CABINET

14 MARCH 2012

REPORT OF TECHNICAL SERVICES PORTFOLIO HOLDER

A.5 CLACTON AND HOLLAND COASTAL DEFENCE WORK

(Report prepared by June Clare and John Russel)

PART 1 – KEY INFORMATION

PURPOSE OF THE REPORT

To report the current situation and recommendations with respect to the coastal defence issues along the frontage of Clacton and Holland-on-Sea including the changes to the new DEFRA funding policy which have a significant impact on Tendring District Council.

To identify the tasks and provide a programme of works required for the period 2012-22.

EXECUTIVE SUMMARY

Due to the lack of DEFRA funding in 2005, following the first Clacton & Holland Coastal Strategy, Tendring District Council commissioned a review with the intention to produce a revised programme of coastal protection works.

This report follows the second Essex Shoreline Management Plan and develops its recommendations to 'hold the line' whilst identifying outline technical solutions.

The Government funding arrangements for coastal protection works will alter in April 2012 such that only a proportion of any costs will be met centrally leaving the Coastal Authorities to source the remainder.

The new Clacton & Holland Coastal Coast Management Plan (Clacton Coastal Strategy), which is due for approval from the Environment Agency later this year, recommends a series of works along the whole frontage from the Martello Inn to Holland Haven with a programme spread over fifty years and a cost of up to £50 million.

However much of this work and expenditure is in the latter stages of the programme and a realistic view suggests that, within the next ten to fifteen years, only Holland-on-Sea and part of the Clacton frontage to the East of the Pier are required urgently at a cost of £25m. The Council's proposals for coastal protection work include a commitment to reinstating the beach at Holland On Sea.

It is important to keep in mind the possibility that catastrophic cliff and promenade failure could occur within this period which would require emergency works and immediate funding.

This report aims to ensure that the Council puts in place the necessary technical resources and funds in order to protect the coastal frontage of Clacton and Holland-on-Sea and the residential and tourism infrastructure that is supported by it. The three million pounds committed at the Council meeting on 7th February for coastal protection and enhancements is the foundation stone for this project.

RECOMMENDATION(S)

(a) That the Council appoint an Engineering Consultant to produce a Project Appraisal Report identifying the technical solutions including timings and costs.

(b) That the cost of the consultancy engagement is met by a contribution from Essex County Council and the Council's own coastal protection special maintenance budget.

(c) That it is recognised that coastal protection is a priority for the council and that officers will explore all options for the funding of the work

(d) That a cross service officer group is established to embed the links between coastal protection, regeneration and leisure activities.

PART 2 – IMPLICATIONS OF THE DECISION

DELIVERING PRIORITIES

The Council's Corporate Plan, Tendring Life, recognises that Tendring's 36 miles of coastline and award winning sandy beaches are both our greatest assets as well as our most difficult and expensive management issues. Both the priorities 'Our Place' and 'Our Prosperity' are impacted by coastal defence issues, in that they relate to the development of a thriving tourist industry and of course protecting our environment.

FINANCE, OTHER RESOURCES AND RISK

Finance and other resources

A fund of £3 million has been established (Council meeting 7/2/12) to fund coastal defence and enhancement work and to be able to take advantage of any regeneration/activities that may arise.

The cost of engaging a consultant to undertake the required piece of work will be met from a contribution from Essex County Council along with funding from the Council's own coast protection special maintenance budget.

Risk: Coastal defence failure is included in the Council's Risk Register.

"There is a risk that, as a coastal authority and in relation to climate change issues, that reduced provision or maintenance of or a collapse of sea defences could have a severe environmental impact and cause damage to local property and infrastructure."

The Register highlights the following specific issues in the event of sea defence failure:

- Preventative / reactive improvements are not undertaken
- Problems stored for later years
- Breach of defences with subsequent flooding
- Threat to property and possibly life
- Complaints from public / litigation
- Adverse publicity
- Local economy adversely affected

LEGAL

The Council has permissive powers to carry out these works under the provisions of the Coast Protection Act 1949. The Council has a duty to exercise its powers reasonably having regard to all the relevant circumstances.

OTHER IMPLICATIONS

Consideration has been given to the implications of the proposed decision in respect of the following and any significant issues are set out below.

Crime and Disorder – No direct implications

Equality and Diversity – No direct implications

Health Inequalities – No direct implications

Area or Ward affected – St. James, Pier, St. Paul's, St. Bartholomews and Haven

Consultation/Public Engagement – Public consultation and engagement has been undertaken for the Essex & South Suffolk Shoreline Management Plan and the Clacton & Holland Coastal Management Plan

PART 3 – SUPPORTING INFORMATION

BACKGROUND

Reports to Cabinet in February 2007 and October 2007 detailed the very serious coastal erosion problems on the sea front at Clacton & Holland-on-Sea and detailed the work already carried out and the work required to address these problems.

The sea walls, particularly across the frontage of Holland on sea, are in a very poor state of repair and there are serious concerns for the future stability of the whole of the Clacton and Holland sea wall. The beaches are at very low levels and the structural stability of the walls is marginal.

A submission has been made to DEFRA each financial year since 2004 requesting grant aid for the proposals but, whilst permission to proceed with the works has been granted, the national budget for flood and coast protection was oversubscribed with a large number of schemes that had higher priority scores than the Clacton Works.

In July 2007 a meeting with DEFRA and the Environment Agency (EA) was held and the serious erosion problems on the Holland frontage were examined on site. The DEFRA engineer agreed that the strategy proposals as submitted at that time were needed but that the Council should consider interim works to try to prevent sea wall failures until such time in the future that the strategy could be afforded and implemented.

The engineer also suggested that the strategy needed to be updated to take account of revised guidance for the submission of schemes for approval and grant funding.

Since that time the following 'patch and repair' works have or will be completed: -

Queensway Sea Wall Emergency Works - £0.40m
Hazlemere Road Sea Wall reconstruction - £1.40m
York Road Sea Wall reconstruction - £1.10m

Holland Haven Sea Wall reconstruction - £0.75m
Cliff Road Sea Wall Stabilisation - £2.30m

In all just under £6m has been spent at these locations all of which has been 100% grant funded.

The table below has been produced to show events: -

• A report detailing the proposed Coast Protection Strategy plan put to Cabinet. • Cabinet approve strategy plan for submission to DEFRA.	April 2003
• The strategy plan submitted to DEFRA for approval.	July 2003
• DEFRA having considered the strategy submitted it to treasury for approval	Jan 2004
• DEFRA requested that further work be carried out on the strategy to bring calculations in line with new guidance	April 2004
• Further work completed and submitted to DEFRA. The strategy now scores 13.7 points in DEFRA scoring system and would therefore qualify for funding in 2005/6.	Aug 2004
• On the basis of the above a scheme for Phase 1 of the works submitted for grant aid.	Oct 2004
• DEFRA announced revised points system and qualifying scores. On the basis of this Phase 1 will not now qualify for grant aid until 2008/9 at the earliest	Nov 2004
• Report back to Cabinet on above, Members resolved that further work on the strategy be suspended and that a letter be sent to DEFRA MP's and the LGA expressing concern about the perilous state of the sea defences at Clacton	Nov 2004
• TDC apply for grant aid for short term support work for a section of the sea walls below York Road with rock armour.	Nov 2004
• DEFRA agree the Clacton strategy proposals (this is agreement to the basis of the proposals not to the funding)	Jan 2005
• DEFRA grant scheme approval and aid for short term measures submitted in November(cost £260K) • Work carried out	Feb 2005 May 2005
• Series of letters sent to DEFRA requesting determination of Phase1 submission for grant aid.	2004 - 2006
• Sea wall collapse at Queensway, DEFRA contacted and asked to fund repairs.	Jan 2007
• Report to Cabinet recommending emergency works be carried out and funded by the Council and a retrospective application to DEFRA for funding. • DEFRA approved grant aid of emergency work (using under-spends on their budget for 2006/7)	Feb 2007 Mar 2007
• Emergency works carried out to stabilise and reconstruct the sea wall at a total cost approved by DEFRA of £400k which cost is 100% grant aided.	Feb 2007
• Meeting with DEFRA & EA to examine problems on site. Despite the clear indication that large lengths of the sea wall are life expired and beaches dangerously low the DEFRA engineer stated that, in the context of the very large demands for funds from competing schemes, and the budget available, the Clacton	July 2007

proposals are not affordable in the short to medium term. • The DEFRA engineer recommended that the Council should consider interim works to prevent failure until the strategy could be afforded. • The DEFRA engineer recommended that the strategy needed updating to take account of revised guidance for scheme submission & grant funding.	
• Medium Term Plans submitted to DEFRA to include Hazlemere Road and York Road works and update strategy proposals as requested.	Aug 2007
• Hazlemere Road scheme approved for funding by DEFRA / EA for technical and financial approval. • Scheme completed at a cost of £1.4m (100% DEFRA grant)	June 2008 May 2009
• Review of Essex & South Suffolk Shoreline Management Plan commenced. • Submitted to Secretary of State for approval.	June 2008 Nov 2011
• Detailed submission of proposals to revise and update the Clacton & Holland Coastal Management Plan (Strategy) as requested by DEFRA to EA National (now Large Projects) Review Group • Report due to EA Large Projects Review Group (LPRG)	June 2008 July 2012
• York Road scheme approved for funding by DEFRA / EA for technical and financial approval. • Scheme completed at a cost of £1.1m (100% DEFRA grant)	May 2009 May 2010
• Holland Haven scheme approved for funding by DEFRA / EA for technical and financial approval. • Scheme completed at a cost of £0.75m (100% DEFRA grant)	Mar 2010 April 2011
• Cliff Road scheme approved for funding by DEFRA / EA for technical and financial approval. • Scheme completed at a cost of £2.3m (100% DEFRA grant)	May 2011 April 2012
• DEFRA introduce new Flood Defence Grant in Aid (FDGiA) arrangements – now 'Flood and Coastal Resilience Partnership Funding'	April 2012

CURRENT POSITION

Essex & South Suffolk Shoreline Management Plan (SMP)

The SMP has been prepared by the Environment Agency (EA) in partnership with all the authorities involved in shoreline management along the Essex and South Suffolk shoreline. The formal review began in June 2008 and this Council has been actively involved throughout its preparation.

The issues of flooding and coastal erosion are serious issues that affect much of the district's shoreline and the SMP puts forward the Management policies for the next 100 years. Reviews and updates will take place every 5 to 10 years to take into account any changes of circumstances, including budget availability.

A draft plan was made available for public consultation in March 2010 and Cabinet considered and provided a formal response to the consultation at its meeting on the 7th July of that year.

The draft policies put forward have now been reconsidered and remain largely unchanged from the original 1999 SMP with two exceptions at Jaywick & St.Osyth and Holland & Frinton where a dual policy of 'Hold The Line / Managed Realignment' was agreed in

Epoch 3 (2055-2105).

For the Clacton and Holland-on-Sea frontage the 'Hold the Line' policy was maintained. This means maintaining the defence line where it is now but can mean upgrading the standard of protection but can also mean that the standard is allowed to reduce over time, depending on the local situation.

Clacton & Holland Coastal Management Plan (Clacton Strategy)
DEFRA requested that the strategy be updated and the EA Large Project Review Group (LPRG) approved a detailed submission for this. However the NRG required that the frontage under consideration should be extended to include EA's frontage at Holland Haven and consequently we are now working jointly with EA to complete this work.

This study is almost completed and will finally be concluded by July of this year. It is 100% grant funded and has been supervised by a joint EA/TDC project Board.

The new Clacton strategy has taken forward the work carried out under the SMP to identify technical and deliverable solutions for holding the existing coastline at Clacton and Holland-on-Sea. It is required to:

- Identify a strategic vision for coastal management and
- establish a sustainable & technically deliverable solution which will effectively deal with coastal erosion

The previous strategy was completed for this frontage in 2004 and recommended offshore breakwaters and sand recharge. This solution involved high up-front expenditure and, due to funding issues, has not been possible to implement.

To overcome this, the new strategy has sought to develop an alternative approach involving dividing the frontage into three Zones (A, B & C) and phasing the expenditure. The areas are: -

- Zone A - Martello Inn to Clacton Pier
- Zone B - Clacton Pier to Eastcliff
- Zone C - Eastcliff to Holland Haven

Each Zone, particularly Holland-on-Sea, may require some further initial patch and repair work to be undertaken where the existing defences are at immediate risk of failure and this is likely to involve rock revetment.

It is important to note that it is not considered feasible to continue with the approach of installing such rock revetment at failing defences beyond this initial repair work (say five years). Rock revetment does not prevent the erosion of the clay foreshore and it is this erosion that is resulting in the defences being undermined and eventually failing.

If the current approach of patch and repair using rock was to continue beyond the short term, then eventually it would become technically unfeasible to hold the existing defences and the current line of the frontage would be lost.

There is a recognition that any long term sustainable solution for this frontage will require significant investment - up to £100million over the next 100 years. Due to the recent changes in coastal defence funding only a proportion of this can be financed through government 'Grant in Aid funding' with the remaining needing to be raised from alternative

sources by Tendring District Council.

For this reason, some short term works to areas of failing defences within the next five+ years may be required and these could provide additional time to raise the funding needed for the longer term solution.

The recommendations of the Plan are flexible and therefore should opportunities to attract funding be identified at an early stage, then major works to implement the breakwater construction and sand nourishment could be brought forward.

Statutory consultation and public engagement

Statutory consultation is a requirement under the Strategic Environmental Assessment (SEA) process and through this there will be discussion on the findings and the environmental impacts of the recommendations with organisations such as Natural England, English Heritage, the Marine Management Organisation, Essex County Council, Tendring Council (as the Local Planning Authority), and EA technical departments. This consultation is currently planned for an eight week period starting in the spring of 2012.

During this consultation period all of the project documents were published to ensure any other organisation or individual that should wish to comment has the opportunity to do so.

There is limited opportunity for members of the public to truly influence a change in the recommendations of the Plan, as these are very much bound by technical and financial limitations. The public engagement therefore is being geared towards 'informing' the public of the coastal erosion problem and challenges, the technical solutions available and the way forward for implementing sustainable coastal management. Communications officers from TDC and the EA are currently working together on this.

Funding

In England the EA administers Flood Defence Grant in Aid (FDGiA) on behalf of DEFRA. This is government money allocated to Risk Management Authorities (RMA's) (which include the EA and Local Authorities) for capital works to manage and reduce flood and coastal erosion risk. In the past any grant has been calculated on a 'Cost Benefit Analysis' which identifies a ratio between the value of the assets protected against the cost of the works.

Each year RMAs are invited to submit details of proposed flood and coastal erosion flood management works which require funding within the following five years. This generates the Medium Term Plan (MTP) which is prioritised to ensure that projects provide good value for money and achieve the EA's corporate targets.

DEFRA has now introduced new Flood Defence Grant in Aid (FDGiA) arrangements, called Flood and Coastal Resilience Partnership Funding (FCRP), and these arrangements will be used for the 2012/13-14/15 allocation.

The new approach aims to encourage total investment to increase funding beyond levels affordable by central Government alone, and to enable more local choice through the new Regional Flood & Coastal Committees (RFCCs).

The key change is that, from 2012/13 onwards, Government will offer a fixed amount of grant to any project, based on the outcomes it will deliver. Projects whose costs do not qualify for full FDGiA funding will require cost savings to be found and/or local contributions in order to be able to proceed. This will affect local expectations of funding where FCRM schemes are proposed, including those that were previously expected to be

fully funded

From 2012/13, the amount of FDGiA available to any capital scheme will directly relate to the number of households protected, the damages avoided, and the wider benefits of a project. As part of implementing this new funding policy, the following Outcome Measures (OM) definitions have been agreed to replace the previous ones that expired in March 2011: -

- OM 1 – Economic Benefits
- OM 2 – Households at risk
- OM 2b – Households at very significant and significant risk
- OM 2c – Deprived households at very significant and significant risk
- OM 3 – Households at risk from coastal erosion
- OM 3b – Households at risk from coastal erosion in 20 years
- OM 3c – Deprived households at risk from coastal erosion in 20 years
- OM 4a – Hectares of water dependent habitat created or improved
- OM 4b – Hectares of intertidal habitat created

For Clacton and Holland-on-Sea this now means that, due to the low cost benefit ratio, a scheme for the seafront will only attract a proportion of the required funding from Central Government and that there now must be a local financial contribution to the project.

If we are to take forward a sustainable coastal risk management plan for Clacton and Holland-on-Sea we need to develop a funding framework that will support a scheme for the frontage that delivers a range of benefits through integrated funding streams.

We will need to investigate all possible funding sources and routes as well as consider if we have the right funding mechanisms in place to give us the flexibility we need to deliver a robust Plan for this frontage.

A summary of alternative sources of finance is attached to this report but it should be anticipated that generally the Clacton and Holland works will attract a contribution of less than 50% and possibly as little as 20% for Holland-on-Sea.

Project Appraisal Report

The next step for Tendring is to determine how the first phase of coastal management works can be implemented to ensure that the frontage now starts to develop in line with the recommendations of the Plan.

In order to ensure a long term solution which is sustainable, fundable and in line with coastal processes, further consultancy work will be required to undertake a 'Project Appraisal'.

This Appraisal will develop in more detail the work carried out in the Strategy focussing on the implementation of the first phase of works. There are currently a number of

uncertainties around what this first phase could be as it will need to make best use of available funds and may incorporate innovative solutions and funding mechanisms for delivering the overall Plan.

The Appraisal will consider the various phasing options for initial implementation on the coastline and how these options may be influenced by funding availability or optimised to realise growth and regeneration opportunities. This assessment of options will identify a preferred option and costs for the first phase or works which will then require approval from the EA before it can progress to construction.

Without an approved Project Appraisal it will not be possible to commence the implementation of the Plan. The key benefits and reasons are: -

1. Identify the 'optimum' first phase of works which (1) makes best use of available funding (2) maximises opportunities to attract further funding (through tying in with tourism, growth and regeneration) and (3) is in line with the long term sustainable solution as identified in the Plan

2. Undertake preliminary design to be able to implement a solution which is effective and works in line with coastal processes

3. Obtain Flood Defence Grant in Aid funding

4. Obtain technical approval to undertake coastal works

5. Preparation of documents for subsequent application for Planning permission

6. Preparation of documents for subsequent application for Marine Management Organisation / Coast protection Act approval

In order to undertake this work a Consultant will need to be appointed and funding for this work is available from within Tendring District Council resources, supplemented by an amount awarded by ECC.

This Consultant must be not only proficient at Coastal engineering but must be familiar with the requirements of the EA's Reporting, Approvals and funding requirements. It is proposed that they should also investigate and report upon funding sources, both external and internally regenerative.

A draft programme for years 2012 – 16 is included with this report.

BACKGROUND PAPERS FOR THE DECISION

1. Flood Defence Grant in Aid 2012/13 Allocation Process
2. Securing alternative sources of funding for flood & coastal erosion risk management.
3. Estimating Outcome Measure contributions using the FDGiA funding calculator.

APPENDICES

1. The Essex & South Suffolk Shoreline Management Plan (Non-Technical Summary)

2. The Clacton & Holland Coastal Management Plan (draft)
3. Draft programme of actions

Managing the coast

Essex and South Suffolk Shoreline Management Plan

Non-technical summary of draft SMP – March 2010
Landguard Point to Colne Point

We have developed the Shoreline Management Plan (SMP) by following a set of principles agreed by all the organisations involved in the process. Some of these principles can be contradictory and this is one of the main challenges of shoreline management. It is unlikely, perhaps impossible, to fully achieve all the principles. So instead the SMP aims to provide the best achievable balance between the principles in the short, medium and long term. The short term refers to epoch 1, the medium term to epoch 2 and the long term to epoch 3. As a whole, this set of principles represents the balance of values to which the SMP aspires. The order of the principles does not indicate the order of importance.

1 To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and the interaction between land and sea

2 To balance flood and erosion management with the assets and benefits that it protects

3 To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts

4 To develop policies that are resilient against future changes and associated uncertainty

5 To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change

6 To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure

7 To support and promote the social and economic values of the Essex and South Suffolk coast to wider society

8 To support conservation and enhancement of biodiversity and geodiversity

9 To contribute to maintaining and enhancing the evolving character of the coastal landscape

10 To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area

11 To support and enhance people's enjoyment of the coast by maintaining and enhancing access

What this booklet tells you

This booklet tells you about the draft Shoreline Management Plan (SMP) for the coast and estuaries between Landguard Point (Felixstowe Port) and Colne Point, and how you can comment on the draft policies.

This is one of three booklets about the draft Essex and South Suffolk Shoreline Management Plan: the other non-technical summaries cover the areas from Colne Point to Bradwell; and from Bradwell to Southend-on-Sea. The final Essex and South Suffolk Shoreline Management Plan (SMP) will be a high-level policy document that has been agreed by all organisations involved in the management of coastal flood and erosion defences. This document is a non-technical summary of the full draft SMP. It presents the suggested long-term plan, based on a full appraisal of options against a wide range of criteria. Details of the timetable for producing the final plan appear on page 5.

This document aims to:

- inform, and get responses from, interested groups or individuals on our understanding of why and how coastal flooding and erosion might occur, and their effects on people, their use of the land and the environment
- obtain your views on the proposals for managing this section of the Essex and South Suffolk shoreline in the short, medium and long term.

In particular, we would like your comments on:

- the intent of management that we propose for each length of the coast
- the draft Strategic Environmental Assessment that we have prepared alongside the SMP. This is also out for consultation. It is included as Appendix L to the full draft SMP and can be found on the CD inside the back cover of this booklet.

Policy Definitions

Hold the Line (HtL) Holding the defence line where it is now
Advance the Line (AtL) Building new defences seaward of the existing defence line
Managed Realignment (MR) Allowing or enabling the shoreline to move, with associated management to control or limit the effect on land use and environment. This can take various forms, all characterised by managing change, either technically, for land use or for the environment. For the Essex and South Suffolk SMP, two distinct types of Managed Realignment are relevant
No Active Intervention (NAI) No further investment in coastal defences or operations

Public consultation

The Essex and South Suffolk SMP is out for public consultation from Monday 15 March to Friday 18 June 2010.

Both this summary document and the full draft SMP and appendices are available online at https://consult.environment-agency.gov.uk/portal/re/flood/anglian/smp150310/consult

They are also available for viewing at a number of local authority offices and the Environment Agency's offices within the plan area (addresses can be found at the back of this document). Copies can also be viewed in a number of libraries in the plan area (addresses given on page 35).

Further information about the public consultation can be obtained by emailing Essex_SMP@environment-agency.gov.uk, or by phoning the Environment Agency's National Customer Contact Centre on 08708 506 506* – Monday to Friday 8am to 6pm.
*Approximate call costs: 8p plus 6p per minute (standard landline). Please note charges will vary across telephone providers.

If you would like to comment on this consultation you can do so online at: https://consult.environment-agency.gov.uk/portal/re/flood/anglian/smp150310/consult
You will need to register before you can respond – this will only take a few moments.

Alternatively you can respond by:

- email: ian.bliss@environment-agency.gov.uk
- writing to: Ian Bliss, Essex and South Suffolk SMP consultation, Environment Agency, Iceni House, Cobham Road, Ipswich IP3 9JD

by 4pm on Friday 18 June 2010.

