Chapter 5: Monitoring Results

5.1 Profile monitoring

The purpose of this chapter is to present the results of beach profile monitoring for the 53 coastal cross-section sites along the Bay of Plenty beaches. All beach volume and shoreline trends are determined since 1990 (except where otherwise indicated).

All elevation information is in relation to Moturiki Datum.

The data in this chapter is presented grouped by beach (Figure 5.1) on a site by site basis.

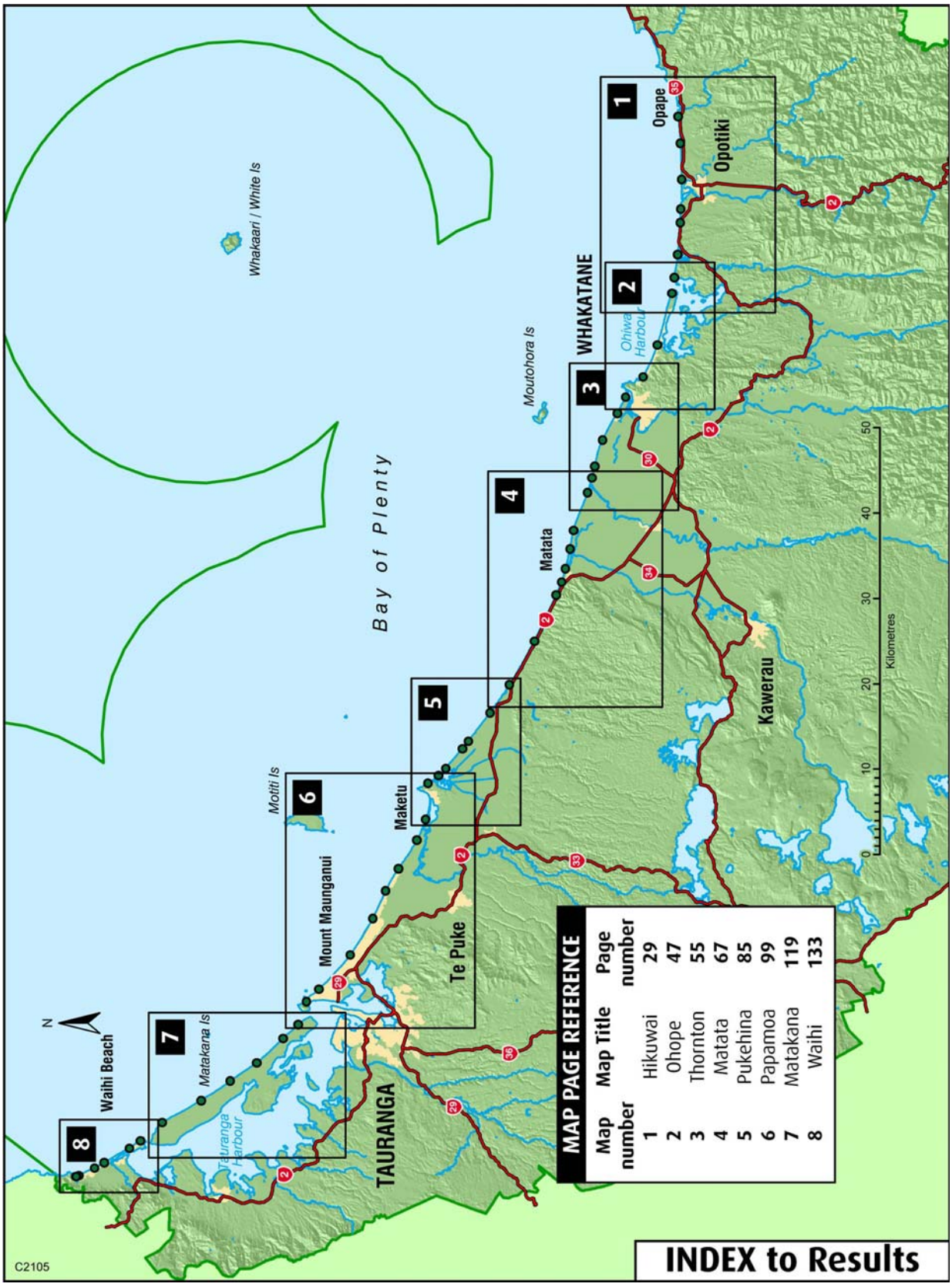

Figure 5.1 Beach profile monitoring sites within the Bay of Plenty.

