1. Introduction

1.1 BACKGROUND

The study summarised in this report was commissioned by Havant Borough Council, and it was carried out at HR Wallingford between August 2005 and December 2008.

The study considers and assesses a number of coastal defence options for the Eastoke Point frontage at the eastern end of Hayling Island. The overall coastal defence policy covering this part of Hayling Island was developed and agreed in 1997 (HR Wallingford report EX 3441). This Shoreline Management Plan concluded that it was important to maintain the present line of defence, because of the dangers of flooding of many residential properties on the Eastoke peninsula. Subsequently, a detailed coastal defence strategy for this peninsula, the Eastoke Sectoral Strategy Study, was produced by Atkins in 2006.

This study seeks to refine and support that strategy, not to supersede it, and concentrates on a particularly dynamic part of the coastline, namely Eastoke Point, close to the entrance to Chichester Harbour. The main focus of this study is the protection of the frontage that forms the seaward edge of the Sandy Point Local Nature Reserve. At present, the existing coastal defences for this low-lying area provide a much lower standard of defence against coastal erosion and flooding than the defences along the main seafront that stretches west towards Eastoke Corner, and those along the northern side of the Eastoke Peninsula. The coastal defence policy for this frontage is to Hold the Line, and this policy was supported by the subsequent Eastoke Sectoral Strategy Study (Atkins, 2006), which provided an initial cost for a scheme to improve the existing defences comprising a rock revetment at the rear of the shingle beach that would be controlled by a system of groynes.

1.2 STUDY AREA

It is crucially important that any improvements to the coastal defences along this stretch of the coast do not reduce the standards of protection offered along adjacent frontages. For this reason, the area considered in the present study (see Figure 1.1) also covers about 320m of the Sandy Beach Estate frontage to the west of the end of the promenade seawall. Any coastal defence scheme around Eastoke Point will need to avoid adverse effects such as lowering beach levels and hence reducing the protection that the seawall and promenade offer against wave overtopping and flooding.

Similarly, the area considered in this study extends northward to Groynes 11/12 and the southern end of the spit leading to Black Point and the Hayling Island Sailing Club. A reduction in beach width at or just beyond this northern limit could threaten the road link between Eastoke and the Sailing Club.

1.3 STUDY AIMS

The most important aims of this study were to develop a cost-effective defence management scheme that will provide adequate levels of flood protection without inhibiting the usage, enjoyment and enhancement of the Eastoke Peninsula, or adversely affecting the coastal defences elsewhere.