What is a Shoreline Management Plan (SMP)?

A Shoreline Management Plan is a plan for managing flood and erosion risk for a particular stretch of shoreline over 100 years, looking at the short, medium and long term.

SMPs identify the best ways to manage coastal flood and erosion risk to people and the developed, historical and natural environment. They also identify opportunities where partners, stakeholders, communities and individuals can work together to manage and reduce flood and erosion risk. The objective of the SMP is a document that outlines the intent of management for the coast and estuaries of Essex and South Suffolk. The plan aims to achieve the best possible balance for all the features that have been identified as valuable by partners and stakeholders around the coast.

Approximately 10 years ago, the first suite of SMPs were completed for the entire length of the coastline of England and Wales. These SMPs are now being reviewed to take into account new information, data and legislation.

The draft plan describes the intent of shoreline management for the short term (up to 2025), the medium term (2026-2055) and the long term (2056-2105). These are referred to as epochs 1, 2 and 3 respectively. The intent for the medium and long term sets a vision for the future, but is based on our current knowledge and understanding. That is why SMPs are reviewed every five to 10 years.

The Environment Agency manages most of the flood defences between the Colne Estuary and Felixstowe Port. There are also a number of erosion defences managed by local authorities such as Tendring District Council. Isolated lengths of coast are managed by other stakeholders, for example private landowners.

In addition to these organisations, Natural England and English Heritage are involved to ensure that we are balancing the needs of the natural, historical and cultural environments around this coast. The coast, and the way it is managed, has strong interactions with a range of issues both landward and seaward of the defences. As a result it is imperative that these plans are developed in partnership and with input from coastal stakeholders and the public.

What is the draft SMP stage?

During this stage we prepare our draft plan and consult the public.

The draft SMP presents:

- an overview of the SMP area, looking at everything that matters for shoreline management. This includes technical elements such as the defences and the coastal processes. Equally important are the 'softer' elements: how do people use the land and the sea around the shoreline; what is the value of the area for wildlife and its heritage value; what is the role of the shoreline in the landscape; and how do all these aspects interact? We have translated this into the set of principles shown at the beginning of this document, which form the basis of the plan.

- an explanation of the role that shoreline management plays along each section of the coast. What would happen if we continue managing the defences as we do today, and what happens if we manage them differently? If we understand this, then we can identify the 'big decisions' that this SMP needs to make.

- an explanation of how we intend to manage the coastal defences in the short, medium and long term; what do we aim to achieve and what are the wider implications?

Timetable for Essex and South Suffolk SMP

SMP Stage	Details	Timing
Preparation of the draft plan	• Scoping • Assessments to support policy development • Policy development • Discussion with landowners who could be affected by policy changes	June 2008 to February 2010
Public consultation	• Consult with people and organisations who have an interest	15 March to 18 June 2010
Final SMP	• Review and incorporate consultation responses • Prepare Action Plan • Adoption and approval • Produce final SMP	June to September 2010
Dissemination of final plan		September 2010 onwards
Monitor and review		Ongoing

Project area overview

The full SMP area is located in the east of England and covers the South Suffolk and Essex coast from Felixstowe Port (in Suffolk) to Two Tree Island (in the Thames). This booklet is one of three non-technical summaries of the main SMP document and is designed to give you an overview of the plan. It covers the area from Landguard Point (Felixstowe Port) to Colne Point; this includes the River Orwell up to Horseshoe weir and Handford sluice in Ipswich, and the River Stour up to the Cattawade barrage sluice, Hamford Water and the coastal frontage of Tendring.

In total, it includes over 100km of coast and estuary banks. Much of the shoreline is made up of embankments that protect low-lying land against flooding. There are also a number of stretches where the land is higher. Along the Orwell and Stour rivers these are generally undefended, but the high ground (cliff) frontage of the Tendring Peninsula is defended against coastal erosion.

Clacton-on-Sea is a coastal resort town that has a seafront that contains a beach, pier, promenade and other leisure and tourist amenities. Tourism also plays an essential part in the economy of the Tendring Peninsula. The Stour and Orwell are part of the Suffolk Coast and Heaths Area of Outstanding Natural Beauty; they are also used for a wide range of activities, the most prominent being the commercial shipping that takes place out of the ports at Felixstowe and Harwich. The low-lying areas included in this plan also provide important habitats for a range of birds, invertebrates and plants.

How the coast and the estuaries work

The coastal and estuarine processes in the area are complex and operate at various scales. At the largest scale, waves approaching the coast from the north-east move sediment around. This causes sediment to build-up at some locations, but sediment loss at others. The impact of the waves is strongly felt at the mouth of the estuaries, and the tidal flows also play a part in removal and redistribution of sediment.

Here we introduce and explain some of the key coastal and estuary processes in the Essex and South Suffolk SMP area. These have played an important role in developing the plan.

Intertidal areas: An estuary is the section of a river where it flows into the sea and is influenced by the tides. Estuary banks are typically wide, flat areas consisting of mud and silt that are sometimes dry, and sometimes under water. Similar areas are also found along parts of the open coast, for example in front of Dengie and Foulness. These are called 'intertidal areas' and are made up of mudflats and saltmarshes. The intertidal area is important because it stops waves reaching flood and erosion defences, and it is also a habitat for many rare plants and animals.

Coastal squeeze: Since the last Ice Age, around 12,000 years ago, the land in the east of England has been sinking slowly, while sea levels have generally been rising. This process is expected to continue and may be speeding up. The natural response of intertidal areas is to gradually move inland. Large areas of the estuaries and coastline in the Essex and South Suffolk SMP area are constrained by high ground and by man-made flood defences. This means that the saltmarshes and mudflats cannot move in a landward direction: they do lose area from their seaward edge, but they don't gain area on their landward edge. This is called 'coastal squeeze'. It puts pressure on the flood defences, which become more difficult to maintain, and it leads to loss of important habitats.

Estuary processes: At the outer and middle reaches of the estuaries erosion of the saltmarsh edge takes place. These sections are exposed to pressures from waves and tidal flows. Some of the sediment eroded from the outer and middle reaches is transported by the tides into the inner estuary where siltation is taking place. As sea level rises and tidal flows speed up, there will be more erosion and coastal squeeze of saltmarsh in estuaries.

Where the estuary is constrained, the flood banks are under pressure. Widening the estuary on one bank loosens this constraint, so it will reduce the pressure on the opposite bank of the estuary.

On the other hand, widening the estuary in the upstream reaches can have a negative effect elsewhere in the estuary. It increases the tidal prism (the volume of water flowing in and out of the estuary with each tide). This means that more water has to pass through the outer reaches, and this can increase the pressure on the banks. As a result realignment will tend to be considered on the middle and outer reaches of estuaries.

Open coast processes: There are a number of exposed coastal frontages in the SMP area. These frontages experience the full force of waves from the North Sea with the strongest waves coming from the north-east. The wave energy moves sediment around the coast. Sediment tends to build up in certain areas where the wave and current energy is less. There can also be a loss of sediment where this energy is greater. This loss of sediment causes a loss of beaches, saltmarshes and mudflats and can cause undermining of coastal and flood defences.

We have divided the area into three Management Units (MU):

Management Unit A (Stour and Orwell rivers): from Landguard Point to the east of Felixstowe port along the north and south banks of the River Orwell, into the River Stour along the north bank and then back out along the south bank to Dovercourt, just south of Harwich. This management unit is a combination of an open coast and estuary frontage. The mouth of the River Stour and River Orwell is an exposed open coast frontage. The estuaries themselves are sheltered but affected by the tides. Where the estuaries' banks are low-lying, the area is defended by earth embankments. The majority of the settlements are not at risk from tidal flooding with the exception of the infrastructure at the ports of Harwich and Felixstowe. In front of the defences there are saltmarshes and intertidal flats which are mainly muddy but become more sandy towards the sea. Monitoring has shown that there has been an overall reduction of saltmarsh in the estuaries.

Felixstowe Port

Management Unit B (Hamford Water): from Dovercourt to the Naze, covering the embayment of Hamford Water. This management unit is a combination of an open coast and estuary frontage. Dovercourt and the mouth of Hamford Water are exposed open coast frontages, whereas inside Hamford Water the processes are more similar to those seen in the estuaries. Within Hamford Water the land behind the earth embankments is low-lying and at risk of flooding, although there are no properties within this zone. In front of the defences there is saltmarsh and intertidal flats. Monitoring has shown that there has been an overall loss of saltmarsh within Hamford Water. Although the area is less constrained than other areas along the Essex coastline, the rate at which saltmarsh is being lost has been increasing. Along the Dovercourt frontage there are 15-metre-high London clay cliffs. The high ground is protected by beach control structures. In front of the cliffs the beach is sandy.

Hamford Water

Management Unit C (Tendring Peninsula): from the Naze to Point Clear on the east bank of the River Colne. The Tendring Peninsula is an exposed open coast frontage. The land is generally high from the Naze to Clacton, consisting of sea cliffs made up of London clay. There are low-lying frontages in between the sea cliffs, which are intersected at Walton-on-the-Naze and Holland Gap. The Naze cliffs in the north of this management unit are currently undefended. Further to the south-west the high ground is protected by sea walls, sheet piling, promenades, wave return walls and beach control structures. In front of the defences is a narrow intertidal zone containing sand beaches with some shingle. From Clacton to Colne Point the land is low-lying and is protected by earth embankments and sea walls. Monitoring has shown that there is significant erosion at the tip of the Naze and at Jaywick. Erosion is caused by wave and tidal energy and landward constraints imposed by the defences and higher ground. This is further compounded by an overall lack of supply of sediment.

Clacton, and beach control structures at Jaywick (Courtesy of Mike Page)

Figure 1: Management Units for the Stour, Orwell, Hamford Water and Tendring Peninsula

Why it is a special place

The three Management Units (Stour and Orwell, Hamford Water and Tendring Peninsula) each have a very different character. One thing that they all have in common is their strong relationship with the sea.

There are various settlements on or near the shoreline, with their communities, range of public services, infrastructure and historic buildings and sites. Large parts of the defended areas are important for agriculture. The Stour and Orwell and Hamford Water are used for both commercial and recreational activities, particularly at the mouth of the Stour and Orwell where the ports of Harwich and Felixstowe are located and at the marinas on the Orwell and at Titchmarsh. People come to the area mainly for seaside and resort tourism and to some extent for wildlife-related tourism. There are large areas of tourist facilities at Clacton-on-Sea, Walton-on-the-Naze, Seawick and Jaywick. In addition there are a number of golf courses, particularly along the Tendring Peninsula frontage, as well as camping and caravanning sites. People are also drawn to the area for the recreation opportunities it provides, such as outdoor pursuits, country parks and nature reserves.

At the same time, the Stour and Orwell, Hamford and part of the Tendring Peninsula frontage has a unique environment. The intertidal mud and sand flats are home to a rich variety of animals and plants, which form a complex and unique system for the wildlife, in particular birds. A large number of invertebrates and shellfish live in the mud flats, and these provide food for large numbers of geese, waders and ducks throughout the year. The saltmarshes, low cliffs, historic grazing marshes, freshwater/brackish water transition and vegetated shingle area also support a wide and diverse range of nationally scarce plants, flora, fauna, invertebrates and migratory and wintering birds. This environment is protected by a range of national and international designations.

The cliffs along the frontage, particularly at the Naze, display a range of geologically important layers and fossils.

Along this frontage there are Martello towers, early 19th-century small defensive forts that have particular historic significance and landscape value. The Naze Tower is also an important historic landmark, which today contributes to tourism and the local economy.

The estuarine landscape of the Orwell and the northern frontage of the Stour is very distinctive. This area is part of the Suffolk Coast and Heaths Area of Outstanding Natural Beauty.

The role of shoreline management: finding the right balance

The draft SMP considers how the shoreline would respond to different management options and how these would affect the values and features that are characteristic for the Essex and South Suffolk SMP area, such as communities, agricultural land, tourism facilities and intertidal habitats.

We have assessed these impacts against a set of policy appraisal criteria and indicators. These criteria and indicators were developed for each Management Unit based on the principles for shoreline management in Essex and South Suffolk as on page 1 of this document and further explained in Appendix G (Draft Policy Appraisal of the full draft SMP). The text box below illustrates how we have done this.

Here we illustrate examples of the policy appraisal criteria, how they are linked to the general principles for shoreline management and how they have been assessed (indicators). Full details are provided in the main SMP document.

Principle: To balance flood and erosion management with the assets and benefits that it protects

Criteria: Level of flood and erosion risk to people and property

Indicator: Number of properties within the tidal floodzone or at risk from erosion compared to the current number

Principle: To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change

Criteria: Adequacy of time available for adaptation for communities, individuals and partner organisations

Indicator: Time (in epochs) available for each required process of adaptation, depending on the policy option

Principle: To support conservation and enhancement of biodiversity and geodiversity

Criteria: Impact on the achievement of management objectives for designated sites, keeping them in favourable condition

Indicator: Area of designated land lost/gained per epoch and scenario

Based on this, we have identified that the SMP has to deal with the following 'big decisions' for shoreline management:

1 For the coastal defences that protect seaside towns (such as Clacton and Harwich) against erosion, the question is how to sustain the vital role of the seafront for the character and economy of these towns. Holding the existing alignment protects existing features, but this can be difficult and it may have a negative effect on the beach and elsewhere along the shoreline.

2 For defences that protect any settlements or important infrastructure it is not realistic to stop defending against tidal flooding. For these defences, the 'big decision' is not whether, but how to achieve continued defence against flooding. The best solution could be to hold the existing line, but it could also be to move the defences landward.

3 For all other flood defences, the SMP has to ask the question whether continued defence is the best solution in the face of increasing pressures and the negative affects of coastal squeeze. Do the benefits that the defences bring outweigh their negative impacts and the effort and costs needed to sustain them?

These decisions have to take into account a range of factors:

- Some of the defences are under significant pressure. This can be from eroding channels, particularly where the estuaries' natural evolution has been constrained in the past by land reclamation.

- Loss of foreshore does not only threaten the flood defences, it can also threaten the environment by reducing the area and quality of intertidal habitats. Much of the intertidal area is protected by international designations and adds value to the local economy (even though it is very difficult to quantify this value). In many cases moving the defence landward would create new intertidal areas to replace those under threat.

- Pressures can also come from waves. Wave action can lead to undermining of defences and there is a risk of overtopping of the defences as wave heights increase as a result on the effects of climate change.

- The defended areas are important, even if they don't include settlements or key infrastructure. They are valuable for agriculture, access to the shoreline, and heritage assets. They also contain important freshwater habitats, some of which have international designations and add value to the local economy (although this can be difficult to quantify). In some cases, functioning of freshwater habitats depends on the intertidal habitats, and vice versa.

Finally, the SMP looks at the long term, but we only have limited knowledge about what will happen in the future. This is the case for coastal processes, and also for the value that society will place on the different features of the area. The SMP needs to make sure that the plan is both robust yet flexible in the face of these uncertainties.

These factors have been taken into consideration during the development of the Shoreline Management Plan.

We have started by using these considerations to identify which of four policies could be realistic for each of the SMP's frontages. For some of the frontages this has led to the conclusion that there is only one realistic option; for other frontages this identified which options need appraisal. These options typically represent the various sides of interest and all include the need to allow time for adaptation to major changes.

Policy Definitions

Hold the Line (HtL)	Holding the defence line where it is now
Advance the Line (AtL)	Building new defences seaward of the existing defence line
Managed Realignment (MR)	Allowing or enabling the shoreline to move, with associated management to control or limit the effect on land use and environment. This can take various forms, all characterised by managing change, either technically, for land use or for the environment. For the Essex and South Suffolk SMP, two distinct types of Managed Realignment are relevant
No Active Intervention (NAI)	No further investment in coastal defences or operations

Summary of the draft plan: continuing to defend communities and giving more room to natural processes

The overall plan for managing the Essex and South Suffolk shoreline is:

- to keep protecting all dwellings and key infrastructure against flooding and erosion;
- to protect all other values of the defended land as much as possible and for as long as possible, but where this is not possible, to allow sufficient time to adapt;
- to work with landowners to realign vulnerable flood defences that are currently under pressure from natural coastal processes to a more landward alignment. This will create a more sustainable approach to managing flood risk and natural processes;
- to identify where important intertidal and freshwater habitats may be under pressure and to consider where they need to be located and managed for future generations;
- to continue to allow natural shoreline evolution where possible, but enable local and sensible intervention where needed.

For most of the currently defended coast and estuaries, the intention is to continue to hold the existing line of flood and coastal defences throughout the short, medium and long term. For the ports of Felixstowe and Harwich, the expansions that are currently ongoing or under consideration are Advance the Line policies.

However, for a number of frontages, the SMP process has identified that the defences are under pressure from eroding channels or from wave attack, in the middle and outer reaches of the Orwell, in Hamford Water and along the Tendring frontage. This pressure is likely to increase. For these frontages a change of policy is desirable, by realigning the defences further inland would make them more sustainable in the long term (while continuing to protect all dwellings and key infrastructure). There are also defences under pressure where realignment is not seen as a realistic option because of overriding constraints. This can be because current defence land use is too important and needs the existing alignments.

This approach has identified a list of 31 policy development zones within the whole SMP area where the plan proposes managed realignment for flood defence frontages. In total, this is approximately 20 per cent of the total shoreline length in the SMP area, or 4.5 per cent of the area of the existing floodzone. Of these, there are 10 in the area from Felixstowe Port to Colne Point: two in epoch 1 (of which one is already in progress during the development of the SMP), five in epoch 2 and three in epoch 3.

The proposed timing of the realignments in the draft plan (short, medium or long term) aims to ensure that there is sufficient time for people, businesses and organisations to consider their options. It is important that there is time for adaptation to any change in the future, and that local people are involved in any new schemes to maximise the opportunities for reducing flood risk, enhance the environment and developing economic and social benefits through managed realignment schemes.

It should be noted that timing for realignment will be further considered during the public consultation phase, which will include key stakeholder involvement. This could mean that timing of realignment may be reconsidered and changed.

As stated before, where defences currently protect dwellings or key infrastructure, the location of the new alignments will ensure continued protection. The realignments will reduce flood risk by setting back vulnerable defences and, where appropriate, building new defences that may enhance the standard of flood protection to local communities. The design of the defences, beyond the SMP, will ensure an appropriate standard of protection.

Managed realignment works with natural processes to absorb large surge tide events and also create new intertidal habitats. The new realignments will affect the current land use as existing farming practices would not be possible at these locations. We are therefore working with the landowning community to establish how we can develop such projects. In addition some important freshwater habitats will also be affected and we will need to work closely with landowners and wildlife organisations to ensure new habitats can be created.

Where there are a number of frontages, typically where flood defences protect larger settlements, the intention of the SMP is to maintain or upgrade the standard of protection, including taking into account impacts of climate change. For the other frontages, the broad-scale analysis of the SMP is not sufficient to determine the appropriate standard of protection: more detailed analysis after the SMP is required. The SMP's Action Plan, which will be drawn up following the consultation of the draft SMP, will identify the timing, roles and responsibilities for this.

For most of the frontages that are currently undefended (parts of the Stour and Orwell estuary and the Naze), the intent is continue this approach throughout the short, medium and long term.

However, where erosion threatens important features, the intent is to allow site-specific management to limit erosion risk, as long as this has an acceptable effect on coastal processes. This includes the Naze Tower and various stretches along the Stour and Orwell.

There are also a number of undefended frontages where coastal change is starting to affect important features, and which need an integrated plan beyond the SMP. This concerns Wherstead, Pin Mill and Shotley Gate, all in the Orwell and Stour estuaries. The SMP's intent for these frontages is to establish a partnership approach for adaptation.

In general, it is important to note that developments in the medium and long term are difficult to predict. The SMP's Action Plan will identify the monitoring and research that are needed to inform the planned review of the SMP in five to 10 years' time.

Where the Shoreline Management Plan proposes managed realignment of flood defences, the ambition of the partner authorities is to implement this policy with full landowner agreement. This also means that all landowners are allowed to hold their own defence line if they choose. New guidance has been developed at a national level (asset maintenance policy) and practical local guidance is available to landowners wishing to maintain their own defences within the plan frontage. Should everyone wish to hold the line, there will be consequences for the erosion and subsequent loss of local intertidal habitats through coastal squeeze. The Environment Agency is tasked with finding replacement habitat on behalf of landowners wishing to hold the line.

The Shoreline Management Plan will have to comply with the legal requirement from the Habitats regulations to mitigate or compensate for intertidal habitat loss caused by coastal squeeze (as discussed in the Appropriate Assessment, included as Appendix M in the full draft Essex and South Suffolk SMP).

In order for landowners, operating authorities or the Environment Agency to gain flood defence and coastal protection consents, some managed realignment of the coast is required to offset coastal squeeze.

As a result the partner authorities have worked – and will continue to work – with landowners to achieve the targets set by Habitats Regulations. However, this will be based on the willingness of landowners to enter managed realignment schemes. At this time we have identified the most vulnerable locations around the coast as potential managed realignment projects.

A situation could arise in the future where it is not possible to create sufficient intertidal habitat within the existing arrangements. The Essex and South Suffolk SMP identifies this as a potential risk that needs to be addressed at a national level and through further engagement with landowners locally after finalisation of the SMP.

The Shoreline Management Plan in more detail

This section describes the draft plan in some more detail, using maps to illustrate what the shoreline would look like in the short, medium and long term. Please find all of the maps for the Management Units inserted at the back of the document.

Management Unit A: Stour and Orwell

The intention for the Stour and Orwell is to support and enhance the natural evolution of the estuaries, while continuing to defend all existing dwellings and infrastructure, and facilitating adaptation or limited local intervention where needed. For most of the shoreline, the current management approach will be continued: holding the current alignment where there are defences, and continuing a No Active Intervention approach for high ground frontages. For some of the frontages however a change of approach is required.

Currently defended areas

The expansions currently ongoing or under consideration for both Felixstowe and Harwich Port constitute Advance the Line policies.

The frontages where the existing defences will continue to be held at their current alignment include Ipswich, parts of the Ports of Felixstowe and Harwich, the Harwich railway line and River Stour valley, plus a number of smaller currently defended areas.

However, at Trimley Marsh, Loom Pit Lake and Shotley Marshes which are important recreational and conservation areas the flood defences are under pressure from erosion and tidal wave action. A landward realignment at some time within the timescale of the SMP will create a more sustainable situation by reducing the pressure on the flood defences and will support the estuary to move towards a more natural system. All dwellings and infrastructure will remain protected, which will require construction of new defences in a more sustainable, sheltered position. The realignments will come at the expense of Grade 3 and 4 agricultural land, and partly designated freshwater habitat, but they will create new intertidal habitats and the opportunity to replace and expand the area of current freshwater interest. Reedbed habitats could be generated at this site. Realignment will have some impact on the historic environment, particularly near Shotley where tracts of historic grazing marsh and associated archaeological features will require finding suitable replacement habitat and recording as part of implementation of the plan. The footpaths on top of the sea banks to be breached will need to be sustained, for example through re-routing. The impact of the potential

realignments on tourism and recreation is difficult to quantify, and realignments can have both positive and negative impacts. All these impacts will be taken into account during project appraisal and scheme development, which will be carried out with full stakeholder involvement before any works start. In addition outputs from the SMP will link up with the Stour and Orwell Estuary Management Plan and their Stakeholder Forum.

