuing, the floor levels of structure will ultimately be 2 or more metres above seabed level. Access to the structures and safety on the structures will become significant issues.

27 If the projected sea levels rises due to Greenhouse Effect occur, these floor levels would need to be revised upwards to 2.8m AHD in 50 years time.

28 There is space to relocate boatsheds and bathing boxes along the back of the dune system in the eastern portion of Shelley Beach, but this would require the removal of some Ti-tree.

Shoreline Stabilisation

29 The “Do Nothing” option implies that the boatsheds along western Shelley Beach will be lost along with the timber wall and access paths behind the structures.

30 Placing sand on the beach, termed “Beach Nourishment” will only provide short term relief because the sand will again migrate eastward. Sand will also be lost by offshore movement if sand of the same size as naturally occurs on Shelley Beach is used. The volume of sand required to restore the beach to its 1950 condition is estimated at 40,000 cubic metres.

31 If coarse sand were used for nourishment, then there would no negligible offshore sand losses. It is believed that there is some suitable coarse sand in South Channel and the spoil ground at Symonds Channel.

32 Beach nourishment on its own is not recommended, because the benefit will be short lived. The public will perceive “failure” because the beach would need to be renourished regularly.

33 The cost of bringing sufficient sand (coarse) from South or Symonds Channel is estimated at $500,000.

34 The cliffs and structures behind the timber retaining wall could be secured by the construction of a rock or porous concrete unit retaining wall. The estimated cost is $500,000 to $700,000. There would still be negligible beach.

35 An offshore breakwater could be constructed seaward of the boathouses and swimming enclosures. With an appropriate design, sand from the eastern end of the beach would be trapped behind the breakwater during summer. Direct additional beach nourishment would not be required. The estimated cost is over $1 million.

36 Beach nourishment could be combined with the construction of a groyne, to the east of Campbells Road. A geotextile groyne is suggested for this option because of the ease of construction. Constructing the groyne and nourishing the beach at the end of summer means that sufficient sand could be recycled from eastern Shelley Beach. The cost is estimated at $500,000.

37 Some sand losses (to offshore) would occur for a combined groyne and nourishment scenario using Shelley Beach (east) sand and the beach would need to be renourished after major storms.

Section 7
REFERENCES

Byrne G. (2003): *Personal Communication*, based on work undertaken for the Victorian Channels Authority.