

This certainly indicates that the proposed defence improvements at Eastoke Point are economically worthwhile in the overall context of the reducing flood and erosion risks to the residents and properties of the Eastoke peninsula.

The changes between Tables 9.9a, which was fundamental to the acceptance of the Sectoral Strategy Study for Eastoke, and Table 9.9b are all due to the increased costs of the preferred scheme developed in this study compared to that recommended by Atkins in 2006. Some of the recurring costs of managing the beaches along the whole southern frontage at Eastoke, including Eastoke Point were included by Atkins in their calculations for the “Main southern frontage”, i.e. west of Groyne 12; these included costs for periodic beach recharge at an average rate of 5,000 cubic metres/ per annum, for beach recycling and for groyne maintenance.

In order to err on the side of caution in this report, we have made extra allowances for such recurring costs for the Eastoke Point frontage, and therefore may have over-estimated the costs of the preferred scheme that has been proposed in this study. Because of this, the overall benefit: cost ratio of 5.32 calculated in Table 9.9b may be too low. It will be necessary to revisit this calculation after the detailed design of the proposed improvements to the coastal defences at Eastoke Point.

10. Overall Study Conclusions and Recommendations

10.1 INTRODUCTION

The primary objective of the present study has been to develop a sustainable coastal defence scheme for managing coastal erosion and flooding risks along the Eastoke Point frontage of Hayling Island. This is a highly dynamic coastline that is becoming increasingly difficult to maintain and manage. It has a long-term history of retreat and varying plan shape, as a result of rising sea levels, variations in the wave climate and changes in the position of the deep channel through the entrance to Chichester Harbour.

Recently, for example in November 2005, the Southern Eastoke frontage and low-lying Sandy Point Nature Reserve just landward of the shingle barrier beaches was flooded by wave overtopping. This affected residential properties, including a number of houses in the Sandy Point estate at the eastern end of the Eastoke peninsula. Unless the coastal defences around this peninsula are improved, the increase in mean sea levels in the coming years will make such events more common and the flood risks will become greater.

In recognition of these risks, the coastal defence policy for this frontage is to Hold the Line. The Sectoral Strategy Study carried out by Atkins in 2006 recommended that the defences are improved to give a standard of protection of 0.5%, i.e. protecting the assets at risk from storm events with a return period of 200 years.

The present study has extended and refined this earlier Sectoral Strategy Study, considering a wide range of coastal defence options and comparing these from the viewpoints of their technical feasibility, their environmental effects and their economic benefits.

10.2 CONCLUSIONS

The main conclusions arising from this study have been as follows:

1. Along the Eastoke Point frontage, the present standard of protection against coastal flooding and erosion is very low, with a few properties potentially being flooded by events with return periods of 2 to 5 years. A more severe event with a return period of between 50 years to 200 years would have the potential to flood between 30 and about 400 houses.
2. The beaches along the southern Eastoke frontage suffer a long-term loss of shingle at a rate variously estimated but apparently between 20,000 to 30,000 cubic metres/ year. If not replaced, this loss of sediment could result in a beach recession rate at Eastoke Point of up to 2.3m per annum.
3. The sediment deficit has been largely compensated for by annual recycling (at about 20,000 cubic metres/ year) but there will be an inevitable loss which cannot be prevented entirely. Some of the losses that have occurred since the original recharge in 1985 have been replaced by periodic dredging of sediments from the approaches to Chichester Harbour; however, it is concluded that any future defences at Eastoke Point (or Eastoke itself) cannot rely on any natural supply of fresh beach sediment being available from the Chichester Harbour delta.
4. In early 2008, the beaches at Eastoke were improved by importation of about 25,000 cubic metres of shingle dredged from an offshore aggregate extraction area. Further recharge will be required indefinitely if the beaches are not to suffer a long-term decline, although an improved coastal defence scheme at Eastoke Point should reduce the losses of beach shingle and make routine recycling made more efficient.
5. The appraisal in this study of the consequences of not intervening to maintain the existing coastal defences, i.e. the Do Nothing option, concluded that the associated loss of properties would be wholly unacceptable.
6. Similarly, only seeking to maintain the existing defences until the end of their useful life, and then not intervening further, i.e. the Do Minimum option, was also shown to be unacceptable.
7. These assessments therefore confirmed the conclusions of earlier studies regarding the coastal defence policy and the broad strategy for managing those defences. Specifically, this study agreed that recommended defence strategy for the Eastoke Point frontage (Atkins, 2006) is correct, and that the objective should be to Hold the Line and to improve the defences to give a standard of protection of 0.5%, i.e. protecting the assets at risk from storm events with a return period of 200 years.
8. In the light of the above, a wide range of various coastal defence types, used around the UK and overseas and that might be used at Eastoke Point, have been assessed in the present study. After rejecting some of the techniques that were clearly unsuitable, an initial long-list of options using one or more of the remaining types of defence were assessed for their suitability for the study frontage, where the chronic and continuing problems of sediment loss, variability of the nearshore bathymetry and complicated hydrodynamics pose particularly difficult technical challenges.
9. Based on specialist judgement, knowledge of the performance and sustainability of past coastal defence schemes in the same area, this long-list of options was reduced to a smaller number to obtain a short-list of potentially applicable methods.
10. The short-listed options have been compared using a multi-criteria analysis that allowed consideration of their technical feasibility, their likely environmental acceptability including sustainability and their economic benefits. This resulted in the selection of