The realignment at Shotley Marshes west is proposed for epoch 1, and we are currently working with the landowner as part of our Regional Habitat Creation Programme. The realignments at Trimley Marsh, Loom Pit Lake and Shotley Marshes east are proposed for epoch 2.

There are three frontages for which the SMP's broad-scale economic analysis supports an intent to maintain or upgrade the standard of protection, including taking into account impacts of climate change. These are Felixstowe Port, Ipswich and Manningtree. For all the other defended frontages, detailed analysis beyond the SMP is needed to determine the appropriate standard of protection.

Currently undefended areas

The frontages where the current No Active Intervention approach will be continued include large sections along both the Stour and the Orwell, particularly in the middle estuaries.

However, there are locations along both estuaries where erosion is affecting significant features. This concerns Orwell Park, Wrabness Beach and various sections of the Stour and Orwell Walk and other footpaths. For these frontages the intent is not to start holding the existing alignment: it would not be sustainable to work against the natural estuary processes. However, local intervention to limit erosion risk to features is acceptable if the impact on natural estuary evolution is minimised. This will require a localised assessment outside the SMP. The SMP will label this intent as a form of Managed Realignment. Note that there is only limited information on erosion processes in the Stour and Orwell; the SMP's Action Plan will identify the need for monitoring.

There are a number of currently undefended areas in the Stour and Orwell where coastal change is starting to affect important features, and which need an integrated solution. This concerns:

- The Strand at Wherstead, where the frequency of closure due to flooding is likely to increase;

- Pin Mill, where the marina is at risk of erosion and there are a number of dwellings, including a Grade II listed building, just above the (current) floodzone;

- Shotley Gate, where the clifftop dwellings are at risk of cliff instability and possibly erosion.

The SMP's intent for these areas is to establish a process of co-operation between the partner organisations and all people and businesses with an interest in the area to develop a sustainable long-term solution, including funding opportunities. This solution may include limited local defences, but it is also likely to include adaptation or other measures. The SMP uses the label Managed Realignment for this intent.

Summary of Potential Policies

Draft policy	Now to 2025	2025 to 2055	2055 to 2105	What this means
PDZ A1 Felixstowe Port				
National SMP policy	Advance the Line	Hold the Line	Hold the Line	Continue protection of Felixstowe Port. The standard of protection will be maintained or upgraded.
PDZ A2 Trimley Marsh				
National SMP policy	Hold the Line	Managed Realignment	No Active Intervention	Managed realignment by breach of the existing defence while continuing flood defence to Felixstowe Port.
PDZ A3a Loom Pit Lake				
National SMP policy	Hold the Line	Managed Realignment	Hold the Line	The current line will be held in epoch 1. In epoch 2, Managed realignment by breach of the existing defence. No defence needed after that. The currently undefended section will remain undefended.
PDZ A3b Levington Creek				
National SMP policy	Hold the Line	Hold the Line	Hold the Line	The current line will be held throughout all epochs.
PDZ A4a Northern Orwell east				
National SMP policy	Managed Realignment	Managed Realignment	Managed Realignment	Local intervention to limit erosion risk to features is acceptable if the impact on natural estuary evolution is minimised.
PDZ A4b Northern Orwell west				
National SMP policy	No Active Intervention	No Active Intervention	No Active Intervention	No erosion expected, therefore no defences needed.
PDZ A5 Ipswich				
National SMP policy	Hold the Line	Hold the Line	Hold the Line	The current line will be held throughout all epochs. Ipswich will remain protected. The standard of protection will be maintained or upgraded.
PDZ A6 Wherstead				
National SMP policy	Managed Realignment	Managed Realignment	Managed Realignment	Integrated plan for adaptation to be determined through partnership approach; may include local defences.
PDZ A7a Southern Orwell west				
National SMP policy	No Active Intervention	No Active Intervention	No Active Intervention	No erosion expected, therefore no defences needed.

Draft policy	Now to 2025	2025 to 2055	2055 to 2105	What this means
PDZ A7b Southern Orwell east				
National SMP policy	Managed Realignment	Managed Realignment	Managed Realignment	Integrated plan for adaptation to be determined through partnership approach; may include local defences.
PDZ A8a Shotley Marshes west				
National SMP policy	Managed Realignment	Hold the Line	Hold the Line	Managed realignment by breach of the existing defence while continuing flood defence to all dwellings.
PDZ A8b Shotley Marshes east				
National SMP policy	Hold the Line	Managed Realignment	Hold the Line	Managed realignment by breach of the existing defence while continuing flood defence to the Marina and all dwellings and roads.
PDZ A8c Shotley Gate				
National SMP policy	Managed Realignment	Managed Realignment	Managed Realignment	Integrated plan for adaptation to be determined through partnership approach; may include local defences.
PDZ A9a,d,f Northern Stour – flood defence				
National SMP policy	Hold the Line	Hold the Line	Hold the Line	The current line will be held throughout all epochs.
PDZ A9b Northern Stour – not erosional				
National SMP policy	No Active Intervention	No Active Intervention	No Active Intervention	No erosion expected, therefore no defences needed.
PDZ A9c,e Northern Stour – erosional				
National SMP policy	Managed Realignment	Managed Realignment	Managed Realignment	Local intervention to limit erosion risk to features is acceptable if the impact on natural estuary evolution is minimised.
PDZ A10a,c,e Southern Stour – flood defence				
National SMP policy	Hold the Line	Hold the Line	Hold the Line	The current line will be held throughout all epochs. The standard of protection at Manningtree will be maintained or upgraded.
PDZ A10b,g Southern Stour – not erosional				
National SMP policy	No Active Intervention	No Active Intervention	No Active Intervention	No erosion expected, therefore no defences needed.

Draft policy	Now to 2025	2025 to 2055	2055 to 2105	What this means
PDZ A1Od,f Southern Stour – erosional				
National SMP policy	Managed Realignment	Managed Realignment	Managed Realignment	Local intervention to limit erosion risk to features is acceptable if the impact on natural estuary evolution is minimised.
PDZ A11a Harwich Harbour				
National SMP policy	Advance the Line	Hold the Line	Hold the Line	The port expansion currently under consideration for Bathside Bay constitutes Advance the Line. The new line will then be held throughout all epochs to continue protection of Harwich Port.
PDZ A11b Harwich town				
National SMP policy	Hold the Line	Hold the Line	Hold the Line	The current line will be held throughout all epochs.

Management Unit B: Hamford Water

The overall intention for Hamford Water is to sustain and support the viability of communities, tourism and commercial activities while creating new intertidal habitats and focusing flood risk management on frontages where it is most needed. The policy to achieve this intent is to maintain flood defence to the majority of the defended land, including all dwellings and key infrastructure at risk of flooding, combined with a gradual increase of natural processes by realigning defences that are under pressure.

The frontages where the existing flood defences will continue to be held at their current alignment are south Dovercourt, Oakley Creek and Titchmarsh Marina.

However, at Little Oakley, Horsey Island, Devereux Farm and Walton Channel the defences are under pressure and a landward realignment will create a more sustainable situation by reducing the pressure from the channels on the defences and moving towards a more natural estuary with increase of tidal prism and intertidal area. For Walton Channel, the realignment could have a socio-economic benefit because the increased flow could help to sustain the navigation channel. All dwellings and infrastructure will remain protected, which will require moving some of the defences to a more sustainable sheltered position, possibly in the form of counter walls. The realignments will come at the expense of some Grade 2, 3 and 4 agricultural land. They will also affect partly designated freshwater habitats on Horsey Island and at Walton Channel, but they will also create new intertidal habitats. They will have an impact on the historic environment, particularly the landscape and archaeology of Horsey Island, which will require finding suitable replacement habitat and recording as part of implementation of the plan. The footpaths on top of the sea banks to be breached, particularly at Little Oakley, will need to be sustained, for example through re-routing. The impact of the potential realignments on tourism and recreation is difficult to quantify, and realignments can have both negative and positive impacts. This impact will be taken into account during project appraisal and scheme development, which will be carried out with full stakeholder involvement before any works start.

The realignment at Devereux Farm is proposed for epoch 1. The realignment at Little Oakley is proposed for epoch 2; the realignments at Horsey Island and the Walton Channel are proposed for epoch 3.

Little Oakley is currently planned as a realignment site for habitat compensation for the Bathside Bay Project (Port of Harwich). The realignment that the SMP proposes for Little Oakley includes the Bathside Bay compensation plus additional area. This is illustrated in the Policy Maps found inside the back cover of this booklet. The realignment that the SMP proposes in Kirby-le-Soken to Coles Creek is the same that is currently being developed within the Regional Habitats Creation Programme for the Devereux Farm project.

For south Dovercourt and Walton Channel, the SMP's broad-scale economic analysis supports an intent to maintain or upgrade the standard of protection, including taking into account impacts of climate change. For all the other defended frontages, detailed analysis beyond the SMP is needed to determine the appropriate standard of protection.

The cliffs at the Naze are the only frontage in this Unit that presently has a No Active Intervention policy. The intent of management is to continue this approach as much as possible, to sustain the geological interest of the fresh cliff face and the supply of sediment along the shoreline. However, the intent is to protect the southern end of the cliffs in order to extend the life of the Naze Tower whilst sustaining and supporting the geological interest. This is in line with the 'Naze Coastal Protection Scheme – Crag Walk Project'. The scheme is being developed by the Naze Protection Society in partnership with Essex Wildlife Trust and Tendring District Council.

Summary of Potential Policies

Policy development zone	Now to 2025	2025 to 2055	2055 to 2105	What this means
B1 South Dovercourt				
National SMP policy	Hold the Line	Hold the Line	Hold the Line	The current line will be held throughout all epochs. The standard of protection will be maintained or upgraded.
B2 Little Oakley				
National SMP policy	Hold the Line	Managed Realignment	Hold the Line	Managed realignment by breach of the existing defence while continuing flood defence to the dwellings, communities, roads and infrastructure south of Dovercourt and to the sewage works. It is possible that the realignment would occur in epoch 1 as part of the Bathside Bay project.
B3 Oakley Creek to Kirby-le-Soken				
National SMP policy	Hold the Line	Hold the Line	Hold the Line	The current line will be held throughout all epochs.
B3a Horsey Island				
National SMP policy	Hold the Line	Hold the Line	Managed Realignment	Managed realignment by breach of the existing defence while continuing flood defence to the south-west half of the island.
B4a Kirby-le-Soken to Coles Creek				
National SMP policy	Managed Realignment	Hold the Line	Hold the Line	Managed realignment by breach of the existing defence while continuing flood defence to Kirby-le-Soken.
B4b Coles Creek to the Martello Tower				
National SMP policy	Hold the Line	Hold the Line	Hold the Line	The current line will be held throughout all epochs.
B5 Walton Channel				
National SMP policy	Hold the Line	Hold the Line	Managed Realignment	Managed realignment by breach of the existing defence while continuing flood defence to all dwellings, the sewage works and the caravan park. The standard of protection will be maintained or upgraded.
B6a Naze Cliffs north				
National SMP policy	No Active Intervention	No Active Intervention	No Active Intervention	The shoreline will be allowed to develop naturally.
B6b Naze Cliffs south				
National SMP policy	Managed Realignment	Managed Realignment	Managed Realignment	The erosion process will be slowed down and managed.

Management Unit C: Tendring Peninsula

The overall intention for the Tendring Peninsula is to sustain and support its viability of the seaside towns and their communities, tourism and commercial activities. This means a continuation of the current management approach: holding the current alignment where there are defences. Although the defences are under pressure, holding the line is necessary to sustain the seafront which is essential to the viability of Walton-on-the Naze, Frinton-on-Sea and Clacton-on-Sea as coastal towns and the Tendring frontage as a whole. Working with communities will be encouraged in the gradual move to more sustainable flood risk management for the low-lying parts of the frontage.

At Holland Haven the defences are under pressure: a landward realignment will create a more sustainable situation by reducing the pressure on defences and moving towards a more natural coastal frontage. All dwellings and infrastructure will remain protected, which will require moving some of the defences to a more sustainable sheltered position. This realignment will come at the expense of Holland Haven Country Park and Frinton-on-Sea Golf Course. The realignment will create new intertidal habitats and opportunities for new forms of tourism and recreation. It will have some impact on the historic environment, due largely to archaeological potential in the realignment area, which will need recording as part of implementation of the plan. The footpaths on top of and toward the sea bank to be breached will need to be sustained, for example through re-routing. The impact of the potential realignment on tourism and recreation is difficult to quantify, and realignments can have both negative and positive impacts. This impact will be taken into account during project appraisal and scheme development, which will be carried out with full stakeholder involvement before any works start.

The realignment of Holland Haven is proposed for epoch 3. The policies for Walton-on-the-Naze, Frinton-on-Sea, Holland Haven and Clacton-on-Sea will be developed in more detail when the Clacton and Holland Haven strategy begins in 2010.

At Jaywick, the situation is very complex and sensitive. The flood defences have recently been strengthened and protect the communities of Brooklands, Grasslands and Jaywick village, plus important tourist facilities (caravan parks and golf club). However, the sea bank is under significant pressure, and sustaining it in the medium and long term will require significant investment, particularly in the eastern half of the policy development zone. Clearly, any change in the shoreline management approach would only be possible in combination with significant adaptation for the people and businesses in the area. The SMP's intent of management for Jaywick is to support the process that Tendring District Council and Essex County Council are carrying out through the Local Development Framework to develop a sustainable long-term solution. In the short term, the intent is to hold the existing frontline defences where they are now. This period up to around 2025 is the minimum time needed to allow the land use adaptation that may be needed. In the medium and long term, the best option is likely to be a mixture of land use changes, flood defences and incident management.

For Holland Haven, the SMP's broad-scale economic analysis supports an intent to maintain or upgrade the standard of protection, including taking into account impacts of climate change. For all the other defended frontages, detailed analysis beyond the SMP is needed to determine the appropriate standard of protection.

Summary of Potential Policies

Policy Development Zone	Now to 2025	2025 to 2055	2055 to 2105	What this means
C1 Walton-on-the-Naze and Frinton-on-Sea				
National SMP policy	Hold the Line	Hold the Line	Hold the Line	The current line will be held throughout all epochs.
C2 Holland Haven				
National SMP policy	Hold the Line	Hold the Line	Managed Realignment	Managed realignment by breach of the existing defence while continuing flood defence to the dwellings, roads and pumping station. The standard of protection will be maintained or upgraded.
C3 Clacton-on-Sea				
National SMP policy	Hold the Line	Hold the Line	Hold the Line	The current line will be held throughout all epochs.
C4 Seawick, Jaywick and St Osyth Marsh				
National SMP policy	Hold the Line	Hold the Line	Managed Realignment	The current line will be held in epoch 1. After 2025 continued adaptation will be needed re-directing residential settlement away from the flood risk zone while ensuring continued use of the area for leisure, recreation and tourism. After 2055 ensuring continued use of the area for leisure, recreation and tourism where possible linked with the development of new intertidal areas.

Next steps

We will assess all feedback to the draft SMP and take it into account as the plan is finalised, working with representatives and elected members from all partner authorities. The final SMP will then be submitted to all partner authorities for formal ratification or adoption. From that point on, the SMP will be the basis for the management of the shoreline, and a source of information for all organisations and people with an interest in the shoreline.

The final SMP will contain an Action Plan. This sets out what the Environment Agency, local authorities and all other partner organisations need to do to implement the plan. The actions will cover the development of flood and erosion defence strategies and schemes, typically led by the Environment Agency or coastal local authorities. But it will also include actions by local authorities, for example to incorporate the plan into the land-use planning system or to support adaptation of affected communities, businesses and organisations. There will also be an action for English Heritage and Natural England to advise and support the mitigation of historic and natural features where they affect shoreline management. There is a range of existing partnerships, such as for the management of the estuaries and coastal areas and for the National Association for Areas of Outstanding Natural Beauty (NAAONB), which will also have an important role in the implementation of the SMP and its Action Plan.

The Action Plan will be set up for use as a 'living' document, to enable management of the actions in the period up to the next SMP review, which is expected in five to 10 years' time.

Typical actions that we expect to include in the Action Plan are as follows:

- Next steps for implementation of short-term policies (especially where different from current policy): any further studies needed to confirm the policy; interaction with land-use planning; scheme development; working with landowners and other stakeholders.
- Specific need for study of refuse-filled walls or other contamination issues to determine feasibility of realignment.
- Monitoring and study to improve knowledge of estuary and coastal development to inform the next SMP policy development. This includes the development of intertidal habitats (quantity and quality).
- Actions with involvement from the planning authorities to prepare land-use adaptation needed as a result of proposed medium and long-term policies.
- The SMP identifies the need for a national approach to caravan parks behind coastal and estuary defences. The Action Plan needs to identify the steps needed to achieve this.
- The next SMP to review the plan in light of new knowledge and possibly new priorities.

Glossary

Adaptation
A change in the way that a feature, such as a community or a habitat, functions to fit a changed environment.

Advance the Line
Building new defences seaward of the existing defence line. This policy should be limited to those stretches of coastline where significant land reclamation is considered.

Area of Outstanding Natural Beauty (AONB)
A precious landscape whose distinctive character and natural beauty are so outstanding that it is in the nation's interest to safeguard it. AONBs were created by the legislation of the National Parks and Access to the Countryside Act of 1949.

Climate change
Long-term change in the patterns of average weather. Its relevance to shoreline management concerns its effect on sea levels, current patterns and storminess.

Coastal squeeze
The reduction in habitat area that can arise if the natural landward migration of a habitat (due to sea level rise) is prevented by the fixing of the high water mark, for example a sea wall.

Department for Food, Environment and Rural Affairs (Defra)
Government department responsible for flood management policy in England and Wales.

Epoch
This refers to a period of time. In the SMPs three epochs are defined – 0 to 20, 20 to 50 and 50 to 100 years from the present.

Erosion
The loss of land due to the effects of waves and, in the case of coastal cliffs, slope processes (such as high groundwater levels). This may include cliff instability, where coastal processes result in landslides or rock falls.

EU Habitats Directive
European legislation on the conservation of habitats.

Foreshore
Zone between the high water and low water marks.

Geomorphology/Morphology
The branch of physical geography/geology that deals with the form of the Earth, the general configuration of its surface, the distribution of the land, water, etc.

Heritage asset
A building, monument, site or landscape of historic, archaeological, architectural or artistic interest whether designated or not. Designated assets may be World Heritage Sites, Scheduled Monuments, Listed Buildings, Protected Wreck Sites, Registered Parks or Gardens, Registered Battlefields and Conservation Areas.

Historic Environment
All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and deliberately planted or managed flora.

Hold the Line
Hold the existing defence line by maintaining or changing the standard of protection. This policy should cover those situations where work or operations are carried out in front of the existing defences (such as beach recharge, rebuilding the toe of a structure, building offshore breakwaters and so on) to improve or maintain the standard of protection provided by the existing defence line. Included in this policy should be other policies that involve operations to the back of existing defences (such as building secondary floodwalls) where they form an essential part of maintaining the current coastal defence system.

Hydrodynamic
The study of liquids in motion. In the context of the SMP: caused by water in motion.

Indicators
Used to support the appraisal of policies against criteria.

Integrated
An approach that tries to take all issues and interests into account. In taking this approach, managing one issue adds value to the way another is dealt with.

Listed building
A building or other structure officially designated as being of special architectural, historical or cultural significance.

Local Development Framework
A collection of local development documents that outlines how a local authority will manage planning in their area.

Longshore
Current moving parallel and close to the coastline.

Managed Realignment
Allowing or enabling the shoreline to move, with associated management to control or limit the effect on land use and environment. This can take various forms, depending on the nature of the shoreline and the intent of management to be achieved.

Mitigation
Practical measures taken to offset the impact of a policy on physical assets. The term mitigation has a specific meaning for particular types of physical asset:

Depending on wildlife, mitigation may be any process or activity designed to avoid, reduce or remedy adverse environmental impacts of the plan.

Depending on the historic environment, mitigation may be 'preservation by investigation' for archaeological features, or 'preservation by recording' followed by stage abandonment, demolition or re-location for listed buildings. There is no effective mitigation for the loss of historic landscapes.

Mudflat
Low-lying muddy land that is covered at high tide and exposed at low tide.

Natural processes
Those processes over which people have no significant control (such as wind and waves).

No Active Intervention
No investment in coastal defences or operations. It can apply to unprotected cliff frontages and to areas where investment cannot be justified, potentially resulting in natural or unmanaged realignment of the shoreline.

Glossary

Policy
In this context, policy refers to the generic shoreline management options (No Active Intervention, Hold the Line, Managed Realignment and Advance the (existing) Line of Defence).

Policy Development Zone (PDZ)
A length of coastline defined to assess all issues and interactions to examine and develop management scenarios. These zones are only used to develop policy.

Principle
High-level statement agreed by partner authorities and used to develop the SMP.

Shoreline Management Plan (SMP)
A non-statutory plan that provides a large-scale assessment of the risks associated with coastal processes and presents a policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner over a 100-year time period.

Standard of Protection (SoP)
The level of protection that a flood or erosion defence provides. This is typically expressed as the frequency of the storm that the defence is expected to withstand. For example, a defence can have a standard of protection of 1 per cent per year. This means that it is expected to withstand a storm that has a 1 per cent probability of being exceeded in any given year. This is sometimes also referred to as the '1 in 100 year return period'.

Sustain
To undertake works to ensure that defences will be provided offering a similar standard of protection to that currently offered.

Tidal prism
The volume of water within an estuary between the level of high and low tide, typically taken for mean spring tides.

Tide
Periodic rising and falling of large bodies of water resulting from the gravitational attraction of the moon and sun acting on the rotating earth.

With Present Management
Policy scenario in which the present management of the whole shoreline is continued for the coming 100 years. Used in early stages of SMP development alongside a No Active Intervention scenario to analyse the role of shoreline management.

