Appendix C: SBEACH assessment

1.1 Introduction

The numerical cross-shore sediment transport and profile change model SBEACH (Storm Induced BEAch CHange) (Larson and Kraus, 1989) has been used to define storm cut volumes and horizontal movement of the dune toe. SBEACH considers sand grain size, the pre-storm beach profile and dune height, plus time series of wave height, wave period, water level in calculating a post-storm beach profile. Model development involved extensive calibration against both large scale wave tank laboratory data and field data. SBEACH has been verified for measured storm erosion on the Australian east coast (Carley, 1992; Carley et al. 1998). Southern Pegasus Bay is subject to similar wave climate and storm events as the Australian east coast and the model is therefore considered applicable for these environments.

SBEACH has initially been run for three profiles (C0471, C0815 and C1130), which are located within cell F, C and A respectively. These three profiles have been selected to assess the performance of the model against the assessed residuals of the dune toe contour. It is expected that the maximum negative residuals of the dune toe contour (based on an approx. 25 year dataset) are situated between the 10 yr ARI and 100 yr ARI numerical storm cut distances simulated by SBEACH.

1.2 Model input

Representative cross-shore profiles from the dune crest to the RL -10 m contour were assessed for the open coast based on average profile surveys information. Design storm nearshore time series including wave height, period and water level are applied at the outer profile boundary (i.e. Figure). Design storms for 10 yr, 100 yr and 2x100 yr events are simulated with the later allowing for potential clustering of storms. Such clustering may result in greater erosion as the first event lowers the beach height and relatively greater wave energy may reach the backshore in subsequent events.