three broad coastal defence scheme options that were taken forward for further consideration.

11. Two of these three broad coastal defence scheme options were very similar in concept to those previously considered in the 2006 strategy study, and are similar to the methods that have been used with considerable success following the 1985 recharge.
12. Further consideration of the remaining broad defence options indicated a clear preference for a scheme that comprised a rock revetment at the crest of the beach as well as beach improvement and enhancement using groynes and beach recycling/ recharge. In addition, to provide extra protection to houses along the eastern end of the promenade, along the southern shoreline of the Eastoke frontage, this preferred scheme included for an improvement to the splash wall at the rear of the promenade.
13. This option will be more robust in the context of potential future delays in funding or approval for beach management operations, and is judged to be the scheme that best matches the somewhat diverse range of views expressed during the consultation exercise carried out as part of this study.
14. The preferred scheme developed in this report includes the replacement of the existing timber groynes with rock groynes, which should better cope with the often rapid changes in beach levels along the Eastoke Point frontage. However, it is suggested that this choice should be reviewed at the detailed design stage for the scheme, in the light of more detailed assessments of costs and environmental impacts.
15. This scheme is rather more substantial than that proposed for this frontage in the 2006 strategy study, and correspondingly more costly. However, the benefits that it will bring in preventing flooding and coastal erosion will very substantially outweigh its costs.
16. In addition, an assessment of the economic benefits of this proposed scheme, taken together with the existing coastal defences along the northern and main southern frontage of the Eastoke Peninsula shows that the combined costs of all the defences is much lower than the potential losses that would be experienced if one or all of the defences were not present.
17. Inevitably, the decision to Hold the Line and maintain the shingle barrier beach around Eastoke Point roughly in its present position disrupts the natural evolution of this shoreline. In addition the construction and maintenance of coastal defence structures, for example rock groynes, and the need for continuing and repeated beach management operations, i.e. recycling and recharge, will alter and disturb the natural habitats at and close to Eastoke Point. While the preferred scheme does have some advantages from the viewpoint of preserving natural habitats, for example largely preserving the character of the Sandy Point Nature Reserve, it will also have some disadvantages, although these have been concluded to be less than for all other practicable coastal defence schemes for this frontage.
18. From the viewpoint of the “human environment” of Eastoke Point, the preferred scheme should have no significant adverse impacts, and will preserve the important access requirements along the coastline and to the Sailing Club at Black Point further north.
19. The details of the preferred scheme will need to be confirmed or modified in a further stage of the design and justification of this proposed improvements to coastal defences. However, the assumptions made in the present study should mean that the costs of the scheme should not be greater than presented in this report, preserving the economic case for its installation and continued maintenance.

20. **Finally, it is important to emphasise the need for urgent action in improving the coastal defences at Eastoke Point.** Sudden and dramatic changes in the coastline have occurred along the Eastoke Point frontage in the past, leading to rapid erosion and lowering of beach levels. Given this danger, the deterioration of some of the groyne and other coastal defence structures and an increasing mean sea level as a result of global warming, the likelihood of severe flooding of the Eastoke peninsula by wave overtopping along the Eastoke Point frontage is becoming greater every year that passes. There is a clear need to progress the improvements to coastal defences, including raising beach levels, without delay.