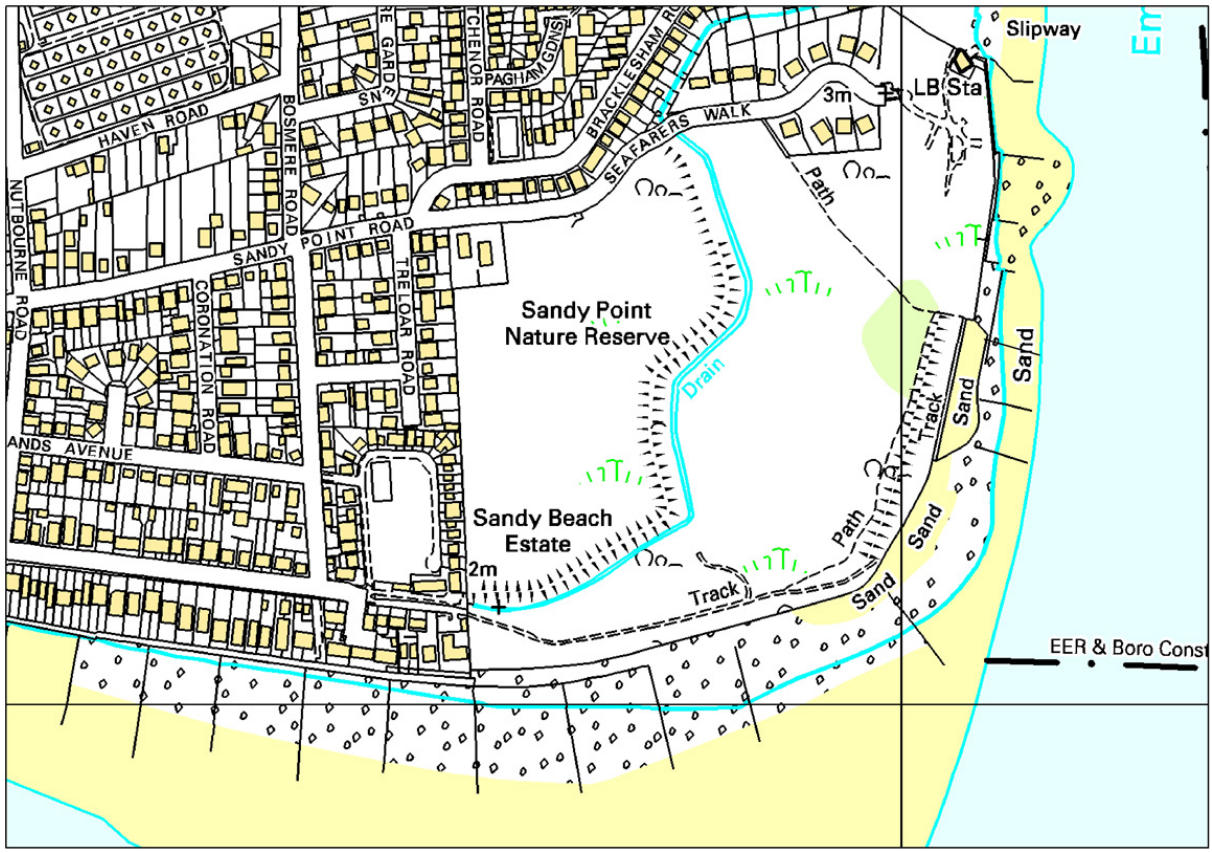

Figure 1.1 Eastoke Point: The area considered in this study

While it was always expected that the defence scheme that best met these aims would rely at least in part on maintaining and enhancing the existing shingle beaches at Eastoke Point, this did not preclude consideration of alternative options.

The study described in this document conforms to the original Consultants' Brief issued by Havant Borough Council and involved:

- Setting the aims and objectives of the coastal defence management strategy for this coastline, in consultation with the Council, local residents and other interested parties;
- Reviewing historical data, published literature and reports, and identifying deficiencies;
- Carrying out a risk-based assessment of the standard of protection offered by the existing defences against erosion and/or flooding of the low lying land and residential properties on the peninsula;
- Reviewing the environmental context of the study area, identifying the main concerns and opportunities. This allowed us to consider the environmental effects of any proposed management options in the light of the environmental concerns and aspirations for Eastoke Point and nearby areas, and to suggest how any adverse impacts might be avoided or mitigated;
- Predicting the future development of the beaches and sediment transport regime over the coming decades for a range of generic coastal defence management strategies;
- Identifying and assessing appropriate management options, taking account of the views of interested Consultees;
- Producing an estimate of the likely range of costs of providing defences and of the benefits achieved by reducing the potential losses caused by coastal erosion and flooding; and

- Preparing a Management Strategy recommending and prioritising coastal management options. This included producing an Implementation Plan, relating management to future events, in sufficient detail to allow scheme progression to grant aid submission.

A major challenge in this study was to develop a good understanding of the very complicated processes that affect this part of Hayling Island's coastline. This required interpretation of information on the geology and geomorphology of the area, reviews of past reports and information on long-term coastline changes, the analysis of survey data and the use of detailed numerical modelling to quantify tidal and wave conditions and hence predict the present and future potential for coastal erosion and flooding. This work allowed the development and then the assessment of alternative coastal defence options, taking into account the engineering practicalities, environmental effects, standard of protection and economic analysis for each option.

1.4 REPORT LAYOUT

This study has been divided into a number of tasks, which have been undertaken and reported in individual Technical Reports throughout the project. This final report principally consists of chapters which each are based upon these Technical Reports on each of the study tasks. The various chapters based on the original reports are briefly described below.

Chapter 2 Review of coastal defence development at Eastoke
Chapter 2 briefly reviews the past history of coastal defences along the main southern frontage at Eastoke and around Eastoke Point towards Black Point spit. This provides a background to the long-term problems of preventing erosion and flooding of this low-lying part of Hayling Island.