Libraries in Essex and South Suffolk

Bishops Park Library
Jaywick Lane
Clacton-on-Sea
CO16 8BE

Brightlingsea Library
New Street
Brightlingsea
Colchester
C07 0BZ

Burnham-on-Crouch Library
103 Station Road
Burnham-on-Crouch
CM0 8HQ

Clacton Library
Station Road (opposite the Town Hall)
Clacton-on-Sea
CO15 1SF

Chelmsford Library
Market Road
Chelmsford
CM1 1LH

Felixstowe Library
Crescent Road
Felixstowe
IP11 7BY

Frinton Library
59 Old Road
Frinton-on-Sea
CO13 9DA

Great Wakering Library
16 High Street
Great Wakering
Southend-on-Sea
SS3 0EQ

Harwich Library
Upper Kingsway
Dovercourt
Harwich
CO12 3JT

Hockley Library
Southend Road
Hockley
SS5 4PZ

Holland Library
Public Hall Frinton Road
Holland-on-Sea
Clacton-on-Sea
CO15 5UR

Hullbridge Library
Ferry Road
Hullbridge
Hockley
SS5 6ET

Maldon Library
Carmelite House
White Horse Lane
Maldon
CM9 5FW

Manningtree Library
High Street
Manningtree
CO11 1AD

Rayleigh Library
132/4 High Street
Rayleigh
SS6 7BX

Rochford Library
8 Roche Close
Rochford
Essex
SS4 1PX

Southend Central Library
Victoria Avenue
Southend-on-Sea
Essex SS2 6EX

Walton Library
52 High Street
Walton-on-the-Naze
CO14 8AE

West Mersea Library
13 High Street
West Mersea
Colchester
CO5 8QA

Wivenhoe Library
104/6 High Street
Wivenhoe
CO7 9AB

Environment Agency and Council addresses

Babergh District Council
Corks Lane
Hadleigh
Ipswich
IP7 6SJ

Chelmsford Borough Council
Civic Centre
Duke Street
Chelmsford
CM1 1JE

Colchester Borough Council
Rowan House
33 Sheepen Road
Colchester
CO3 3WG

Environment Agency
Brook End Road
Chelmsford
CM2 6NZ

Environment Agency
Iceni House
Cobham Road
Ipswich
IP3 9JD

Environment Agency
Rivers House
Threshelfords Business Park
Inworth Road
Feering, Colchester
CO5 9SE

Ipswich Borough Council
Grafton House
15-17 Russell Road
Ipswich
IP1 2DE

Maldon District Council
Princes Road
Maldon
CM9 5DL

Rochford District Council
South Street
Rochford
SS4 1BW

Southend-on-Sea Borough Council
Civic Centre
Victoria Avenue
Southend-on-Sea
SS2 6ER

Suffolk Coastal District Council
Melton Hill
Woodbridge
IP12 1AU

Suffolk County Council
Endeavour House
8 Russell Road
Ipswich
IP1 2BX

Tendring District Council
Thorpe Road
Weeley
Clacton-on-Sea
CO16 9AJ

Tendring District Council
Town Hall
Station Road
Clacton-on-Sea
CO15 1SE

GEAN0110BRED-E-P

Clacton and Holland Flood and Coastal Erosion Risk Management Plan

Draft Strategy

Report – R0012/IMAN002009/9V3831

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Published by:

Environment Agency
Horizon house, Deanery Road
Bristol BS1 5AH
Tel: 0117 934 4000
Email: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

Further copies of this report are available from our publications catalogue: http://publications.environment-agency.gov.uk or our National Customer Contact Centre: T: 08708 506506

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Document title	Clacton and Holland Flood and Coastal Erosion Risk Management Plan Assessment of Strategic Options
Document short title	
Status	Version 1
Date	August 2011
Project name	
Project number	IMAN002009/9V3831
Client	Environment Agency
Reference	IMAN002009/9V3831/R0012/303915/PBor

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1 INTRODUCTION

1.1 Background

In 2000 Royal Haskoning were commissioned to develop a Coastal Strategy[1] for the Tendring District Council (TDC) managed Clacton town frontage. The Strategy identified the problem along the frontage as being the long-term falling beach levels, which puts pressure on the ageing defences. A failure of the defences at Clacton would put significant properties, businesses, infrastructure and people at risk from erosion of the soft cliffs. In 2004 the Strategy was updated[1] to reflect changes in the Environment Agency appraisal process. It did not score highly enough in the National Priority Scoring system and was subsequently not formally approved.

Since 2004 the problems at Clacton-on-Sea have continued and the defences have deteriorated further. In 2007 a short stretch of the defences failed, necessitating emergency works. Additional sections have also required urgent works as they have deteriorated beyond an acceptable level of risk of failure. Subsequent to the money being spent on this 'Patch and Repair' approach, the Environment Agency's National Review Group (NRG) decided that a new Strategy should be developed to address the on-going problems along the frontage in a more planned manner. Royal Haskoning were commissioned to develop this updated Plan.

The objectives guiding the development of the study and Plan were established during the initial stage of the project:

a) To assess the best cost effective solution for managing flood and coastal erosion risk on the Clacton/Holland-on-Sea frontage;
b) To optimise the standard of protection that can be justified throughout the appraisal period;
c) To comply with the Water Framework Directive;
d) To provide a procurement strategy for the future programme of works;
e) To develop a monitoring regime and an implementation plan for intervention and maintenance;
f) To engage with local communities and other key stakeholders throughout Study/Strategy development ensuring the use of 'Building Trust with Communities' to shape the preferred strategic options;
g) The study will consider appropriate appraisal periods commensurate with the needs of the frontage aligned with the draft SMP2;
h) To ensure the Study/Strategy does not have a detrimental impact on the management of adjacent frontages;
i) To consider and provide mitigation for any environmental impacts of the Study/Strategy, and identify opportunities for environmental enhancement; and
j) To consider and mitigate impacts of climate change, or provide measures for adaptation to climate change.

These objectives have been developed further as the study has progressed to provide the objectives directing the outcome of the recommended Plan (Section 4.1).

Where appropriate, the study has built upon, and includes work undertaken in, the 2004 Strategy. This has been re-assessed to take account of changes that have occurred since 2004.

To date, in the development of the Plan, a Baseline Processes and Defence Inspection[2] report has been produced. The defence inspection redefined the residual life of the defences and this is recorded in the corresponding Appendices[2]. In addition a Scoping Report has been undertaken as part of the Strategic Environmental Assessment[3] (SEA). These documents set the baseline for examining the issues and problems faced in developing an appropriate way forward.

1.2 Purpose of Report

This report re-examines the problem, sets the objectives to be met by the Plan, and provides an appraisal of options for management of the Clacton and Holland frontage based on addressing these objectives. The report follows the structure set out in the FCERM-Appraisal Guidance[4]. The aim of the Management Plan is to develop a realistic, long term sustainable strategy for managing the Clacton frontage. In being realistic, consideration is given to how any outcome of the Plan could be funded.

1.3 Layout of Report

Section 2 of the report provides an overall description of the frontage drawing upon information and guidance provided by the Shoreline Management Plan[5], recognising also the intent of management defined for adjacent sections of the coast. This section also provides the broader scale context within which the Plan is developed and highlights constraints such as the potential impact on adjacent frontages and the natural environment, the use and aspirations for the Clacton area as well as issues associated with funding.

Developing from this, Section 3 discusses and describes the problem at Clacton. This is based on an examination of the 'Do Nothing' Scenario, considering also, in relation to this, the sustainability of the current management approach both technically and in terms of fundability. In developing the definition of the problem it is recognised that the issues with respect to the frontage are complex. This is discussed within this Section in terms of the overall approaches that could be developed, highlighting further the specific problems in addressing the needs of the area.

Sections 2 and 3 form the baseline for development of the Plan Objectives. The Plan Objectives are discussed and defined in Section 4. The objectives take account of, and are in line with, the criteria set out in the SEA. These objectives provide the basis for development of the overall approach to management and consideration of options. Whilst it is essential that the Plan provides a coherent approach to management of the whole frontage, it is also recognised that different sections of the frontage have different issues in terms of management. This is both in terms of timescale, or immediacy of the problem, and in terms of the different characteristics with respect to land use and longer term risk or impact on the area. Objectives are, therefore, set with respect to the whole area and in relation to the specific needs of each zone identified within the frontage.

Section 5 discusses a long list of options, considering technical approaches that might be used in maintaining defence to the area, in addition to considering how these approaches might then be applied in relation to the overall approaches to management

in meeting the objectives. This long list has been assessed and refined to provide a short list of options for more detailed appraisal.

Section 6 develops upon this short list of options. In line with the FCERM-Appraisal Guidance[4], this short list is developed as part of the appraisal process, considering how the approach to management may be taken forward in the short term and how this may need to be adapted in the future. The final short list is appraised setting out a preferred approach over the duration of the Plan (Section 8). The study highlights important issues that will need to be addressed in delivering such an approach and identifies, as part of the Plan, aspects that need to be taken forward alongside short term management of the area.

The recommendations of the study are drawn together in the Section 8, with the overall conclusions and recommendations being presented in Section 9.

2 DESCRIPTION OF THE AREA

2.1 Description

2.1.1 Study Frontage Boundaries

The study frontage is defined as the specific area of Clacton and Holland-on-Sea (Figure 2.2). The area starts in the south at the beginning of the Tendring District Council cliff protection defences (the beginning of the cliff line itself). This is the location of the end of the Environment Agency major flood defence system, marked by the Martello Tower breakwater. This system extends to the southwest in front of the low lying Jaywick frontage. The present study area extends northeast through to Holland Haven. The northeast boundary is defined as the Port of London Authority communications tower.

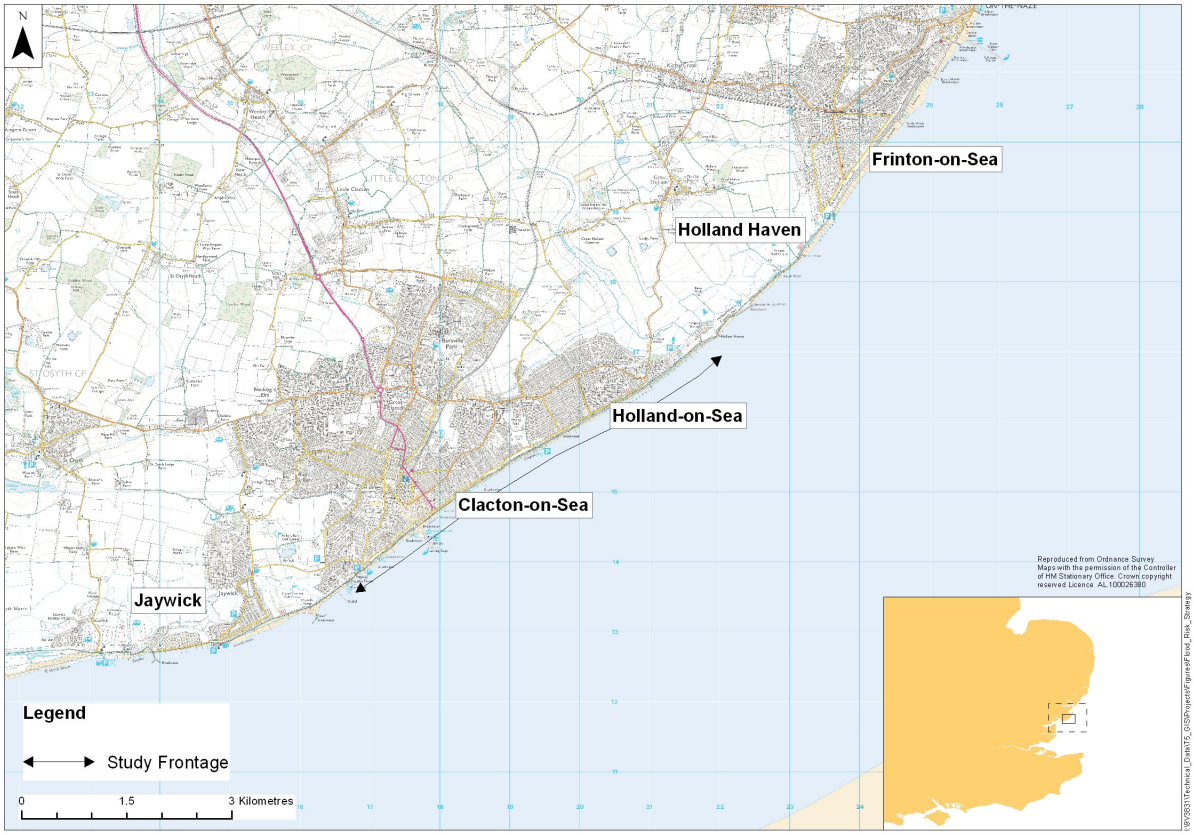


Figure 2-1: Location plan of Clacton

2.1.2 General Area

The Clacton and Holland on Sea frontage is situated towards the centre of the open southeast facing shoreline of the Tendring Peninsula, facing out towards the outer Thames Estuary. The main town is located on high ground formed of London Clay, which runs back within the hinterland and forms the backbone of the peninsula (Figure 2-1).

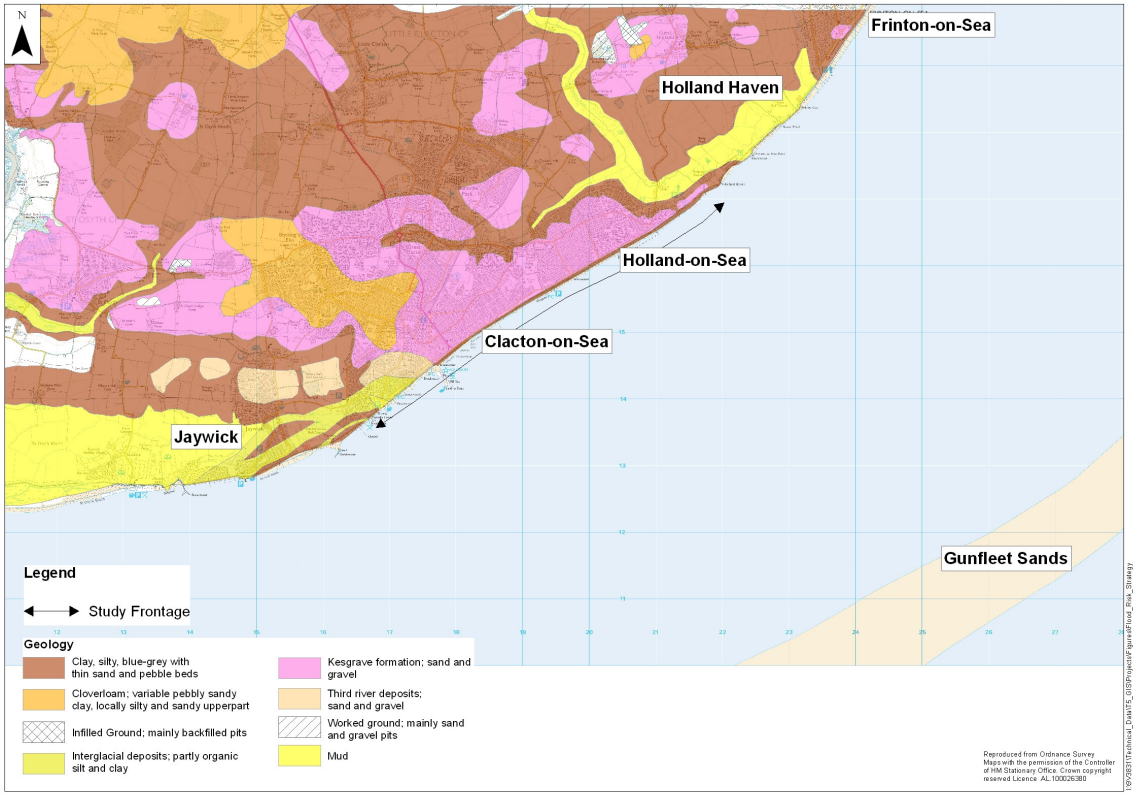


Figure 2-2: Geological map of Clacton and surrounding areas

The coastal slope, immediately behind the shoreline, is made up of sands and gravels, and is protected by a series of various defences which have been constructed, repaired, reinforced and replaced over the last century. The frontage is divided into two distinct areas of Clacton and Holland-on-Sea; although over time urban development of these two communities has merged resulting in development now being continuous along the whole sea front.

To the south of the project area (the Clacton headland), the coastline falls away steeply down to the large low lying expanse of Jaywick and St Osyth marshes. Much of the coastal strip to this area is developed, with the villages of Jaywick and Seawick sitting behind the sea defences that protect the area. The majority of the hinterland is agricultural, with isolated farms. The shoreline continues through to Lee-Over-Sands and the Colne Estuary. This estuary runs inland past Brightlingsea and up to Colchester.

To the north of the project area, the high ground continues through to Frinton and Walton, the other two main seaside towns along the Tendring Peninsula coastline. Between Holland-on-Sea, at the northern end of Clacton-on-Sea, and Frinton there is, however, an extensive area of low lying land, forming the old estuary of the Holland Brook. This is known as Holland Haven and is protected by Environment Agency maintained flood defences.

Beyond Walton, behind the high ground of the Naze is Hamford Water. Hamford Water is an embayment with a largely estuarine setting, but with open coast at its mouth. As such, the area is predominantly made up of intertidal flats and saltmarsh, with coastal defences protecting the hinterland from flooding.

Although nominally orientated along a northeast/southwest axis, the frontage forms a curve with the Clacton area forming the main forward section of high ground, effectively acting as a broad headland.

The developed nature of this frontage means that the majority of the study area has less natural habitat interest than other parts of the Essex coastline; however the areas immediately adjacent to the main urban area of Clacton do have significantly more habitat value. The main designations within the immediate study area are two geological Sites of Special Scientific Interest (SSSI) (Clacton Cliffs and Foreshore and Holland-on-Sea Cliffs SSSI's), and Picker's Ditch Meadow Local Nature Reserve (LNR) further inland. Immediately adjacent to the study area is the Holland Haven Marshes SSSI and LNR.

More distant sites of significant interest include the Essex Estuaries Special Area of Conservation (SAC), Colne Estuary Ramsar/Special Protection Area (SPA)/SSSI/National Nature Reserve (NNR) and Hamford Water Ramsar/SPA, as well as the Outer Thames Estuary SPA. More detailed information on all of these sites is given in the SEA Scoping Report, and those sites designated at the European or international level will also be addressed within a Habitats Regulations Assessment (HRA). The SEA and HRA processes aim to ensure that the proposed plan approach does not have a negative effect on such sites.

Clacton-on-Sea is the largest town on the Tendring Peninsula located between the coastal towns of Jaywick to the west, Holland-on-Sea to the east and inland Great Clacton to the north. Clacton-on-Sea is the main town providing essential services to the hinterland of the Tendring Peninsula. Clacton-on-Sea Town Centre contains the largest primary shopping area within the District, and recreational activities are popular along the foreshore as well as in the hinterland. Amongst the shopping and other recreational facilities, however, the town is largely residential. It is also a key seaside resort and an important tourism centre on the Essex coastline. Tourism is worth more than £276 million per year to Tendring[6] and the main tourism facilities / attractions in the town are the beaches, pier, seafront gardens, historic interests such as the listed buildings, amusement arcades, hotels, guest houses, sailing facilities and out-lying caravan and chalet parks.

Despite Clacton being an important employment centre, the wider district of Tendring is one of most deprived areas in the country, being the fifth most deprived area in the East of England and the most deprived area in Essex, with significant pockets of deprivation in Jaywick. Tendring is ranked in the top ten local authority districts nationally for people aged 65 years and over[7,8], and has above national and regional averages of poor health indicators, above regional averages of unemployment, and below national and regional average of people that are of working age (16-64).

The main road into Clacton is the A133. Roads also branch out to the north and south to the rear of Clacton, to Frinton and Walton and to Jaywick and Seawick. However, the main coastal road linking all these settlements runs along the Clacton sea front immediately at the crest of the coastal slope. The main railway line runs down the centre of the Tendring Peninsula, into the core of Clacton.

2.1.3 Study Frontage Description

A Map showing the key features along the study frontage is shown in Figure 2.3. The southern part of the study area has seen significant development over the last two decades, providing important new sea front properties behind the Martello Tower Breakwater. The area is important for water sport use, being a key attribute of the area highlighted in the Celebrate-on Sea study[9] for future re-generation. As the name of the breakwater suggests, the area also contains one of the two Martello Towers which exist in Clacton which reflect Clacton's essential maritime heritage. The main RNLI station is also situated within this area.

The coast road (Marine Parade West), which runs south of here in land through to Jaywick, climbs from the low lying southern area up towards the centre of Clacton. The road runs close to the crest of the coastal slope, with a narrow width of open grass area, integral with the classic gardens designed into the coastal slope. Kings Promenade exists to the bottom of the slope and gives on to relatively wide areas of sandy beach, which have benefited in part from the Environment Agency beach renourishment and defence system to the south. The section between the Martello Tower and the Pier now contains the only remaining significant area of exposed beach along the whole sea front and is the main recreational beach for the town.

Key Features

N

Port of London Authority tower

Anglian Water Pumping Station

The Gap

Clacton Sailing Club

Beach huts

The Esplanade

Kings Parade

Defences failled here in 2007

Residential Clacton

Gunfleet Sailing Club

Communal grassed area

Cafe

Pier

Clacton Town

Water sports area
Main recreational beach

RNLI

Clacton Resort

Martello Tower

Coastal gardens

Martello Tower/ Coastguard Station

Main regional hospital

0 0.25 0.5 1 Kilometers

Legend

Study Extent

ROYAL HASKONING

Clacton and Holland Flood Coastal Erosion Risk Management Plan
Environment Agency
1:20,000
September 2011
Figure 2.3

To the back of the road, the coastal strip is occupied by residential properties and hotels, the main regional hospital and second of the Martello Towers, which had been converted to the coastguard centre. This area leads into the main centre of the Clacton sea front, with the main commercial, shopping and tourism centre of the town extending back from the Pier Gap. This section, from the southwest study boundary up to the Pier, is the core of Clacton, herewith called "Clacton Resort". The Pier itself, built in 1871, extends some 380m out to sea. The Pier has undergone a number of renovations since its construction, evolving and improving its status as a key tourist attraction for the frontage. It is tied into the town via Pier Gap, the start of a road which extends back into the main town centre. The numerous arcades and amusements which are located on the Pier itself also spill out onto the mainland, immediately at the entrance of the Pier, linking this important asset into the heart of the town.

Northeast of the Pier is the centre of the study frontage, herewith called "Clacton Town". Here, the nature of the coast differs markedly from the relative tourist "honey pot" to the southwest. The cliffs increase in height and steepness, and access to the promenade, which continues along the frontage, is by a number of steep paths. At the top of the cliffs the coast and the town continue to be separated by the main coastal road (called Marine Parade East at this location).

The relative abundance of sand which characterises the beach to the south of the Pier is not present to the north, and the coast is intertidal along much of its length, with very low beach levels. The base of the promenade is protected by concrete "Wave Walker" units, constructed in 1995. Access to the narrow beach is limited to low tide and is by steps at regular intervals between the coastal defences.

Moving further northeast, the coast is interrupted by a rock groyne and a small instep in the defence line. A café is located here, taking advantage of the wider promenade as well an access ramp up to Marine Parade East. Car parking space is also available at the top of the cliff at this location.

From the café, the cliff top is slightly further inland, decreasing the slope of the cliff down to

the promenade and beach. Access from the town to the promenade starts to improve here, with more pathways parallel and oblique to the coastline. The Wave Walker coastal defences continue to front the narrow beach, until where the coastal road starts to move inland creating a wider grassy area at the top of the cliff line.

Where this communal grassed area exists, further inland there is a change in predominance of shops and arcades to hotels and office buildings, marking the transition to residential housing and the start of Holland-on-Sea. The coastal defences are slightly set back from the general alignment here and change from Wave Walker units to concrete stepwork constructed in the 1960s and dilapidated timber and concrete groynes.