Each beach summary contains:

- Beach summary map

  Show each beach group with the determined historical beach state.

- Site discussion and analysis

  See description below.

And each site summary contains:

- Discussion

  Comments regarding the summarised data on the adjacent site page.

- Historical photography

  Typically two images are provided for each site. One taken in 1978 as part of the Bay of Plenty Coastal Survey Report 78/1 (Healy, 1978) the second photograph was taken in February and March of 2006, orientation was determined by the 1978 imagery. No photographic record is available for Matakana Island.

- Site summary information

  Shows the state of the selected site (for the period of the NERMN record), location in NZMG, period of the NERMN record, the number of profiles measured, the morphodynamic type (Wright - Short model) (sourced from Pickett, 2004) and the statistical significance (p-level) test on the volume and toe of foredune (TOF) datasets. The result is an estimated measure of the degree to which it is "true" (in the sense of "representative of the population"). More technically, the value of the p-level represents a decreasing index of the reliability of a result. The higher the p-level, the less we can believe that the observed relation between variables in the sample is a reliable indicator of the relation between the respective variables in the population. Specifically, the p-level represents the probability of error that is involved in accepting our observed result as valid, that is, as "representative of the population" (Brownlee, 1960). A p-level of 0.01 was used for assessing the volume and toe of the foredune position datasets. See section 5.2 for an explanation of the state criteria used.

- Seasonal profile distribution chart

  Shows when the dataset records were measured.

- Beach profile summary chart

  Shows the first profile in the NERMN dataset, the last profile in the previous NERMN report (Hodges & Deely, 1997), the last profile in this report, the minimum envelope based on all measured profile points, average profile position based on all reported profiles and the maximum envelope based on all measured profile points.

- MHWS chart

  Showing the variation in the MHWS elevation (based on Tauranga primary port record). The figure of 1.1m was sourced from the LINZ website, Table 3 for regulatory agencies, June 2006.

- Offshore profile summary

  Three profiles have typically been measured at each site on a 5 yearly cycle. Measurements were made by University of Waikato staff. The accuracy of the 2003 sections should be significantly better than that achieved by the 1997 and 1992 surveys due to greater resolution in the depth sounder ($\pm$ 1cm in 2003, compared to $\pm$ 5cm in 1992) and the heave compensation used for the 2003 survey, which removes any significant wave action from the survey data. (Ellery, 2003).

- Assessment of volumetric changes for each profile

  Profile areas are calculated from the front benchmark to mean sea level with the resulting values presented as plots over time. From these plots, the magnitude and rates of changes between monitoring occasions can be visually assessed. Profile areas have the units of a cubic metre per metre of beach profile (m^3/m).

- Assessment of shoreline movement for each profile

  Shoreline movement is determined by calculating the change in the position of the toe of foredune position along the profile. This position has been retrieved from annotations in field books, where not available visual inspection of the profile is undertaken to determine this beach position. Distance is from the benchmark origin in metres.

  As beaches generally go through alternating periods of accretion and erosion depending on such factors as wave climate and sediment supply, the presented trends should not be used as future indicators of beach change, they are only presented as historical trends.