Chapter 3 Assessment of coastal processes
This chapter presents an assessment of the geomorphological and hydrodynamic processes that operate at Eastoke Point placing the study frontage in context with its surrounding environment, namely the main Eastoke frontage, Chichester Harbour entrance and East Head. The assessment includes an overview of the historic shoreline evolution and more recent trends in beach profile changes, as well as numerical modelling of waves and tidal currents. The objective of this study task was to identify a realistic shoreline recession rate, and to quantify extreme waves and sea levels, including their return periods and joint probability as a basis for both assessing coastal flooding risks and to help in the selection and design of improved defences.

Chapter 4 Condition assessment of existing defences
This chapter reviews the condition of the existing coastal and flood defence structures along the Eastoke frontage. A physical survey of the defences was carried out and the subsequent evaluation of condition and performance was based upon an improved performance-based method for visual inspection of flood risk management assets (such as embankments and vertical walls) and of assessing of asset condition, which has recently been developed for the Environment Agency and Defra.

Chapter 5 Baseline Environmental Assessment
This chapter reviews and summarises both the main natural environmental features of the Eastoke Peninsula and surrounding areas, some of which have been recognised and designated because of their importance. In addition, a review has been carried out to identify the characteristics of the same area that are regarded as important from the human perspective, for example relating to amenity, recreation and aesthetics. This project task identified the attributes of the area that might be adversely affected by coastal defence schemes, and hence

to assist in the assessment of the environmental effects of alternative defence options later in this study.

An important part of this part of the study was the consultation undertaken with those interested in the possible effects of future changes at Eastoke Point and further afield, with or without improvements to the coastal defences. This aspect of the study is also reported on this chapter.

Chapter 6 Assessment of coastal erosion losses: Do Nothing scenario
This chapter, and the next, consider the consequences of future coastline changes at Eastoke Point for a Do Nothing policy, i.e. assuming that in the future no active steps are taken either to build new coastal defences or maintain those that presently exist, other than essential safety measures. This provides a "baseline" against which the benefits of maintaining such defences, or alternatively installing new defences, can be properly assessed, costed and compared. Chapter 6 concentrates on predicting the future changes in the coastline, and evaluating the value of the resulting losses of land, properties and infrastructure.

Chapter 7 Assessment of coastal flooding losses: Do Nothing scenario
This chapter continues the consideration of the consequences of a Do Nothing policy, but concentrates on predicting the occurrence of coastal flooding as the existing defences deteriorate. The Eastoke Peninsula has suffered from flooding due to wave overtopping of coastal defences on a number of occasions in the recent past, most recently in March 2008. Chapter 7 predicts the extent of flooding that will occur for a range of wave and water level conditions and quantifies the economic consequences of the Do Nothing policy option, in terms of the annual damage costs to properties. In addition, the contributions resulting from the overtopping of various sections of the defences around the peninsula to the total predicted flooding were calculated.

Chapter 8 Development and assessment of coastal defence options
This chapter extends the consideration of coastal defence options for protecting Eastoke Point that was presented in the 2006 Strategy Study, and develops preferred schemes that will overcome the numerous environmental and practical problems, and provide a sustainable and cost-effective long-term plan to reduce the flood and erosion risks along this frontage to an acceptable level. Starting with a review of a wider range of possible coastal defence techniques, it goes on to eliminate those that are not suitable at Eastoke Point. The remaining techniques that are used form a number of defence scheme options. A number of criteria are then developed that are used to compare these options with each other. These criteria cover factors as costs, sustainability and the impacts on adjacent frontages as well as both the direct and indirect benefits of each coastal defence scheme. The comparison is done is such a way as to allow others to test the robustness of the decisions made. This resulted in three possible defence schemes being taken forward to a more thorough economic appraisal and comparison.

Chapter 9 Economic appraisal of preferred coastal defence scheme
In this chapter, the preferred defence schemes developed and appraised in Chapter 8 are subjected to a more detailed assessment of their costs and benefits. For the purpose of comparison, and to assist in the calculation of the benefit: cost ratio of schemes, this chapter also includes a consideration of the Do Nothing and Do Minimum policies.

Chapter 10 Conclusions and Recommendations
The final chapter of the report presents the conclusions and recommendations from the whole study.