Along the promenade, at the boundary between Clacton-on-Sea and Holland-on-Sea, is the Gunfleet Sailing Club, first established in 1951. Beach huts also start to increase in number along the promenade from here. Coastal defence types change with increasing regularity along this part of the frontage. This section from the Gunfleet Sailing Club to the northeast boundary of the study area is subsequently herewith called “Residential Clacton”. Along many sections, rock has been placed at the toe of the defences, or a full rock revetment is in place, to mitigate against the very low beach levels.

Some sections of the beach have been closed off entirely to public access. This central part of Residential Clacton is the location of the more recent emergency and urgent works. At the intersect with Queensway Road at the top of the cliff, the defences actually failed in 2007, resulting in the promenade washing out.

At the cliff top, the coastal road (Kings Parade at this location) moves seaward, again directly separating the coast from the properties inland of the road, narrowing the distance between properties and the defences. Underneath the road along the Holland-on-Sea section is an Anglian Water intercept sewer and a water mains pipeline.

The cliff is encased in concrete in some sections and the beach huts take up the limited space between the cliff and the sea.

As one moves further northeast, at the point where the coastal road moves inland, there is a slight change in coastline orientation. This orientation change also marks a general increase in beach width, and increasingly homogenous coastal defence types. From an aerial view this orientation change can be seen as one of the two headlands along the frontage. The cliffs start to decrease in height and access along the cliff top is via a small road (The Esplanade), with only limited access to the promenade. At the end of the Esplanade are the Clacton Sailing Club and a low point in land elevation. If there were no defences, the road, 'The Gap', is the main potential flood route to the rear of the town.

The number of properties immediately to the back of the cliff dwindles where the main coastal road moves inland, and there is a large open area behind the promenade, which leads to the Port of London Authority tower, the Gunfleet Boating Club and the north easterly extent of the study frontage. The Anglian Water intercept sewer, located beneath the road at Residential Clacton, leads to the sewage pumping station which is at this end of the frontage.

2.2 Strategic Policy

2.2.1 Risk Management

The study area is covered by the Essex and South Suffolk Shoreline Management Plan 2 (SMP2)[5]. This SMP2 covers the whole coastal area between Landguard Point (Felixstowe) and Two Tree Island (Southend) and provides the high level approach to flood and erosion risk management. In addition, to the south of the study area various works have been undertaken to reduce flood risk to the area. The SMP2, and other reports relating to the study area and adjacent frontages, are discussed below to provide the context in which this Management Plan is being undertaken.

<u>Essex and South Suffolk Shoreline Management Plan 2 (SMP2)</u>

The Essex and South Suffolk SMP2 has, during the development of this Management Plan, been adopted by all partner organisations following public consultation. In covering a large spatial scale, the SMP2 defines and subdivides the wider area into smaller units, called Management Units. The Tendring Peninsula falls within Management Unit C in the Essex and South Suffolk SMP2. This is further subdivided into Policy Development

Zones (PDZ'Ss). Clacton and Holland-on-Sea fall within PDZ'S C3. The SMP2 then performs the function of identifying the wide ranging factors and interests pertaining to coastal management in each area (always considering the wider SMP2 spatial-scale). The process has involved consideration of all of these factors to develop a long term policy of future management for the study area. A policy statement has subsequently been developed, which captures all of the specific considerations and uses them to translate into the long term management intent for that area. The conclusion of the policy statement has then been summarised as a defined policy, which could range from 'Hold the Line', through to 'No Active Intervention', for any of the PDZ'Ss. Table 2-1 provides the definition of this range of policies.

Table 2-1: SMP2 Policy Definitions

Name	Description
Hold the Line	Maintain the defence where it is now.
Advance the Line	Build new defences seaward of the existing defence line.
Managed Realignment	Allow the shoreline to move seaward or landward, with management to control or limit the effect on land use and environment. This can take various forms, depending on how the area is to be managed. All realignments are characterised managing change, both technically (by breaching and building defences) and also for land use and environment (by helping or ensuring adaptation).
No Active Intervention	No intervention is undertaken to maintain the defence line.

Extracts from the policy statements for the study area (PDZ C3) is provided in Text Box 1.

The overall intent of management for Tendring is to sustain and support the viability of the seaside towns and their communities, tourism and commercial activities. This means a continuation of the current management approach: holding the current alignment where there are defences. Although the defences are under pressure, holding the line is necessary to sustain the seafront which is essential to the viability of Walton-on-the Naze and Frinton-on-Sea (C1) and Clacton-on-Sea (C3) as coastal towns and the Tendring frontage as a whole. Working with communities will be encouraged to move gradually to more sustainable flood risk management for the low-lying parts of the frontage. It should be noted that beach erosion is likely to remain an issue due to a shortage of sediment supply

Text Box 1: SMP2 Policy Statement extract: PDZ'S C3

The Hold the Line approach and the wider reaching intent of providing support to the "viability of the seaside towns and their communities, tourism and commercial activities" is taken forward as the preferred high level approach in this Management Plan.

Seawick, Jaywick and St Osyth Marsh – PDZ C4

The frontage comprises a large defence system covering some 3.5km of coastline from West Clacton through to Cocketwick, providing defence to an extensive area of

residential properties, holiday parks and agricultural land. The earliest defences, in the form of sea walls, were breached in 1953 causing loss of life and extensive flooding to the area behind. The walls were improved following this disaster but, by the 1980s, there was continued loss of the beach with erosion of the underlying clay, threatening failure of the defences. Over much of the frontage, the sheet piled toe was exposed; in areas, low foreshore levels exposed 2m of sheet piled toe. Regular overtopping, lack of security against flooding and loss of beach amenity had resulted in significant social deprivation and deterioration in housing quality.

During the 1980s four fishtail groynes were constructed, with beach recharge, at a cost of £10M (PV_{2005} cost £24m). Due to redistribution of sediment and general loss of overall sediment volume, local areas of sea wall were exposed. Further recharge was undertaken in 1995. This also prompted modelling studies and development of a beach management plan. This recommended further beach recharge, two additional structures (in Bays 2 and 3) and extension of the most westerly structure, the Martello Tower Breakwater. Modelling demonstrated that this would be effective in retaining sediment. The cost of all works, undertaken in 1999, was initially estimated at £9.4m, with an outcome cost of £7.5m (PV_{2005} cost £9m). The general standard of defence has been maintained at a 1:200 level. There are over 2500 residential properties and some 49 commercial properties at risk, in addition to 500 mobile homes and 107 ha of golf course. More recent works have been carried out, undertaken to address local beach lowering within Bay 3, at a cost of £9m. These works are considered to have completed the need for major investment in the frontage. However, as identified: first in SMP1 and subsequently in SMP2, there is concern over the long term sustainability of flood defence management to the frontage. Text Box 2 provides an extract from the policy statement for PDZ C4.

Text Box 2: SMP2 Policy Statement extract for PDZ C4

At Jaywick, the situation is very complex. The flood defences have recently been strengthened to protect the communities of Brooklands, Grasslands and Jaywick village, plus important tourist facilities (e.g. caravan parks).

However, the sea defence is under considerable pressure, and sustaining it in the medium and long term would require significant investment, particularly in the eastern half of the PDZ'S. Clearly, any change in shoreline management approach would only be possible in combination with significant adaptation for the people and businesses in the area. The SMP's intent for Jaywick is to support the process that Tendring District Council and Essex County Council are carrying out through the Local Development Framework to develop a sustainable long-term solution for the area. The period up to around 2025 is the minimum time needed to allow land use adaptation that may be required. In the short and medium term, the intent is to hold the existing frontline defences where they are now. After 2055 the intent is less fixed and depends on further work through the Local Development Framework in the coming years, and therefore the SMP proposes a dual policy of Managed realignment or Hold the line. Any change in management after 2055 will not take place without the implementation of appropriate adaptation measures and all management will reflect the need to defend residential settlements, while also reflecting the extent of land use changes that may have taken place. Any policy implemented, either Managed realignment or Hold the line, will ensure continued appropriate flood defence for the communities and associated socio economic features at Jaywick and will also ensure continued use of the area for leisure, recreation and tourism.

The ongoing planning process specifically concerns Jaywick, which is only part of PDZ'S C4. However, the whole of the PDZ'S needs an integrated shoreline management approach, which means that the outcome for the rest of the PDZ'S (Seawick, Leewick and the agricultural land around it) partly depends on the decision for Jaywick as described in the previous paragraph

As a result of these complexities, the most recent works were appraised solely over a period of 35 years.

In relation to this Management Plan, it is assumed that defence to this area would be continued for at least the next 50 years (SMP2 policy). As such, the Plan for the Clacton area has to ensure that any strategic approach to management of the Clacton frontage has to be compatible with this aim for the frontage to the southwest. It is further understood, that the longer term management of the Jaywick frontage is by no means certain and that management of the important interface between the two areas should neither depend upon future defence to the southwest, nor compromise the opportunity to do so.

Holland Haven PDZ C2

Concurrent with the commencement of the development of this Management Plan, a High level Assessment[10] of the Holland Haven flood defences to the north east was undertaken by Royal Haskoning. This assessment looked at the condition of the Environment Agency maintained defences as well as the risk of coastal and fluvial flooding to the low lying land immediately behind them. The assessment concluded that the defences in the area are in a better condition than was previously estimated (2001) and that there are no immediate causes for concern about their overall maintenance. However, in looking at the processes occurring along this section of the frontage, and their relation with the problem of falling beach levels, the assessment also concluded with some long-term recommendations which have a significant impact on the present Plan.

The SMP2 has identified similar long term complexities with regards to sustainable coastal flood protection for Holland Haven to that of the Jaywick frontage. Text Box 3 contains an extract from the policy statement for PDZ C2.

At Holland Haven (PDZ C2) the defences are under pressure and a landward realignment would create a more sustainable situation by reducing the pressure on defences and moving towards a more natural coastal frontage. However, the situation is complex and sensitive. The SMP's intent of management for Holland-on-Sea is to support a long term sustainable solution and adaptation. In the short term and the medium term, the intent is to hold the existing frontline defences where they are now. After 2055 a dual policy means that the existing frontline defences may be held where they are now or some form of Managed Realignment may be implemented. It needs to be noted that in the long term, holding the line at this frontage will be challenging, and funding may have to come from a variety of sources. In both cases, so also if Managed realignment takes place, all dwellings and infrastructure will remain protected, which will require moving some of the defences to a more sustainable sheltered position.

Whether the policy in Epoch 3 is Hold the line or Managed realignment, all dwellings and infrastructure will remain protected, which will require moving some of the defences to a more sustainable sheltered position but this would need to be explored more fully in the future with full community consultation before finalising a policy option. The importance of protecting Holland Sewerage Treatment Works was recognised by the Elected Members Forum and this was seen as a priority for protection for the next 100 years.

With this SMP2 policy statement in mind, the High Level Assessment study recommended also that the situation should be reviewed as part of an ongoing process. In the meantime, the recommendations include regular monitoring of the area to ensure that any patch and repair interventions which might be required, can be identified and undertaken.

Following from the extracts from the policy statements for the study area and the adjacent PDZ's C2 and C4, Table 2-2 provides the final SMP2 policies for the three PDZ's. The adjacent frontages' long term policies have a significant impact on the development of the present Management Plan in that options for management at Clacton that should not impact negatively on their implementation.

Table 2-2: Essex and South Suffolk SMP2 Management Intents for PDZ's C2, C3 and C4[5]

Policy Development Zone	Epoch 1 Now - 2025	Epoch 2 2025 - 2055	Epoch 3 2055 – 2105	What does this mean?
C2 Holland Haven	Hold the Line	Hold the Line	Managed Realignment/Hold the Line	The current line will be held in epoch 1 and epoch 2. In epoch 3 there is a dual policy of either managed realignment or hold the line. In either case flood defence to dwellings, roads and sewage treatment works will be maintained of upgraded.
C3 Clacton-on-Sea	Hold the line	Hold the Line	Hold the Line	The current line will be held throughout all epochs.
C4 Seawick, Jaywick and St Osyth Marshes	Hold the Line	Hold the Line	Managed Realignment/Hold the Line	The current line will be held in epoch 1 and epoch 2. In epoch 3 there is a dual policy of either Managed Realignment or Hold the Line, depending on further work as part of the Local Development Framework.

2.2.2 Planning and Economic Regeneration

The importance of Clacton as a centre for ongoing and increasing economic activity is recognised in the Scoping Consultation Document (SCD)[3] for this Management Plan. In terms of current employment the town provides the largest opportunity for employment for the Tendring District. This is largely located in the service industry, reflecting its important role as a centre for the tourism industry for the region. The seaside town itself is recognised as being worth more than £276million/year to Tendring. This is due to the combination of beaches, hotels, seafront gardens, caravan parks and the historic Clacton Pier that exist in the area.

Despite the ongoing vibrancy of the tourist industry in and around the town, it is also recognised that the wider Tending District is one of the most deprived areas in the country. Growth trends have, however, been identified and the town is seen as an area of ongoing regeneration. This provides significant opportunity for this Management Plan to be aligned with aspirations to enhance and revitalise Clacton.

Celebrate-on-Sea

This initiative was developed during 2010 by Broadway Malyan in association with Hemingway Design on behalf of InTend and Tendring District Council. The initiative focuses on regeneration opportunities in the area around the Pier Gap within the context of the Tendring Core Strategy and Draft Clacton Town Centre Area Action Plan. Whilst examining many aspects in terms of the challenges faced by the town, the document highlights the importance of the sea front as being core to Clacton's capacity for reinventing itself and to regeneration:

"Clacton has the capacity to reinvent itself as a truly 21st Century Resort offering a high quality all round visitor experience, building on the many assets of the town – its heritage, new investment such as DONG Energy, attractive open spaces, local enterprise and good transport connections and above all – its seafront."

As identified within the Celebrate-on-Sea document, the aim is to use the seafront as a catalyst to drive forwards the transformation and regeneration of the town. The document highlights a comprehensive programme of key initiatives which among other aims seek to:

- Encourage investment in new development and improvements to the seafront;
- Enrich the existing character of the seafront and the town's cultural heritage;
- Phase proposals to make best use of available funding and investment.

The report highlights that there is a need for a clear vision for the future and a comprehensive plan which will guide development and investment.

It is well recognised that funding has been a key issue that has previously constrained the implementation of a long term solution at Clacton. In developing this updated Management Plan it is recognised that risk management has to be closely aligned and integrated within such initiatives as Celebrate-on-Sea, to facilitate integration of coastal defence into the long term economic integrity of the town. The development of this Plan has therefore to allow and embrace a staged approach to investment and improvement, ensuring that opportunities along the seafront work with and do not unnecessarily

constrain emerging plans for broader investment and regeneration. Whilst recognising that Celebrate-on-Sea defines a vision rather than a definitive plan for investment, it has been taken as a platform for assessing options for risk management.

3 ANALYSIS AND DEFINITION OF THE PROBLEM

3.1 Physical problem

As made clear from the above discussion and strategic context, Clacton is an important sea side town, essential in attracting visitors to the Tendring Peninsula area of Essex. The current condition of defences in the area is poor and they are deteriorating. Since defences were constructed in the 1800s the area has been subject to erosion. This problem has been highlighted by annual monitoring since 1991, and consequently the frontage is seen as being under significant pressure. This pressure is demonstrated strongly by the requirement for further intervention on top of recent repairs at York Road and Queensway, where the beach and clay platform upon which the beach sits has continued to fall. This may potentially require further work over the next 15 years. In other areas there has been damage to the long section of defence just to the north of the Pier, where concrete units, placed to reduce wave interaction, have suffered extensive abrasion and are now at risk within the next five years. These issues, together with the assessment of the residual life of defences are discussed more fully in Appendix A. This appendix highlights the following issues associated with management of defences along the frontage.

- Protection of the cliffs along the general Tendring Peninsula, which reduces the input of sediment into the system;
- Sediment loss in both directions alongshore (northeast and southwest) dependent on the oncoming wave direction. Clacton-on-Sea and Holland-on-Sea are very sensitive to this due to their orientation;
- Storms which move and mobilise sediment offshore, from where longshore sediment transport by tidal currents can move it away from the frontage;
- Sand removal, even if only temporary, is allowing the underlying clay bedrock to be exposed and eroded, which is an irreversible process; and
- As beaches lower, they allow larger waves to reach the defences, from which their energy can be reflected, causing localised scour and further inhibiting beach build up in calmer weather.

The direct consequences of this, under present conditions, are:

- Failure of the foundations to the sea wall through undermining;
- This is compounded by the fact that larger, higher energy waves can reach the base of the structures, which also increases the wear and tear on the structures; and
- Increased occurrence of overtopping by larger waves, which can wash out the base of the cliff behind the sea wall.

3.2 Do Nothing Scenario

Whilst individual defences might, in themselves, have a longer life, the overall assessment of the frontage indicates a residual life of some 15 years for the majority of the defences. In some areas short sections of defence would begin to fail over the next 5 years. The initial assessment of the Wave Walker defence extending some 1500m north of the Pier was for a residual life of 15 years. During the course of the study further deterioration has been noted and this is currently being re-examined. The life of

this section of defence, without further management action, could be significantly reduced from this initial assessment. The latest estimate of residual life is 5 years.

As defences fail, the promenade behind them would immediately be lost due to the washout of fill beneath it. Associated assets, such as beach huts, kiosks, toilets would also be lost immediately. As this occurs, adjacent defence lengths would then unzip as the process of fill removal would continue alongshore to either side of the initial breach location. The removal of defences and the promenade then means that the toe of the cliff would be progressively exposed to waves and currents and erosion would weaken and undercut the cliff above, causing failure and loss of assets at the cliff top. The stability of the coastal slope would also be weakened and this would result in more extensive lengths of failure.

Clacton Resort

The section of the frontage in most favourable condition is that to the southwest of the Pier, where the defences benefit from the higher sand levels. However, specifically, there is concern over the condition of the defence local to the RNLI Station. Failure of this short section would result in a reduction in the life of adjacent sections and would lead to opening up of the low lying area all the way through to Jaywick to substantially increased risk of flooding. By 2040, the cliff recession associated with this would result in the loss of 49 residential properties, two car parks, a Martello Tower and a number of restaurants in this zone. In addition, the connecting section of road between West Road leading to Jaywick, and Wash Lane, would be severed. This would cut the link between Jaywick and Clacton. The alternative route would take the user to Rush Green Lane in the north, increasing journey times and distances and placing more pressure from increased traffic onto this infrastructure. In the same 'Clacton Resort' zone, the main Hospital in this area would be at substantial risk of loss by year 2050. The hospital provides vital services to the Tendring Peninsula and this loss would put additional pressure on Colchester District Hospital, as well as increasing ambulance journeys for patients who would otherwise have been seen more locally in Clacton.

Clacton Town

Following the loss of the Wave Walker units in year five, the Pier would be isolated within 15 years, with the subsequent loss of the Pier Gap and then rapid erosion and failure at the crest of the slope eating back to the seaward area of the centre of the town by year 2040. The coastal road would be cut within 10 years, severing the immediate link between east and west Clacton, as well as links to further a field such as Jaywick and Frinton. Almost immediately following failure of defence in this central area, access to the shoreline would be lost and the area would, in effect, be cut off from use of the sea front. Properties would start to be physically lost from year 17. In some areas, such as between Connaught Gardens through to Lyndhurst Road, the slightly greater width of the cliff top green would allow potentially a period of approximately 35 years before property was lost, but following this, in this area the erosion and failure of the coastal slope would eventually result in the loss of 148 properties over the next 100 years. The initial loss of defences would trigger the inevitable loss of assets over the longer term.

Prior to this physical loss of access, the beaches would be so depleted and defences would be in such a poor condition that the prime attraction of Clacton as a sea side town would already be gone and there would be little or no incentive for major service

providers, such as retailers, restaurants and hotels to continue investment in the area. The main value of Clacton as the regional tourism and support centre for the Tendring Peninsula would be lost. While this process would take several years, scope for regeneration of the town would be lost immediately and the process of increasing deprivation and dilapidation would start.

Residential Clacton

Despite the lower cliffs in this zone, resulting in a probable slower erosion rate, there would be loss of a significant number of properties beginning in year 19, with a number being lost before this. Only at the very northern section of the frontage would loss of property be less significant. In this area there is, however, significant infrastructure, for example the Clacton Sailing Club (established in 1961), the Port of London Authority communications mast and the sewage treatment works. Defence failure would also open up the flood route to the low lying land of Holland Haven and the low valley of the Gap.

Critically, Defence V at the north western end of the frontage is in a poor condition and is likely to fail in the next five years. If this occurs, the small road, serving a residential street and a number of properties, will be lost in the first five years (2020). By 2025 the adjacent defence (Defence X), located between the Anglian Water sewage treatment works, is likely to fail. Through failure of this section, the Clacton Sailing Club would be lost.

Despite works currently being undertaken to improve adjacent Defences R and S (Cliff Road coastal protection works[11]); in the 'Do Nothing' scenario Defence Q is likely to fail by 2020. Losing this section of defence means that within 15 years the coastal road at the top of the cliff is rendered impassable due to the retreat of the cliff line. However, users of the road could still travel from Frinton and into Clacton via the B1032, and travel behind the residential area of Holland-on-Sea until either York Road or Queensway, where they could rejoin the coastal road travelling towards the town centre. By 2050 the B1032 would, however, be severed at the roundabout in Holland-on-Sea. The alternative route (of the same standard of road) would take the user as far north as Thorpe-le-Soken, significantly increasing the thoroughfare in this area and putting pressure on the infrastructure, as well as increasing journey times and distances. Alternatively, there are some unnamed roads stretching across the rural parts of the peninsula, however, it is probable that they are not of a standard suitable for increased traffic flows. In addition, the potential flooding associated with the loss of coastal defence would render many of these routes impassable, although this is not considered to occur often enough to be included in the economic assessment of damages.

With the loss of the coastal road comes the loss of the Anglian Water intercept sewer and the water mains pipelines. This would impact on the continued use of the residential properties immediately to the back of the road as well as impacting on services more broadly to properties in the area. The main services would need to be rerouted.

Overview

As indicated, the majority of the defences along the frontage have a residual life of 15 years. Therefore, 2025 marks the onset of widespread failure and recession of the

majority of the frontage, running from west of the Pier and meeting the already-failed sections of defence in the north east. Failure also undermines the integrity of some of the newer defences, such as Queensway and York Road, which would not be expected to live out their remaining estimated residual life.

Over the main developed sections of the frontage, over the next 100 years erosion is predicted to extend back some 250m from the present cliff top. This would in general take out up to five rows of housing back from the sea front, with the loss of complete roads running back from the coast. While the rate of erosion would reduce over time, it would continue well beyond the 100 year period with the main headland of the Tendring Peninsula gradually retreating with sea level rise. There is no naturally occurring hard geology which would limit the erosion. Related to the loss and lack of investment associated with the core of the town, the sustainable future of Clacton as a vibrant sea side town and centre for the Tendring Peninsula would be called in to question.

Altogether, over 3,300 properties would be lost including the main services, the hospital, and the core of the town. In addition, infrastructure such as the intercept sewer and the water mains pipeline would see over £8 million further damage, and the coastal road would be severed. The Martello towers would be lost together with the integral culture and heritage of Clacton.