5.2 Statistical analysis criteria

For the classification of beach state a set of objective criteria were determined based on a 0.01 level of significance. The linear regression test was performed on both the volume and toe of foredune (*Systat 9 software*). Were the test proved true (<0.01) the coefficient was then used to determine whether the beach was in an erosion (retreat) or accretion (advance) trend state (Figure 5.2). When the test was false (>0.01) the dataset was deemed stable (or sometimes referred to as being in dynamic equilibrium). Where the two datasets arrived at contradictory results the following rules outlined in Table 5.1 were used.

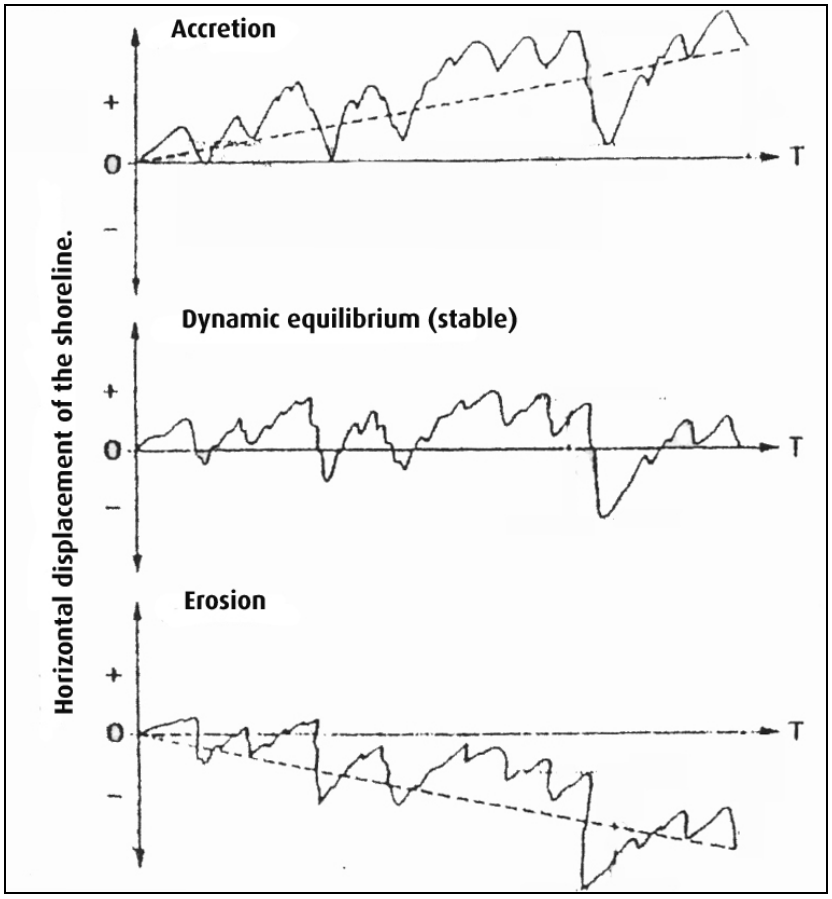

Figure 5.2 Three types of shoreline trends from Gibb (1995).

It should be noted that for Environment Bay of Plenty's state of the environment reporting to date only beach volume change has been used for determining the historical trend in the profile datasets.

Table 5.1 Trend criteria

Test results (volume & toe of foredune)	Criteria	Comment
Stable and stable	Stable	Dominant stable trend exists in the recorded dataset.
Erosion and erosion	Erosion	Dominant erosion trend exists in the recorded dataset.
Accretion and accretion	Accretion	Dominant accretionary trend exists in the recorded dataset.
Erosion and stable (or vice versa)	Erosion?	In this case when either one of the tests differs from the other, the non stable state was chosen but inclusion of the ? highlights the variability in the dataset and also the requirement for additional/continual monitoring to strengthen the direction of the trend.
Accretion and stable (or vice versa)	Accretion?	In this case when either one of the tests differs from the other, the non stable state was chosen but inclusion of the ? highlights the variability in the dataset and also the requirement for additional/continual monitoring to strengthen the direction of the trend.