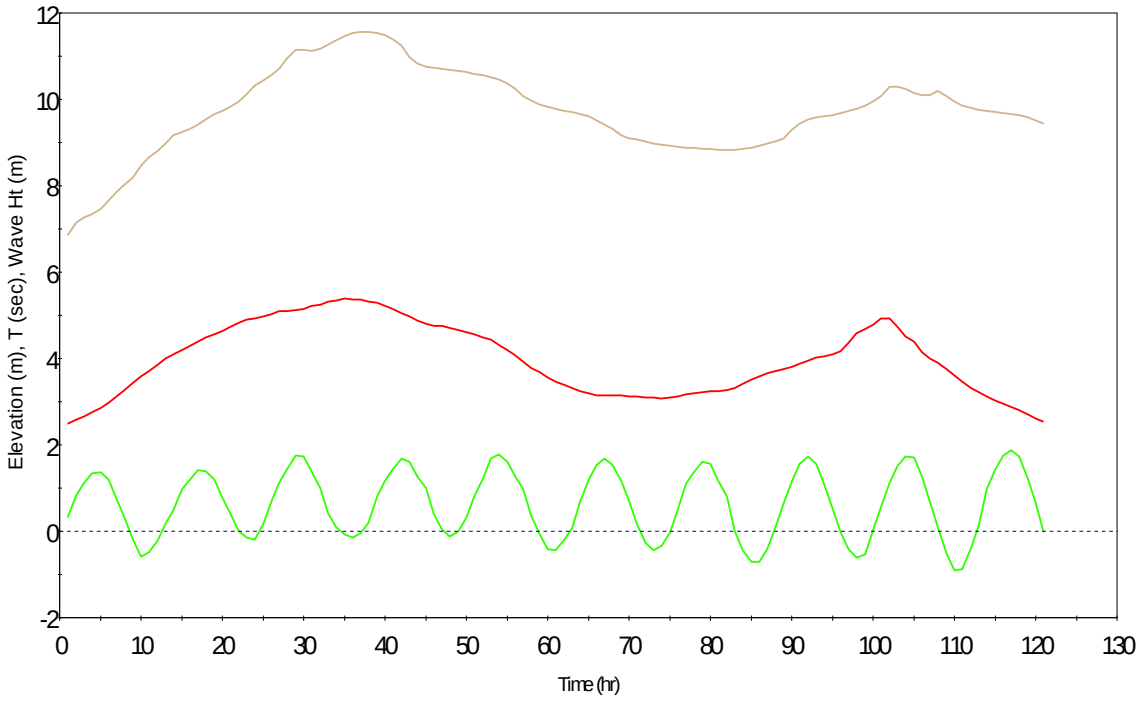

Figure C1: Synthetic 100yr design storm input for Pegasus Bay

1.3 Model results

The ranges of shoreline excursion distances of the typical dune toe contour (RL 2.5 m) calculated by SBEACH for the open coast are shown in Table. This table shows the initial and equilibrium profiles formed due to 10, 100 and 2x100 year storms for profile C0815.

Table C1: Storm excursion distances calculated by SBEACH and minimum negative residual of RL 2.5 m contour

Profile	10 year ARI (m)	100 year ARI (m)	2x 100 year ARI (m)	Minimum negative residual (m)
C0471	0	-2	-3	- 9
C0815	-0.5	-3	-3.5	- 10
C1130	-1	-5	-6	- 11

The change in modelled beach level was also examined on the upper beach. At profile C1130 numerical storm cut distances of up to -6 m were found for the dune toe contour compared to -11 m based on the observed data. A larger storm cut excursion distance of -13 m occurred between the RL 1.5 m and RL 2.0 m contours. However, this is still less than the observed minimum negative residual of -18 m at the RL 1.5 m contour.

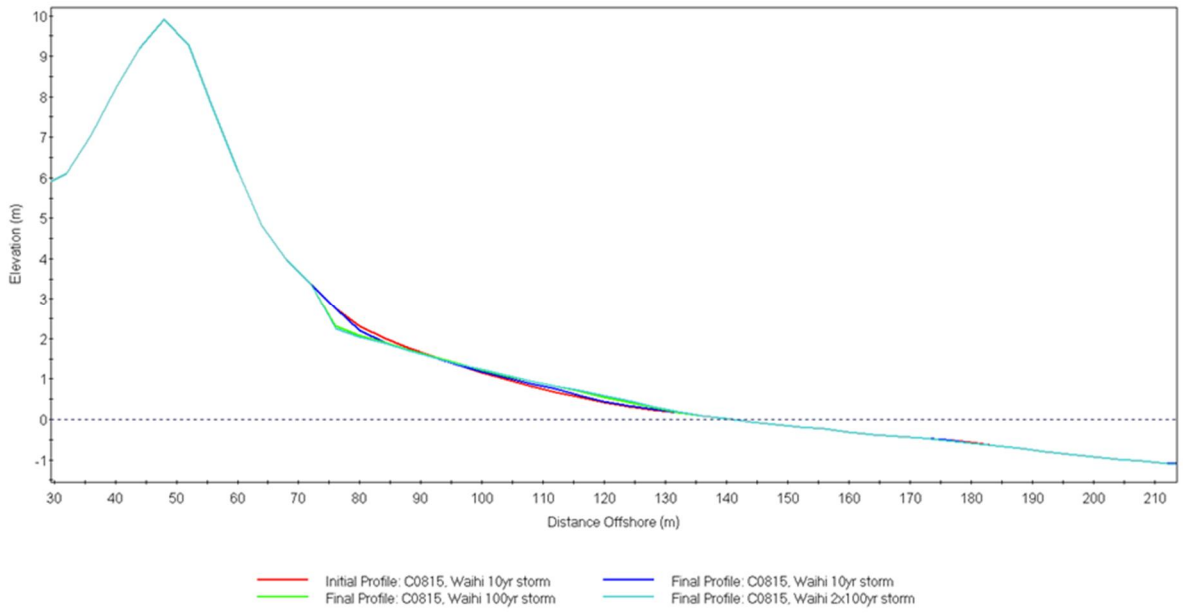

Figure C2: SBEACH results for profile site (C0815)