It is very important to note that before the loss of infrastructure, business and buildings associated with the 'Do Nothing' scenario are realised, the beaches and foreshore along the frontage would already be significantly lowered and unusable. At present there are already stretches of the coastline where public access is prevented, due to the low condition of the defences and narrow foreshore, as well as the significant vertical distance between the beach and the access steps to it. Associated with this loss of a vital asset to Clacton would be the loss of income generated annually through tourism. This tourism provides a '*raison d'être*' for numerous local businesses such as hotels, bed and breakfasts, restaurants as well as arcades and of course the historic pier. It could therefore be considered that many of these would experience substantial loss of business before their physical loss through erosion. Although this is not accounted for in the economic assessment of damages, it should be considered when assessing the qualitative impacts of doing nothing.

3.3 Present Management

The policy within the SMP2 is for Hold the Line. Following on from the Strategy update of 2004, the approach to management has been to undertake repairs as necessary to the frontage. This has been driven by its continued deterioration and has aimed to provide adequate protection necessary to maintain the defence of the area in the short term, with an expectation that a more strategic approach would be developed in the medium to long term.

In effect, the present management approach has been one of doing the minimum necessary to sustain the defence in the short term. This has led to a policy of 'Patch and Repair', at times on an emergency basis.

Following through such an approach has maintained the basic structure of the existing defences in a competent manner, but has not been able to address the fundamental

cause of deterioration; the overall lowering of the beach platform. Even in areas such as just to the north of the Pier, where works have been specifically engineered to help reduce loss of sediment and hence facilitate protection of the clay layer, the subsequent continued pressure on the frontage has resulted in deterioration of the condition of the defence over the last twenty years. In other areas, rock has been placed to the toe of defences providing essential support for refurbishment and replacement of the promenade walls behind. This approach has resulted in the development of a rock toe over much of the central areas in front of Holland on Sea. This is in addition to works in local areas taken to deepen the toe of defences and to encase the existing sea walls.

Whilst this approach maintains the basic defence, the approach does little to support the broader use of the area. Beach levels continue to fall and access to the foreshore becomes increasingly difficult.

If the approach is continued into the future, there would be a need to further strengthen the existing defences. It is quite probable that the only technically available option under this approach would be to increase the use of rock. Gradually over time, the defence would develop as a rock revetment over the full length of the frontage. This would have some benefit in reducing wave reflection and might reduce the rate of lowering of the clay platform, however such lowering would continue and associated with this there would be the need to further increase the foundations of the defences.

In effect, this approach would exacerbate the anticipated impacts of sea level rise on the beach and the defences. The lower clay platform, coupled with rising sea levels, would allow increased wave energy incident at the defence line. The modelling of beach loss and platform lowering (Appendix A) has indicated that, the lower the level of the foreshore platform, the more vulnerable to sudden failure the frontage is. Effectively, in this scenario of management, the consequence of defence failure in the future would initially be greater than if the defences were abandoned, for example, today. Any failure or future decision to abandon defences would result in very rapid “catch up” in erosion and retreat of the cliff and coastal slope. The modelling suggests that if defences were abandoned in 20 years time, as opposed to being abandoned now, the increased rate of erosion would result in greater loss of property initially than would be the case under an immediate ‘Do Nothing’ approach.

Technically, the present approach to management could be sustained over the next 100 years. However, the fact remains that this would require increasing engineering effort, and subsequently, would be coupled with ever increasing costs. At the same time, the approach would lead to greater vulnerability of the frontage. This, therefore, can not be seen as being a long-term, cost effective, sustainable approach in terms of broader management of the frontage.

The consequences of a patch and repair approach would be increasingly apparent over the next 15 to 20 years as more sections of defence become critical and more effort would need to be put into dealing with undermining of the defences. The approach limits the future redevelopment of the sea front and, at the same time, results in loss of significant amenity value.

Over the next 15 to 20 years, over virtually all the area north of the Pier, much of the already limited sand cover and small pocket beach areas would disappear; as is evidenced now by a comparison with 20 to 30 years ago. The promenade would remain but would act as nothing more than an access along the frontage. Beach use would be restricted to the area south of the Pier and, even in this area, over a longer time period there would be loss of beach area.

Much of the traditional character of Clacton as a seaside town would be lost. This would constrain investment in the area with a gradual decline in tourism. This would impact on the economic sustainability of the town centre, leading to further loss in value and dilapidation.

Essentially, the longer that such an approach to management occurs, the harder it would be to move to and fund an appropriate long-term defence system which sustains the town of Clacton.

3.4 Funding Constraints and Implications for Future Management

3.4.1 Introduction

In using FCERM-AG, the appraisal process aims to demonstrate and guide the outcome towards the most cost beneficial and technically sustainable option as the preferred solution. This option should also meet the specific objectives of any particular project. The consideration of how a project might be funded over and above what can be provided for by Flood Defence Grant in Aid (FDGiA) is recognised within FCERM-AG. However, the outcome of the process is a means to prioritise this government funding against national priorities in terms of Flood and Coastal Erosion Risk Management (FCERM). Against such criteria, if the project is deemed a low priority in relation to the national average, then it receives no funding. A new approach to funding has been developed[12a;12b.] with the focus on outcomes, rather than a percentage of scheme cost.

This approach leads to national funding as being a mechanism for supporting more collaborative approaches to funding, recognising the importance of coastal management to the nation, to seaside communities and to individuals and commercial organisations that benefit from a coastal location.

Funding has been, and remains, the key constraint in the implementation of any Coastal Management Plan at Clacton and Holland. This is highlighted by the outcome and difficulties encountered in taking forward the long-term intent of the 2004 Strategy. The question of funding is, therefore, a key aspect of the problem faced at Clacton and has the potential to alter the development of the Management Plan significantly.

As highlighted above, either of the two scenarios described ('Do Nothing' or Present Management continued into the future) constrain the opportunity for collaborative funding of sustainable future management, in terms of attracting additional inward investment. Obviously, there would still be more limited opportunity for joint funding, even under the Do Minimum approach in sustaining existing values associated with the sea front over the short to medium term.

In the context of these funding constraints, this section discusses the potential approaches which could be taken in the management of Clacton.

3.4.2 Potential approaches to management and their influence on funding

At present the Clacton frontage is protected by a series of linear defences, running along the full length of the coastline. The defences vary in condition and are subject to different levels of exposure and pressure. Overall, if defences were not maintained or improved, the majority of the defences are likely fail over the next 15 to 25 years, as described in Section 3.2. This would lead to exposure of the cliff behind and failure of the coastal slope as the cliff toe is eroded.

The 2004 Strategy looked at a variety of options, from maintaining defences through to more major redesign of defence to the frontage. Although this was justified in terms of the economic benefits outweighing the costs, the proposed scheme for the area, involving breakwaters and recharge along the whole frontage, was not able to be funded solely by FDGiA. It was therefore not implemented, leading management towards a reactive 'patch and repair', or in some areas, improvement to defences, close to or even after their failure. These works have been funded due their urgency, but their approval has also been based on the assumption that a long term, full scheme will be implemented at some point in the future.

The Clacton frontage has, therefore, a real problem. Continuing to defend in the present manner is driving management down a course that is unlikely to be technically sustainable in the long term. Compounding this, the alternative would mean a major redesign of the approach to defence, however, this is constrained by a lack of FDGiA funding. A third, undesirable, approach might be to accept that defence of Clacton cannot be taken forward. In this case the issue is one of having to adapt use and accept that Clacton will not be there in the future.

The consequential implication of any action taken now clearly influences the opportunity for change in the future.

This is highlighted schematically in Figure 3-1.

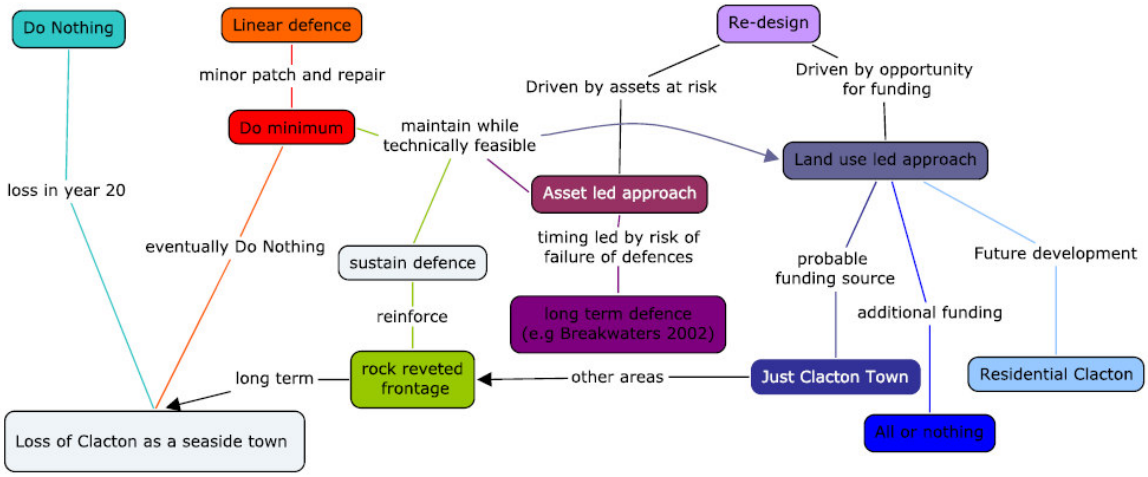


Figure 3-1: Schematic of Management Approaches

The essential choices for approaching management are briefly outlined below.

Linear Defence

This is the present day patch and repair, or 'Do Minimum', approach for the frontage. Taken forward in the short term, this would not preclude future change in management. In the short term it could be seen as reinforcing and maintaining a basic backstop level of protection that would still be required in adapting to alternative ways of management.

There is, however, a time limit within which such alternative choices would need to be made. If funding runs out as the patch and repair becomes increasingly onerous, then eventually management reverts to 'Do Nothing'. If there remains an imperative to sustain Clacton, the patch and repair would evolve into an approach of continuing more major repairs until the whole frontage is protected by a rock revetment. This, as discussed above, is potentially manageable over the 100 year period but fails to provide a long-term sustainable approach to sustaining the broader value of Clacton as a sea side resort.

'Do Minimum' is seen as a platform upon which to redesign the approach to defence management into one that addresses the long-term pressure on the frontage. Two alternative approaches can be envisaged in delivering such a change; Asset Led and Land Use Led.

Asset Led Approach

In the Asset Led Approach, the emphasis would be strictly in line with maximising the cost effectiveness of defence strictly in relation to flood and erosion risk reduction. The basic aim of this approach (as with the alternative Land Use Led Approach discussed below) would be to address the fundamental causes of the problem; increasing wave energy and foreshore platform lowering. This approach is exemplified by the outcome of the 2004 Strategy.

As highlighted by subsequent implementation directed by this previous Strategy, the change would need to be phased, balancing the effort required to maintain a Patch and Repair policy against the significant capital investment involved in adapting to a more major scheme. Such an approach would not preclude enhancement of the frontage in

terms of use and the subsequent increased amenity and tourism values would be seen as a significant added benefit, supporting the overall sustainability of the community.

A phased implementation, according to asset condition and likelihood of failure, would allow the costs to be spread over the appraisal period. The Asset Led Approach would eventually provide protection for the whole frontage. It would also determine the form and shape of the coastal strip and future development would be considered around this form created by the defences. The approach would not therefore preclude opportunity for alternative collaborative funding and, as demonstrated by the outcome of the 2004 Strategy, this collaborative funding approach would be seen as an essential part of taking this approach forward. This update to the long term Plan for Clacton has the benefit of increased understanding of the fundability problem, and is therefore able to do this. The FDGiA funding available to any option will be calculated, leaving an understanding of the level of external contribution required to plug that gap.

Land Use Led Approach

The Land Use Led Approach to redesign the frontage would need to incorporate greater flexibility in terms of specific works being taken forward. The primary focus would be on enabling development, regeneration and other opportunities, and the associated sources of funding that could be generated through this. The approach would require a developed collaborative partnership between, for example, town planners, coastal engineers and businesses.

By its nature, therefore, such an approach cannot necessarily define a specific long-term solution if the essential ability is to be maintained to respond to the developing land use vision. However, the strategic approach does need to provide a strong framework for management in to the future. This Management Plan therefore provides an opportunity to develop this framework. This is likely to result in a tool for making decisions about coastal defence over the 100 year appraisal period. This tool could highlight the various pathways that exist in the management of the frontage, to facilitate various relevant bodies' understanding of the issues that need to be addressed.

Such an approach also has to recognise the relatively different characteristics of different sections of the coast in maximising the potential for collaborative funding, while still recognising the need for a coherent long-term approach to management of the whole area. Both the uncertainties presented by such an approach, and the need to have a coherent approach in terms of staging and in terms of location, add to the issues and the problems that would have to be addressed through the Plan.

Choosing the right approach

Taking either redesign approach forward has to be founded on a sound technical appraisal and based around long-term, risk based planning. The consideration of the potential approaches within this section of the report highlights the difficulty of establishing a realistic approach in terms of funding and need, but doing so within the bounds of specific objectives for continued adaptability of any long-term proposals. With reference particularly to the study objectives d), f) and g), set out in Section 1.1, the Plan has to be developed around maintaining the opportunity for developing a realistic procurement of funding, in discussion with a broader audience, involving stakeholders and the community, and in a manner that works from the clear need to address

immediate problems through to a less certain but attainable vision for long-term management. This Management Plan, therefore, should be seen as the platform to a more collaborative partnership approach, in providing the tools and baseline information required for making technically and financially sound decisions into the future.

3.5 Definition of the Problem

The very clear problem is the risk to the future sustainability of Clacton as an important seaside resort and residential area, threatening the long-term development of the Tendring Peninsula and associated communities and use of adjacent areas of the coast and within the hinterland.

This is seen more specifically in terms of the following issues:

Technical:
- The long-term pattern of deterioration of existing defence;
- The difficulty of maintaining these defences due to the on-going lowering of the foreshore platform;
- The danger that a continued piecemeal practice in term of defence management would, in the medium term, lead to an approach which, in the longer term, would become unsustainable and increasingly fragile and would eventually lead to the decision being made in the future that defences could no longer be sustained;
- In the medium term, failure of defences would severely constrain and, therefore, direct and pre-empt decisions for management and future adaptation to management of areas to the north and south of the study frontage.

Flood and Erosion Risk:
- There would be the direct loss of some 3,307 residential properties over the next 100 years and that loss would continue beyond that time;
- There would be the loss of some 185 commercial and service (including the main hospital) properties and industry which, in addition to the direct economic loss, would result in significant impact on the wider area and would impact on the value of other assets not specifically at risk during the next 100 years;
- There would be a pre-emptive loss or increased flood risk to some 1,016 properties in Clacton and a further 2,239 within the adjacent areas of low lying land in Jaywick and Frinton;
- There would be disruption to key infrastructure, with the loss of the coastal road, main services including the intercept sewer and water pipeline. This would require significant investment in addressing this loss;
- There would be loss, initially of access to the Pier, and eventual loss of this structure itself.

Social and Environmental:
- The continuing loss of the essential sea front values, including the promenade and areas for beach and watersports use, impacting on the amenity provided by the area and the associated loss in terms of tourism, impacting on the sustainability of the core commercial centre of the town, value of property within the area and reducing the capacity for supporting the region;

- Direct loss of access to the sea front and the Pier, affecting, in particular, the use and commercial viability of the town centre;
- Reducing opportunity to attract inward investment into the area, reducing the capacity for the area to adapt to the future, for regeneration of the town and increasing the general risk of social deprivation within the wider area;
- Loss of significant historic structures, emphasising the impact on the culture and heritage of Clacton.

Funding:

- The difficulty of ensuring sufficient funding of risk management, based solely on criteria and outcomes qualifying for FDGiA. The difficulty is particularly in respect of obtaining sufficient funding in the medium to long term for change to a more sustainable approach to risk management;
- The reducing opportunity for collaborative funding due to the rapidly deteriorating conditions at the sea front which limits attractiveness for investors and local economic development that can generate funding through local taxation;
- Associated with this, lead-in time necessary to develop and put in place funding agreements to ensure the future of Clacton;
- The need to consider development and adaptation of an approach to management that would allow future funding opportunities to be put in place and the uncertainties associated with a time based decision making process for future management, maintaining flexibility, while still providing a realistic long-term approach to management.

3.6 Constraints

Locally there are constraints in terms of the important geological SSSI's. There is recognised conflict, identified within the SEA that to take any action over the foreshore area in the vicinity of these features will result in altering the value of these features. To take no action, could similarly result in damage to these features.

A significant constraint on purely risk management for the area is the need to consider how this will impact on the potential for future regeneration and investment opportunities, which in themselves provide the opportunity for collaborative investment in risk management. The Pier is a further constraint in that this is considered to be an important part of the visual and historic landscape. While recognising that this feature is considered an important focus for regeneration and seafront use, taking account of its landscape perspective is a constraint on how management could be achieved.

At a broader level, there are potential constraints in terms of the scale of works that might be undertaken along the Clacton frontage with respect to the larger scale coastal behaviour and the potential impact on international designated sites outwith the area of the study. This has been considered as part of the SEA process and it is concluded that the typical scale of management undertaken at Clacton will not impact on these areas. The issue does, however, remain a constraint on any larger scale management initiative.

These issues are discussed more fully in the SEA but are highlighted in summary to aid understanding of management potential in the area.

4 MANAGEMENT PLAN OBJECTIVES

The objectives relating directly to the development of the Plan are set out in Section 1. These have been brought forward and developed as specific objectives used in assessing options for management. These specific Plan Objectives reflect the values discussed in Section 2 and aim to address the problems and constraints discussed in Section 3 relating to fundability. It is further recognised that, while the area and plan has to set out a coherent approach to management, there are quite clearly areas with distinct problems and opportunities, both technically and in terms of time scale and in terms of use.

Objectives can therefore be set with respect to the whole frontage (Plan area Objectives) and then, at a more location specific scale, particular issues and opportunities can be identified. In assessing and appraising subsequent options for management, this distinction at the more local level allows further refinement of the short list of approaches that could be applied to the Clacton frontage, in Section 6 of the report.

4.1 Plan Level Objectives

The overall aim of the Plan can best be captured in the high level objective:

To provide a sound, secure, and realistic framework for risk management that contributes to sustaining the economic welfare of Clacton and aims to enable and support stimulating delivery of economic, social and environmental benefit and regeneration.

In delivering this overarching objective, the following specific objectives of the outcome of the Plan are defined as:

4.1.1 Technical

T1. To provide a technically feasible response to flood and coastal erosion management;

T2. To ensure that the future maintenance required for any works which come out of the Plan is technically sensible;

T3. To develop technical approaches, particularly over the short term, that do not impose constraints on approaches into the future;

T4. To ensure that methods of construction do not impact negatively on health and safety, both in construction and operation.

4.1.2 Environmental

Env 1. To protect and enhance valued natural environment assets;

Env 2. To appropriately consider potential impacts and opportunities to enhance historic features, amenity assets, and infrastructure important to the future functioning of Clacton-on-Sea and Holland-on-Sea;

Env 3. To ensure the plan makes the most of current and future opportunities to enhance society;

Env 4. To aim to develop a flexible, lower-carbon approach to coastal management to climate change;

Env 5. To fully address the impacts of climate change on the potential solutions to long term management of the frontage.

4.1.3 Economic

Econ 1. To provide and identify within a Plan the best cost effective solution for managing flood and coastal erosion risk on the Clacton/Holland-on-Sea frontage;

Econ 2. To optimise the standard of protection from erosion and flooding that can be economically justified throughout the appraisal period, over different periods of time within the appraisal period;

Econ 3. The Plan should recognise that future opportunity for investment has the potential to influence the economic justification. The Plan will highlight and encourage options which increase the opportunity for economic decisions to be deferred whilst sustaining an economically justified approach up until that decision point.

4.1.4 Funding

F 1. To develop a Plan which optimises the opportunities for collaborative funding;

F 2. To do this, the outcome of the Plan should tie in with any local frameworks for regeneration and planning.

Overall, as well as providing a business case for FDGiA funding of any long term solution at Clacton, in recognising the constraints in funding, this Management Plan should also aim to provide a platform on which a collaborative partnership approach can be developed.

4.2 Specific Issues and Opportunities

The Clacton frontage is essentially linear, with homogenous coastal processes. A 'Do Do Something' approach that addresses the entirety of the Clacton and Holland frontage can therefore be considered to be the most technically appropriate approach to the problem of falling beach and platform levels. However, as has been described in Section 2.1.3, the frontage can be seen to differ significantly in terms of other factors such as land use, economic activity and present defence condition, leading to the definition of three distinct areas as "Clacton Resort", Clacton Town" and "Residential Clacton". This definition means that there is unlikely to be one global solution, or concept, that fits the whole frontage.

The three defined areas are taken forward in this Management Plan as three strategic management zones; A, B and C (Figure 4-1). In the short listing and refinement of options, these zones are essentially considered as being separate from each other. This allows for local adaptation of options around specific management needs. Once all appropriate options for management of each zone have been identified and refined and inappropriate options ruled out, consideration is given to the interactions across the whole study area.

This section further defines each zone in terms of present day character and translates this into potential future management needs. Where known, future aspirations for coastal management as defined in reports such as Celebrate-on-Sea[9] are also referenced. Table 4-1 summarises the key differences between the strategic management zones.

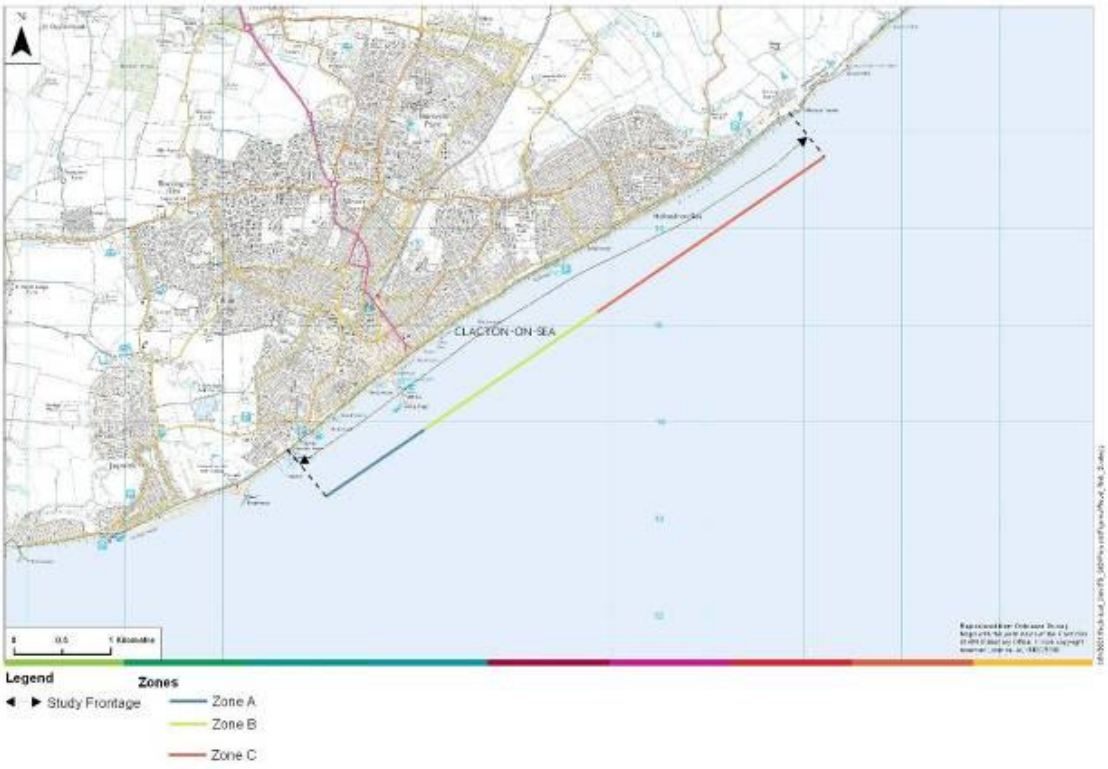


Figure 4-1: Location of zones along study frontage

Table 4-1: Strategic Management Zones

	Zone A	Zone B	Zone C
Zone Name	Clacton Resort	Clacton Town	Residential Clacton
Location	From the south-western boundary of the Clacton frontage to the Pier.	From the Pier through to the Gunfleet Sailing Club.	From the Gunfleet Sailing Club through to the north-eastern boundary of the Management Plan frontage.