10.3 RECOMMENDATIONS

This study has been carried out to improve the detail of the Sectoral Strategy Study carried out by Atkins in 2006. The conclusions it has reached, as presented above, broadly confirm the coastal defence improvements for Eastoke Point suggested in that strategy, although we have concluded that these will need to be more extensive and costly than envisaged at that time.

The present strategic study is intended as a firm basis for a number of further steps in the process of improving the coastal defences at Eastoke Point. In broad terms, these future steps can be summarised as:

1. Applying for “grant in aid” from the Environment Agency for the necessary funding to design and construct the works;
2. Undertaking a detailed design study of the proposed new rock revetment, rock groyne and producing a correspondingly detailed implementation plan for managing the beaches and defences subsequently. This step will also involve producing an formal Environmental Impact Assessment;
3. Applying for the necessary planning approvals and environmental consents to implement the proposed works;
4. Implementing the proposed defence improvements, by installing the rock revetment, the rock groyne and beginning the beach management activities;
5. Monitor the constructed works and beaches, and maintaining as required.

The following recommendations are made to assist in the planning and execution of this future work.

1. Maintaining satisfactory beach levels at Eastoke Point is crucial to the objectives of reducing flood risks and preventing erosion. Further investigation into the likely effectiveness of groyne to retain beach sediments, and of the likely requirements for recycling or recharge operations is recommended. The costs of increasing the lengths or heights of groyne, or reducing the gaps between them should be compared with the estimated needs for and costs of recycling and recharge to obtain the best solution from the viewpoints of costs and environmental acceptability.
2. It is recommended that numerical modelling is undertaken of any proposed groyne layout to demonstrate the effects of altering the lengths and spacing of these. This modelling will probably only be practicable along the western part of the study frontage, east of groyne 12 and extending perhaps as far as groyne 5 and 6. To assist in this modelling, more detailed and repeated three-dimensional surveys of the beach surface between the existing groyne are recommended to show the relationship between the

groyne crest levels and the beach profiles on either side of the groynes, and to provide at least some typical plan-shapes within those groyne bays.

3. The potential advantages and disadvantages of using timber rather than rock to rebuild some of the groynes along the Eastoke Point frontage should also be considered during the detailed design of the scheme.
4. Once more detailed plans of the scheme are available, it is recommended that an environmental impact assessment is carried out to analyse the possible effects of the scheme, particularly on designated conservation areas both locally (e.g. Sandy Point Local Nature Reserve) and further afield (e.g. within Chichester Harbour). During this study, it is recommended that the possibility of some enhancement to the Sandy Point Nature Reserve, to improve both drainage of its low-lying parts and improving the associated local habitats, is incorporated within the overall scheme. The present arrangements to avoid undue harm to the environment, and particularly to vegetated shingle beaches, during beach management operations such as recycling also should be reviewed and revised at this stage.
5. At Eastoke Point, the complicated hydrodynamic environment and the potential for changes in it and in the nearshore seabed contours caused by shifts in the position of the entrance channel to Chichester Harbour will mean that a considerable degree of flexibility will be required if the coastal defences are to be managed in the most effective manner. The present monitoring of the beach changes along this frontage is good in comparison to most parts of the UK, and it will be essential to continue this in future to help optimise the proposed coastal defence scheme.
6. It is recommended that consideration be given to extending the present monitoring for at least a 1 to 2 year period following the reconstruction of the groynes around Eastoke Point to allow a more detailed analysis of beach levels adjacent to them in comparison with the groyne crest levels. It is likely that the beach levels could be improved by minor adjustments to the rock groyne profiles in the light of experience. Information on planned and unplanned changes in the crest levels of the groynes (e.g. as a result of settlement) should also be collected.
7. It will be valuable to survey the beaches at Eastoke Point after installation of the new defences in such a way as to be able to calculate overall volume changes in each groyne bay and overall, to assist in future beach recharge planning. It is also recommended that the extent of vegetated shingle within the study area is monitored. This recommendation envisages the use of LIDAR or some other form of spatial surveying rather than simple cross-sectional surveys.