	Zone A	Zone B	Zone C
Zone Name	Clacton Resort	Clacton Town	Residential Clacton
Land Use Description	Presently the main focus for tourism and contains the majority of the town's tourist amenities, including the Clacton Pier. In addition, the Clacton Hospital is located here, and the RNLI Slipway and station.	Zone B can be considered as similar to Zone A, in that it is located adjacent to the Pier and is in front of the main Clacton Town. There are a large number of businesses located in this zone. However, the potential for Zone B to be a focus for tourism is reduced due to the depleted beach.	The land use associated with Zone C is largely residential. The Anglian Water Sewage Treatment Works and the Port of London Authority Tower are located in this zone.
Coastal Defences	The two defence lengths within Zone A are in a relatively good condition and the beach is relatively wide and healthy.	The three defence lengths in Zone B are in relatively poor condition compared to Zone A and the width of beach is reduced significantly due to the identified problem of sediment loss from this frontage.	There are 18 separate lengths of defence type in this zone, and a significant proportion of them are in relatively poor condition, reducing the integrity of adjacent defences in better condition.
	Defence Residual life: 15-20 years	Defence Residual Life: 5-15 years	Defence Residual Life: 5 – 45 years (majority are 10-15 years)

4.2.1 Zone A

Overview

The defences in Zone A have no urgent requirement for improvement. This is with the exception of the sloped stone pitched revetment adjacent to the RNLI station. Here, the beach, which sweeps from the north east arm of the Martello Tower Breakwater, reaches the defence line and remains very narrow up to the start of the groyne field to the north east. The revetment is subsequently largely exposed to wave action over significant parts of the tide cycle. With the exception of this short section, this zone does have the most significant and, consequently, busiest beach of the whole frontage.

Together with Zone B, this Zone A also provides the backdrop to the historic Clacton Pier. Further back from the coast this tourism focus is reinforced by the number of arcades and restaurants located here. There are also public gardens developed between the promenade and the road. With the attractions for tourists, the economic value of Zone A to the wider Tendring Peninsula is high.

Management Needs

There is a requirement for managing this zone, to maintain, and where possible, enhance its tourism focus. In terms of use of the beach, there is already a desire amongst town planners for this area to become focused towards water sports. This might be one avenue to pursue in providing a framework for attracting external funding. It is recognised that the tourism and infrastructure already located here can be used as a drive for attracting developers.

Timing

The relatively good condition of the beach and coastal defences in this zone provides the opportunity to take time to develop a framework for collaborative funding and regeneration. It is, however, recognised that the defence surrounding the RNLI slipway is a more immediate problem and will require some work in at least the next 15 years.

4.2.2 Zone B

Overview

The majority of the defence along Zone B comprises concrete Wave Walker units. These have deteriorated since their construction in 1995 and a review currently being undertaken recommends that urgent works should be carried out to prevent their failure in the near future. In terms of land use, the beach is so depleted along much of this section that it is not significantly used. Despite this, the promenade starts to feature a café and increasing numbers of beach huts towards the northeast of this zone, and where the Wave Walker units end to meet the 1960s stepwork, there is a slightly wider beach. The Gunfleet Sailing Club is located at the boundary of Zone B and Zone C, where the promenade juts out and rises in level significantly, forming a small headland. At the cliff top the town centre of Clacton continues along this zone, with numerous hotels, restaurants, arcades and shops. There is also a section above where the café and beach huts are where the coastal road is set back from the cliff top, providing more space for potential works.

Management Needs

There is a real opportunity in this zone to extend the benefits brought about by the location of the Pier and to attract visitors to this section of the frontage. To realise these benefits, access from the town to the coast is likely to require improvement. To improve the links between the town and the coast would need to take account of how the coast interacts with the town in general. There is a strong incentive to provide adequate protection to this area to reflect the economic importance of Clacton town centre behind it. The Celebrate-on-Sea[9] report highlights the potential for this area to become an area of tranquillity, to encourage people towards the area for barbequing, walking, cycling and to encourage beach huts onto the promenade.

The Gunfleet Sailing Club also needs to be taken into consideration in developing solutions for management.

Timing

This zone has a critical requirement for works due to the deterioration of the Wave Walker units. Their estimated residual life is five years[13]. The concrete stepwork along the rest of this section is also estimated to need work by at least 2025. In addition, there

could also be a requirement to remove some of the dilapidated groynes along this section on the grounds of health and safety.

4.2.3 Zone C

Overview

Zone C is located furthest from the pier and main tourism focused areas. This zone can be further subdivided based on the level of development located at the cliff top.

First, in the more developed area, properties, which are predominantly residential, are located close to the edge of the cliff. Long sections of defence are already fronted by a rock toe or revetment, preventing public access to the beach. Parts of the promenade have also been closed on health and safety grounds.

Further to the northeast, the cliffs start to reduce in height and the number of properties decreases. Eventually they cease altogether, and there is a largely undeveloped area up until the Sewage Treatment Works and Port of London Authority Communications Mast at the northeast boundary of the study frontage. Here, the beach is wider and there is less pressure on the defences, but, with the exception of the Gunfleet Boating and Clacton Sailing Clubs, there is relatively little regular use of the beach by visitors.

Management Needs

Management needs to acknowledge the two different land uses in this zone, with the residential area in the southwest and the less developed area in the northeast. There is a requirement to think about the needs of the boating and sailing clubs in this area too, as well as the protection to key infrastructure.

Timing

This zone has the largest number of defence types, with the largest disparity in condition. There are sections of this zone which are likely to fail within the next 5 years, however, these are limited and small enough in size, potentially, to continue the present patch and repair approach in managing them. In recent urgent and emergency works in this zone, there has been an increasing preponderance for rock placement as the preferred solution, so it can be assumed that this would remain the case. If this was implemented and timed according to when defences are likely to fail, there is likely to be significant investment required over time as increasing volumes of rock would be required to provide adequate protection. There is an opportunity in this Plan to investigate this potential escalating cost and to assess whether, and when, the money could be used for a more sustainable outcome.

4.2.4 Conclusions

The analysis carried out in this section highlights that, although this study frontage is linear in shape, it is necessary to differentiate areas based on a number of criteria. These include present land use; potential opportunities for attracting collaborative funding, linked closely to land use; type, and condition, of defences; and relief of the land. This Plan will now use the findings of this analysis for each zone in developing potential solutions for management of flooding and coastal erosion.

5 OPTIONS APPRAISAL

5.1 Approach to Appraisal

Section 3.4.2 introduced the three potential approaches that could be taken to managing the Clacton and Holland-on-Sea coastline. These management approaches are borne out of the constraints of future funding, and although not used in the appraisal of options *per se*, they do pave the way for a clearer understanding of how funding could shape this Plan. This section now introduces, and describes, the appraisal of options for flood and coastal erosion risk management along the frontage.

Figure 5-1 shows a schematic of the structure that this appraisal will follow. Options appraisal can be broken down into a number of different tiers. First are the options considered at Shoreline Management Plan (SMP) scale. This consideration has been carried out in Section 2.2.1, which describes the Essex and South Suffolk SMP2's Management Intent for Clacton as one of sustaining and supporting the viability of the town and its communities, tourism and commercial activities. This means a continuation of the current management approach: holding the current alignment where there are defences. As the SMP2 says: although the defences are under pressure, holding the line is necessary to sustain the seafront which is essential to the viability of Clacton-on-Sea as a coastal town and the Tendring frontage as a whole. The SMP2 has translated this intent of management into a 'Hold the Line' policy over the next three epochs (100 years).

The appraisal process from here now looks at the high level management approaches of 'Do Nothing', 'Do Minimum' and 'Do Something' and their implications for the frontage. The 'Do Something' approach is then developed, with the identification and appraisal of the generic types of 'Do Something' options for coastal management. These are technically assessed with the intention of identifying potential benefits of specific approaches whilst ruling out any which are not suitable for particular areas along the study frontage. Following this initial appraisal, the resulting short list of options is then applied and refined according to the specific issues for the zones, outlined in Section 4.2.

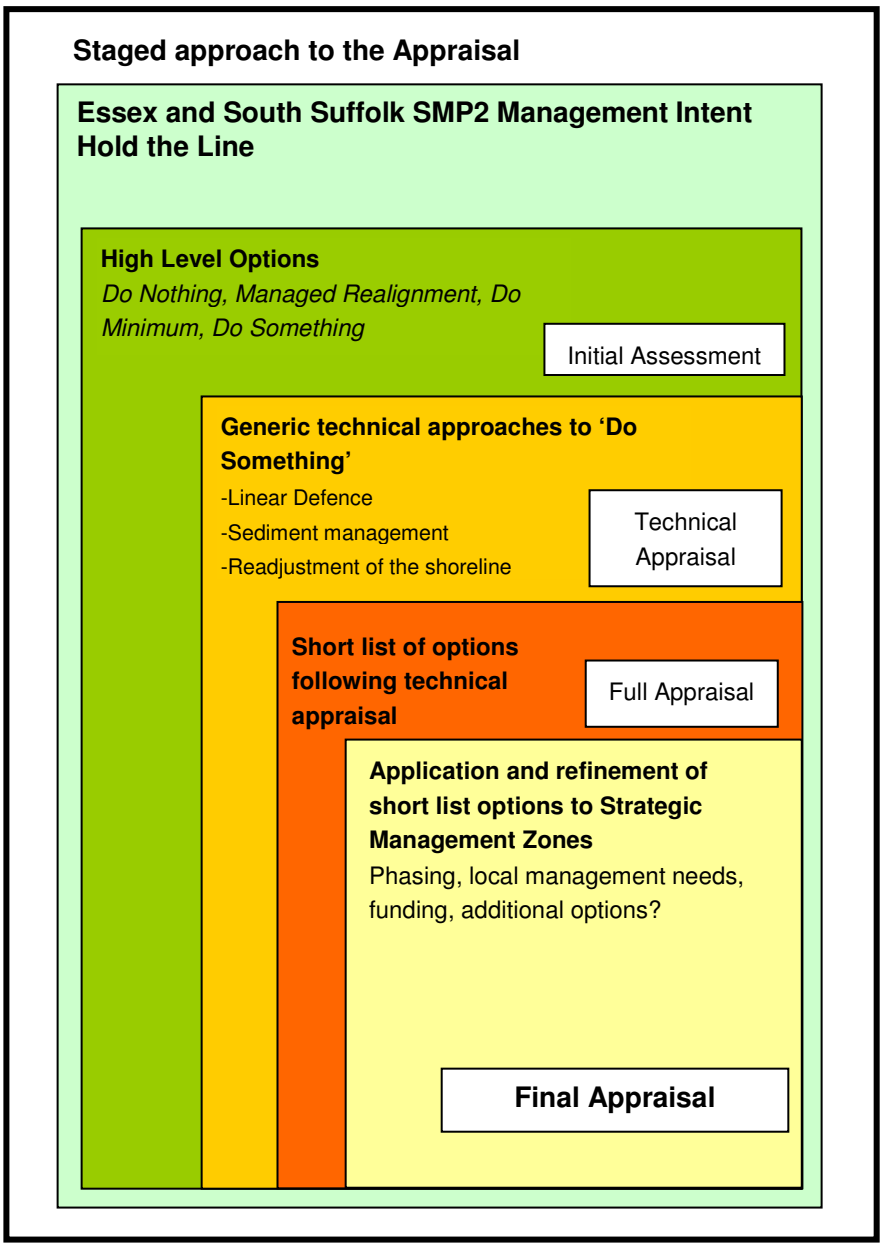


Figure 5-1: Schematic showing the staged approach of appraisal

5.2 Initial Assessment (High Level Options)

The Essex and South Suffolk SMP2 has a preferred management intent of 'Hold the Line' at Clacton. The intent of this policy is discussed earlier in Section 2.2.1. Given the condition of the defences, delivery of this policy would require positive action ('Do Something'). This is taken forward in the appraisal. However, in the development of this Strategic Plan, a review is undertaken of options which do not necessarily satisfy the management intent of the SMP2 of 'Hold the Line'.

5.2.1 Do Nothing

This scenario assumes that the existing defences would be left in place but would receive no form of ongoing maintenance or improvement. At the end of their residual life it is expected that there would be failure of the defences. It is likely that the cause of failure would be progressive undermining of the foundations due to beach lowering, and/or structural failure through deterioration of the wall condition. At the time of writing, and following a coastal defence inspection, the majority of the defences have an estimated residual life of 15 years. Once they fail, there would be unconstrained recession of the cliffs. The consequence of this policy has been discussed in Section 3.2 and a full economic analysis is provided in Appendix B. A summary is provided in Table 5-1 below.

Table 5-1: Economic Damages of 'Do Nothing'

Erosion Damages Number of properties	Medium term (0-20yrs)	Long term .(20-100 years)	Total (100 years)	Present Value Damages** (PVd) (£k)
Residential	*216*	*3093*	3309	£114,686
Commercial	*18*	*163*	181	£14,322
Infrastructure	*2*	*2*	4	£14,488
Amenity				£197,624
Total Erosion PVd (£k)				£341,120
Flooding* Damages Number of properties	High Risk (> 5%)	Significant Risk (<5% to >1.3%)	Moderate Risk (1.3% to >0.5%)	Present Value Damages** (PVd) (£k)
Residential	80	53	79	£22,339
Commercial	2	-	-	£17
Total Flooding PVd (£k)				£22,356
Total Do Nothing PVd				**£363,476**

* Flood risk is associated with Zone A due to failure of Defence C (Year 15). Risk is evaluated based on maintaining defence system to west for 50 years and applies solely to property at risk immediately in the area of Clacton.
** Present Value Damage is the total economic damage, discounted over the appraisal period (100 years).

This option is rejected in principle due to its severe consequence, leading to the effective loss of Clacton as an important regional town. It fails to meet any of the objectives as set out in Section 4 and is contrary to the SMP2's intent of management. The option does, however, establish the baseline for assessment of positive options for management. For this reason the approach is taken forward in the appraisal and has to be considered as a realistic outcome if no action is taken to sustain defences to the area.

5.2.2 Managed Realignment

Managed Realignment would involve setting back the present line of defence and moving people and assets further inland. Given that this frontage is under pressure from erosion and that erosion would continue, particularly to the foreshore platform, this option would always require new control structures, at a new chosen location inland. As well as the high costs associated with this, this option would have major socio-economic impacts on the area and on the population of Clacton and Holland-on-Sea. The potential costs are described qualitatively below, and are aligned with the categories of the Plan specific objectives in Section 4.1.

Technical

- Under this high level approach there would be the risk to adjacent frontages. This approach would require management of the defences to the southern end of the study frontage to prevent outflanking of the defence system to the south. Works would have to be undertaken in the area of the RNLI Station over the short to medium term so as to maintain defence to the large area of the Jaywick and St Osyth Marshes. There is less risk to the north of the area.
- People, properties and infrastructure would need to be moved away from the realignment area (including the purchase of land to do this). This would require significant input from town planners and a wholesale redesign of Clacton and Holland-on-Sea.
- There would be a significant cost associated with moving properties and infrastructure further inland.

Environmental/Social

- Demolition and making safe the Managed Realignment zone to ensure that any pollution as the cliff recedes is reduced to an acceptable level;
- Significant disruption to Clacton and Holland-on-Sea residents and visitors;
- Potential geomorphological impacts on adjacent stretches of the coastline.

Economic

- New structures to prevent further coastal erosion past the desired new coastline would always be required;
- There would be a high overall cost of managing the process of realignment recession;
- Potential compensation and the cost of moving people away from the realignment area.

Funding

The high costs associated with implementing Managed Realignment would be unlikely to attract sufficient funding.

A detailed economic analysis of these impacts has not been undertaken. However, for the reasons set out above, this option is ruled out as a sustainable approach to management for the wider frontage. Locally, there may be opportunity for limited realignment as a means of providing a more sustainable management approach, within a framework of controlling the overall development of the coastal shape. Whilst the overall approach is rejected at this stage, local realignment is retained as an option at the local level.

5.2.3 Do Minimum

A 'Do Minimum' patch and repair approach would involve a continuation of existing practice whereby, when existing defences come to the end of their residual life, works would be undertaken to ensure that they do not fail. The difference, when compared with existing practice, would be that this 'Do Minimum' option would aim to plan works in advance, to address areas specifically seen as being at risk based on their residual life, rather than being reactive to failure.

The general types of works required in the 'Do Minimum' approach are described in detail in Section 5.3.1. Here, an assessment has been made of the likely works required in each Strategic Management Zone, based on defence residual life. The costs of these works have been estimated over the 100 year appraisal period; Figure 5-2 shows this cumulatively over this time period. A more detailed description and discussion of the specific works required over time, per zone, is provided in Section 6.

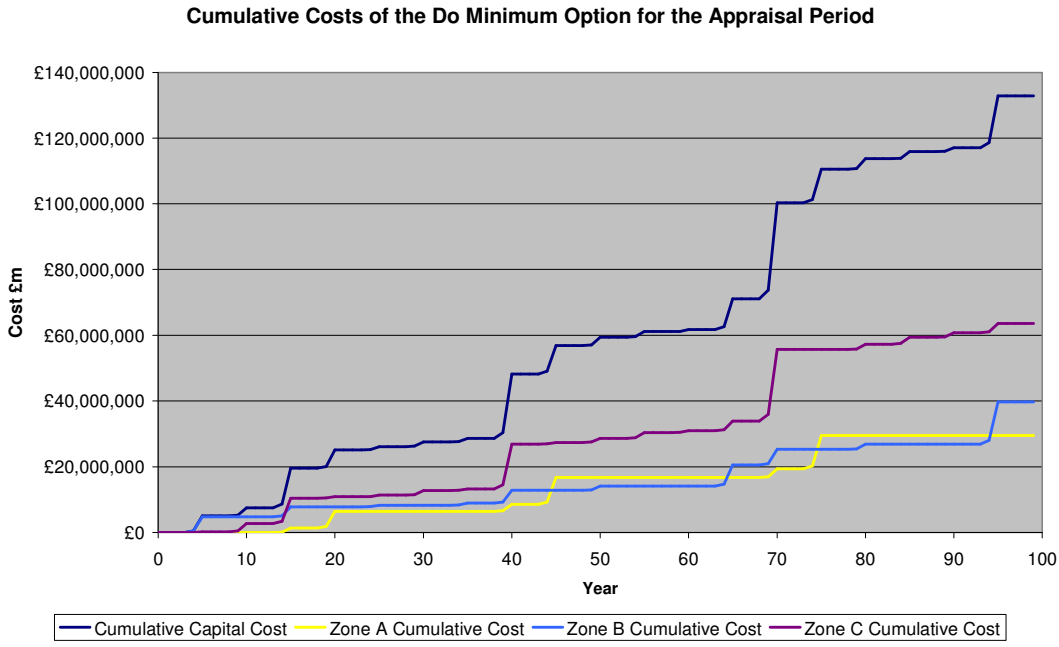


Figure 5-2: Cumulative Cost Profile (cash cost) of 'Do Minimum' for all zones

It may be seen that costs increase over time, as greater effort is required to maintain the defence. In effect, the approach moves from one of 'Do Minimum' (i.e. one of sustaining existing structures using sea wall strengthening) to one of constructing a full revetment and taking a Linear Defence approach over the whole frontage. The critical time/cost periods in this profile are when management moves from merely reinforcing the existing defence to one of effectively replacing the structures.

In this preliminary analysis, 'Do Minimum' is confined to doing the minimum necessary to sustain the defence in the short term until more major works become necessary. From Figure 5-2, it may be seen that, in the case of Zone C, the 'Do Minimum' spend profile increases significantly in year 15. This would then lead on to more substantial works over a time period of year 20 to 25, with further major investment in year 40 and year 65. In the case of Zone B, 'Do Minimum' would involve substantial investment in as

early as year 5. Further investment in this zone, which only contains three sections of defence, would then be incurred in year 15, and then many further interventions would be required over the 100 year appraisal period. Since Zone A is in better condition than other zones, there is relatively minor investment required over the first 20 years. It is not until years 20, 40 and 70 that subsequent works would be necessary.

Using the cost profile, in this Management Plan, 'Do Minimum' is defined as ending in year 20 in Zone A, year 15 in Zone B; and year 15 in Zone C. At these points in time, it is argued that the defences could not be sustained technically without more major intervention. If the decision were made to continue down the route of patch and repair after these decision points, then essentially, coastal management would be moving down an increasingly unsustainable pathway. As described in Section 3.3, this option would see a continuation of foreshore platform lowering, leaving the frontage progressively more vulnerable to defence failure.

'Do Minimum' is therefore appraised as a stand alone option, which ends in the respective years in each zone. Even though the analysis of beach and erosion behaviour shows that erosion (following defence failure) would in fact be greater if the foreshore platform was left to erode further, damages, following the end of the 'Do Minimum' works have been assessed for each zone as being those damages which would have occurred under 'Do Nothing', delayed by (and discounted over) the period of time over which the defences are being sustained. Under this 'Do Minimum' option, economic damages associated with flooding are delayed by five years (from 2026 to 2031) in Zone A, through the works carried out. These economic damages and benefits are set out in Table 5-2.

Table 5-2: Economic Damages and Benefits of 'Do Minimum'

Erosion Damages Number of properties	Medium term (0-20yrs)	Long term .(20-100 years)	Total (100 years)	Present Value Damages (PVd) (£k)
Residential	27	3282	3309	£95,838
Commercial	5	176	181	£11,958
Infrastructure	2	2	4	£14,488
Amenity				£178,521
Total Erosion PVd (£k)				£300,805
Flooding* Damages Number of properties	High Risk (> 5%)	Significant Risk (<5% to >1.3%)	Moderate Risk (1.3% to >0.5%)	Present Value Damages (PVd) (£k)
Residential	33	9	1	£18,384
Commercial	46	44	79	£3
Total Flooding PVd (£k)				£18,387
Total Do Minimum PVd (£k)				**£319,192**
Total Do Nothing PVd				**£363,476**
Present Value Benefits (PVb) of Do Minimum*				**£44,284**

* Present Value Benefits is the total Present Value Damages avoided, by implementing the option.

This preliminary assessment shows significant economic value in maintaining defence even over this short period of time, independent of what choice might be made for the future investment in the Clacton frontage. At the end of the defined 'Do Minimum' works, this approach as a plan for the area suffers from the same dis-benefits as 'Do Nothing'. In particular, in relation to the amenity and social objectives, there would be significant direct loss in beach use and through loss of confidence in the area. This would clearly have a major impact on the opportunity for regeneration and for attracting collaborative funding.

There is, however, a clear advantage of using 'Do Minimum as a short term platform prior to implementation of more sustainable management. It would allow more time for the realisation of opportunities for attracting collaborative funding, to facilitate future management. This would satisfy Plan Level Objectives Econ 3 and F1 (Section 4.1).

5.2.4 Do Something Approaches

There are a variety of different approaches, or technical options, that could be taken forward in for long-term defence of the frontage. In principle, these deliver three basic concepts of approach:

Linear Defence

This approach builds upon extending the life of the 'Do Minimum' approach discussed above. The basic concept would be to resist further horizontal erosion of the defence line, protecting the coastal slope and thereby providing protection to assets behind. In the medium to long term, it ultimately leads to construction of a rock revetment along the whole the frontage,

Sediment Management

The intent of the approach would be to restore and continue to maintain defences through introducing sediment and sediment supply to the frontage. The approach is limited to management of the sediment budget, without physically altering the exposure of the defences. The aim would be to protect the foreshore platform and to provide increased resilience to the existing defences.

Readjustment of the Shoreline

The aim of this approach would be to physically adjust either the shoreline shape or the way in which energy impacts on the shoreline. In taking this approach forward, there would be various approaches that could be adopted looking at a full scale adjustment of the energy regime. One way would be to exclude energy from direct impact on the shoreline, in effect, bringing the foreshore forward. The alternative is in adjusting the alignment of the shoreline such that energy is used to retain sediment locally against the existing defences. In either case there would still be a need to build upon the existing defences.

Together with the baseline options of 'Do Nothing' and 'Do Minimum' identified above, these 'Do Something' options provide the framework for development of the long list of Options developed below.

5.3 Technical Assessment of the Do Something Approaches

This initial assessment of options looks at, and discusses, the viability of technical approaches for delivery of a long-term solution to the frontage. This is developed as a long list of 'Do Something' approaches.

5.3.1 Linear Defence

The technical tools which fall under this concept are all based on the types of defences currently in place at Clacton. Many of them have been used in recent years in emergency and urgent works along the frontage. It is important to state here that although they are considered in this section as moving towards 'Linear Defence' as a conclusion for coastal management, many of them can also, and need to, be applied in conjunction with the options which move towards 'Sediment Management' and 'Readjustment of the Shoreline', as well as forming the 'Do Minimum' baseline option.

The options here can be divided into two categories:

1. *Sea Wall Strengthening*
2. *Construction of a Revetment*

Sea Wall Strengthening

Sea wall strengthening would involve works to the existing walls to extend the life of the defences and/or reduce the likelihood of overtopping which would result in a breach. There are a number of different engineering techniques included in this defence method. They are described and appraised in Table 5-3.

Table 5-3: Sea wall strengthening techniques

Technique	Reason	Appraisal
Construct a rock toe	To prevent undermining of the existing sea wall	Both options would deepen the foundations and maintain the stability of the wall as the foreshore platform and beach continued to lower. They could be carried out isolation without strengthening other parts of the sea wall. The poor condition of some defences at present would require strengthening in addition.
Construct a steel sheet pile toe, seaward of the existing toe		
Re-skin the existing sea wall with an overlay of concrete	To strengthen the sea wall and prevent failure	Concrete encasement would introduce a steep slope down to the beach and reduce access and increase health and safety risks. The relatively smooth slope would increase wave overtopping of the promenade.
Re-skin the existing sea wall with pre-cast concrete stepwork		This option has been the preferred solution for smaller scale sea wall strengthening works along the frontage over the past ten years. The solution involves propping the existing sea wall whilst pre-cast concrete units are placed in front of it and back filled to adjoin them to the existing defence line. The new wall is typically held by a steel sheet piled toe. Access to the beach is improved using this option and it is considered aesthetically acceptable.
Backfill the sea wall and reconstruct the promenade	To mitigate against the risk of voids developing beneath the promenade	A new row of steel sheet piles would be required in front of the existing defence line. Therefore for the promenade to be reconstructed, sea wall strengthening would also be required.
Protect the toe of the cliff	To prevent cliff failure behind the sea wall	This would only protect the cliff from failure above the existing defences. Access for construction would also be a significant problem as plant would not be able to access the base of the cliff on the promenade without significant strengthening of the coastal defences first. It would not prevent the ongoing problem of low defence condition.

The use of sea wall strengthening in isolation would, in effect, be a continuation of the present management of the frontage. Although technically possible, there are serious concerns over the long-term sustainability of this method, with the likelihood of accelerated erosion of the existing beaches and underlying clay. This would occur as

the size of waves reaching the sea wall would increase due to greater water depths and as the level of wave reflection increases. This cycle of erosion and exposure to waves would mean that regular foundation strengthening would be required, at 15-20 year intervals, and that increasingly substantial works would be required. However, it is considered that after the next cycle of foundation strengthening, beach levels would be so low that very substantial works would be required. This would involve a step change in costs and it would be necessary to undertake the reconstruction of the entire wall.

The need for regular and substantial works to the sea wall means that there are serious concerns over the long-term sustainability of this method.

Application at Clacton: Taking into account the technical concerns associated with sea wall strengthening, it is questionable whether the method in isolation is viable. There are reservations over the long-term sustainability of the method. This is apparent at stretches of Clacton where the solution has already been adopted. At York Road, pre-cast concrete stepwork was constructed in 2010 and shortly after construction the clay and beach level dropped in front of the defences, necessitating placement of rock to prevent undermining of the toe.

Rock Revetment

A revetment provides protection to the existing defences. A rock revetment would provide a means to dissipate wave energy, would mitigate to some degree against further lowering of the beach and support the existing sea wall. The scale of the revetment could be varied from a small buried toe to a full height revetment depending on requirements at any given location. Any revetment would require stabilisation works to the existing sea wall to ensure that this does not fail from behind the new structure.

A revetment constructed along the frontage could be constructed from concrete units, asphalt or rock. They are each technically appraised in Table 5-4.

Table 5-4: Revetment Types and Technical Appraisal

Revetment Type	Technical Appraisal
Rock	The rock would act as a support to the existing sea wall. It would aid the dissipation of wave energy and would partially mitigate against the lowering of the foreshore platform and beach level over the medium term.
Concrete Armour	This method would have a very similar impact to rock revetment but would be constructed from concrete armour units, laid onto a rock underlayer. However, there would be significantly higher construction costs associated with this material. Abrasion has been seen to be an issue in areas of existing defences.
Asphalt	This would involve an open stone asphalt revetment being constructed in front, and on top, of the existing defences, with fill used to fill the void beneath it. It would also dissipate wave energy. Construction in the intertidal zone would make this a difficult option to construct and would also give rise to a health and safety risk as the slope would be accessible to the public but would still be relatively steep.

The non-vertical nature of any revetment type would provide a means to dissipate wave energy (the extent to which this occurs would be dependent on the material used to construct the revetment). Any of the revetment types described would also require stabilisation works to the existing sea wall to ensure that this does not fail from behind the new structure. The method by which this would occur would depend on the type of existing defence.

Application at Clacton: A revetment is considered a practical 'Do Minimum' approach to the study frontage. The benefits it would provide include some mitigation against the falling foreshore platform and beach levels, and, combined with some sea wall strengthening; it could offer a relatively easy method to prevent defence failure and subsequent cliff erosion. In the short to medium term, however, it is a 'Do Minimum' method, because it would not stop platform and beach lowering, and would also severely reduce beach access and amenity value of the frontage. As for the construction material, concrete armour and asphalt are ruled out at this stage because of their respective associated cost and health and safety implications. Rock revetment, however, is carried to the next stage of appraisal.

5.3.2 Sediment Management

The viable technical methods to manage the sediment budget at Clacton are as follows:

1. Beach Management;
2. Beach Nourishment;
3. Groynes are included in this section, and could be used in combination with both 1 and 2 because their purpose is to control the movement of the sediment in the long shore direction, without any significant realignment of the shoreline.

Beach Management

Beach Management, by definition, involves the regular recycling of material within the frontage and the importation of limited quantities of new material. It would facilitate the maintenance of beach levels, to protect the foreshore platform, extend the life of the defences and reduce the level of any wave overtopping.

With the exception of the beaches to the west of the pier there are no large accumulations of sediments along the study frontage which could provide a source of material for recycling operations. The recycling of material from the western end would reduce the standard of protection provided along this length and, taking into consideration the likely volume available for recycling, would result in limited and short-term improvements to the remainder of the frontage.

During storms, the rate of longshore drift could effectively outstrip the endeavours of the beach management by moving recycled sediment back along the frontage and distributing imported material throughout the frontage.

Application at Clacton: Beach Management is not technically viable as any improvements in beach levels would only be short term. The method is, therefore, rejected and could only be considered as a maintenance measure after the completion of a nourishment scheme. Beach management is, therefore, not considered as a

technical defence method within the long list of strategic options. As such, it is not assessed against the Plan level objectives.

Beach Nourishment

Beach Nourishment would involve the importation of substantial quantities of material to "rebuild" the beaches where levels are low. The material used could be either sand or shingle.

Beach nourishment would ensure the mitigation against the problem of falling beach levels at the frontage. Specifically, it would:

- Bury the foundations of the existing sea walls and reduce the risk of the defences being undermined. The higher beach would also protect the underlying clay by reducing the risk of it being exposed and eroded. Nourishment would, therefore, extend the life of the existing sea walls. The protection provided to the clay platform would also ensure that the risk of cliff failure is reduced; and
- Reduce the level of any wave overtopping and, therefore, raise the standard of defence against breaching (from overtopping).

A substantial beach would be required to isolate the sea wall from wave attack. The quantity of nourishment material placed should be sufficient to allow beach profile changes to take place without re-exposing the sea wall to wave attack. Insufficient nourishment would quickly lead to re-exposure of the sea walls and accelerated loss of the beach. The material used could be either sand or shingle. Table 5-5 provides a technical comparison between the use of sand or shingle for this method of coastal management.

Table 5-5: Technical comparison between sand and shingle nourishment

Material	Sand	Shingle
Description	Both materials would be obtained from an offshore source and placed onto the beach making it higher in level. This would reduce wave attack on the defences, prevent undermining of the defences and reduce cliff instability.	
Technical issues	A larger volume of sand would be required compared with shingle due to the resulting typical profile of 1 in 15.	A smaller volume of shingle would be required compared with sand due to the resulting typical profile of 1 in 7.
	Both materials would be subject to substantial wave driven longshore movements.	
	Sand would be subject to large cross shore changes during storms. Material would be removed from the beach crest and deposited offshore (drawn down). Being further offshore, the material would be vulnerable to erosion by tidal currents.	Cross shore movement of shingle would not cause the same problems as sand as the material will tend to be pushed landwards creating ridges at the toe of the defences.
	Windblown transport of the material can cause nuisance problems as it might pile up on the sea wall.	Sufficient shingle would be required to ensure that profile change can occur without material

Material	Sand	Shingle
		being thrown up by waves onto the promenade during storms.
		Mixing of the shingle with the existing beach material could alter the grading of the nourishment material and increase mobility of the beach, making it difficult to manage.
Grading (cost basis)	0.5mm	5.0mm
Availability	Both materials are available from local licensed aggregate sites in the outer Thames Estuary. The mixture of aggregates at each site would require screening to produce material predominantly with sand or shingle gradings.	
		Large quantities of shingle of a consistent grading are unlikely to be found. Therefore there is a risk that shingle of the required grading would not be available and that a supply of variable grading would affect the performance of the beach.

Application at Clacton: This method is technically viable in isolation, however, there are concerns over the subsequent effort required to manage the frontage to avoid losing the placed material.

The large longshore movements of material within the frontage would result in lengths over which beach levels would be low and lengths where material would temporarily accumulate due to differential drift along the frontage under different wave conditions. The frontage has been shown through modelling to be exposed to significant movement both to the north and south. This erosion and accretion would vary in both extent and duration depending on the particular sequencing of storms from the east and south west. This behaviour would make it very difficult to maintain a consistently high standard of defence and a high level of protection to the existing sea wall. The solution to this would likely be annual recycling (Beach Management) operations to be undertaken together with the regular renourishment operations.

Even with these operations there would be an on-going loss of sediment from the frontage. Typical annual losses could be of the order of 5000m^3 a year (Appendix A). In the case of sand and there would, therefore, be an on-going requirement for further major renourishment.

As a stand alone option, this approach was considered during the development of the 2000 Strategy. This option was rejected in that appraisal on the grounds of on-going cost.

Groynes (Refurbishment or Replacement)

Groynes (refurbishment or replacement) would involve refurbishment of the existing groynes or the construction of new groynes along the frontage. Groynes could be constructed from timber, steel, concrete or rock and would limit and control the longshore movement of beach material but would have negligible influence on the cross shore behaviour of the beach during storm events. As the problem along the frontage is related to the lack of sediment, on their own, groynes would not be an effective method to raise beach levels as sediment could still be moved offshore. Subsequently, groynes would need to be used in conjunction with beach nourishment.

In terms of the placed material type, groynes would be most effective with shingle because shingle is less mobile in the cross shore direction as sand. With the additional beach material from the nourishment, groynes would control the movement of the placed material, maintaining higher beach levels against the sea wall. This would protect the toe of the wall as well as providing a degree of protection to the underlying clay foreshore platform.

It must be noted that groynes with shingle nourishment would only effectively provide protection over some 30m of the upper beach and this would vary with specific wave direction. While this would provide some protection to the foreshore platform, the continued beach lowering would still only be delayed. Based on this, there is the potential to use this technique locally or as a means to extend the period of 'Do Minimum' but not as a long-term solution.

Application at Clacton: Groynes (with shingle nourishment) is a technically viable method and is, therefore, carried forward to the next stage of the appraisal.

5.3.3 Readjustment of the Shoreline

There are two technical methods which could be used to readjust the shoreline at Clacton and Holland-on-Sea. Both options would require beach renourishment to be initially implemented in addition to the structures, with beach management used to maintain the sediment volume along the frontage. The two options are described below:

Detached Breakwaters

Detached breakwaters would aim to pull forward, or provide width to, the shoreline within which to retain sediment. Their principal function would be in reducing the wave climate over the frontage. They would be constructed from rock and would be placed parallel to the frontage in a series. They limit the source of the problem at Clacton by reducing the energy impacting on the shoreline. This dissipation of wave energy would allow the retention of beach material within their lee. The diffraction of waves around the ends of the structures would re-orientate the existing beaches resulting in a gain of material over the lengths behind the structures and a loss over the lengths opposite the gaps.

Detached breakwaters, in combination with nourishment, would provide and maintain high beach levels against the existing sea walls. This would protect the toe of the walls, protect the underlying clay foreshore platform and reduce the level of any wave overtopping. The detached breakwaters would reduce the volatility of the beach by reducing the potential for both the longshore and cross shore transport of material by wave action. Although there would probably remain a need for periodic recycling/renourishment of the frontage the beach control structures would enable this to be a planned, rather than an emergency, operation.

Sand or shingle could be used as the nourishment material (see Table 5-5 for a comparison).

Application at Clacton: Detached breakwaters (with sand nourishment) were the preferred approach selected in the 2004 Strategy[1]. It remains a technically viable method and will be taken forward to the next stage of this appraisal.

Fishtail Breakwaters

Fishtail breakwaters would aim to retain sediment in specific areas by realignment of the shoreline to create headlands. In doing this, fishtails differ in principle to breakwaters, which pull the whole shoreline forward. This approach, as has been seen further south along the coast at Jaywick, results in embayments. In this situation, beach width still requires careful consideration between the structures. The headland approach, however, does provide the opportunity to realign wave energy across a length of the frontage and retain sediment over a wider area of foreshore between structures. It is in this context that the generic term of “Fishtails” is used in this appraisal. In reality, fishtails can range in size, shape and influence; from the shore-linked breakwaters developed at Jaywick, through to shorter modified crosshead groynes. Equally, under this technical option, the fishtail approach would include structures adapting the alignment of the existing defence such that that alignment is brought forward to retain sediment with respect to specific wave directions. This range of fishtail shapes is shown in outline in Figure 5-3.

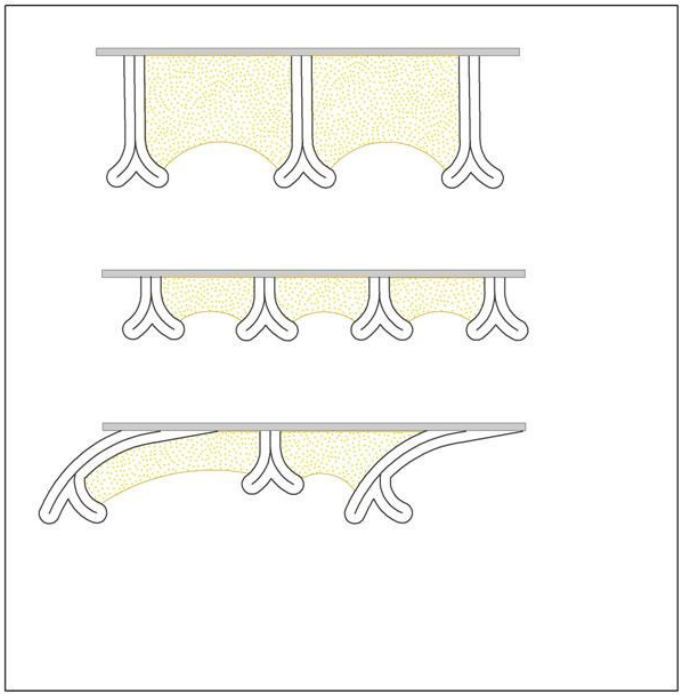


Figure 5-3: Schematic of Fishtail Breakwater Variation

Like detached breakwaters, fishtail breakwaters shelter the adjacent beach from wave action and also draw material into their lee by wave diffraction around the ends of the "tails". As groynes, the structures perform two functions; they deflect the tidal currents offshore and reduce the current induced transport of material that would otherwise be drawn down the beach by wave action. They also significantly reduce the longshore movement and hence reduce losses from the frontage. The additional beach material from the nourishment would ensure that the bays between groynes maintain a suitable minimum width to protect the structures at the back of the beach. The benefit of this Fishtail Breakwater approach over Detached Breakwaters is its greater flexibility in design, and in being able to adapt the shape to incorporate local variation.

With beach renourishment, fishtail breakwaters would provide and maintain high beach levels against the existing sea walls. This would protect the toe of the walls, and protect the underlying clay foreshore platform. As already alluded to, an accumulation of material adjacent to each Fishtail Breakwater would lead to lower beach levels within the central section of each bay formed between the breakwaters. To allow the natural beach plan shape to develop within each bay, and recognising that this would intersect with the current line of defence, some limited form of Linear Defence option may also be required.

This would be acceptable, subject to achieving the necessary cover to the foreshore platform over the whole sub-bay created between the fishtail control points.

As with detached breakwaters, beach nourishment could consist of either sand or shingle. However, in general, sand would be preferred from the amenity perspective.

Application at Clacton: Fishtail breakwaters (with sand or shingle nourishment) are a technically viable method and are, therefore, carried forward to the next stage of the appraisal. Their successful application to this coastline is exemplified with the defences at Jaywick to the southwest. The specific form of the fishtail breakwater will be adapted in this Plan, with the intent to physically retain and realign the shoreline. This will be considered further.

5.3.4 Summary of Initial Assessment

This assessment started with the high level options for the frontage, including 'Do Nothing', 'Do Minimum' and 'Do Something'. It then looked in detail at the types of 'Do Something' options which could be taken forward in this Management Plan.

It is clear that the 'Do Nothing' option fails to meet socio-economic, political, environmental and technical objectives and is contrary to the agreed intent of management from the SMP. If implemented it would result in significant loss of residential and commercial properties, meaning that a significant number of people would have to move away from the area. The town of Clacton would cease to exist as it is today. Nonetheless, 'Do Nothing' is taken through to appraisal as the baseline upon which all other options can be compared, and to illustrate the future for Clacton if no funding for coastal management becomes available.

Similarly, Managed Realignment over the whole frontage is not considered appropriate to achieve the objectives of the Plan. There would be a need to undertake substantial works to secure continuity of defences to the south of the study frontage, while over the main frontage there is no set back line that would provide a more sustainable defence position, without loss of significant assets and very high costs for adaptation.

It is clear that in the context of the constraints of funding, the 'Do Minimum' option becomes a critical consideration at Clacton, but only as a short to medium term expediency. This is recognised and is the reason why the option has already had a level of cost appraisal carried out, converse to the other options. This early assessment of the types of work which would be required, and their associated costs, indicates that there is a specific, observable time at which the 'Do Minimum' actually evolves into a 'Do Something' option, that being a Linear Defence approach to the frontage. The 'Do Minimum' is, therefore, taken forward in appraisal as a stop-gap measure which will hold the line at Clacton for up to the next 20 years. This would provide the time to realise opportunity for developing alternative funding sources. Failing funding becoming available, there must then be a decision to choose either 'Do Nothing', and accept that Clacton cannot be physically sustained, or move towards the Linear Defence approach to management, and accept that there will not be a beach at Clacton, leading to the probable economic demise of the town.

The acknowledgement above that 'Linear Defence' cannot be considered a sustainable solution to the frontage immediately leads to the rejection of the approach as part of the 'Do Something' suite of options. The option is likely to have significant capital costs as the scale of works required to hold the line, in the presence of continued beach lowering would escalate over time. Linear Defence would be implemented as the evolution of the 'Do Minimum' option over the 100 year appraisal period. As such, the costs of this

option have been calculated and are illustrated in Table 5-6. This supports the statement that it would involve significant capital cost.

Table 5-6: Do Minimum and Linear Defence costs

Option	Zone A		Zone B		Zone C	
	Time (years)	PVc (£k)	Time	PVc (£)	Time	PVc (£)
Do Minimum only	0-19	£932,465	0-14	£4,251	0-14	£2,210
Linear Defence	20-100	£7,043	15-100	£9,758	15-100	£15,337

The second suite of options under the 'Do Something' approach is 'Sediment Management'. Three major options were postulated in this approach (beach management, beach nourishment and beach nourishment with construction of groynes). The lack of sediment along the frontage rules out beach management as a potential option at present. There is recognition, however, that this approach would work if used with initial beach nourishment, in conjunction with the construction of a significant groyne field, followed by annual beach management campaigns. This combination starts to solve the problem of beach loss along the frontage. The relatively short width of the foreshore platform over which it would provide protection, however, means that it would not completely solve the problem at Clacton. It would also not be economically sustainable over the full 100 year appraisal period due to the ongoing cost of replacing sediment lost from between the groyne bays. There is, however, benefit in taking forward this approach as an option between 'Do Minimum' and 'Do Something'.

The third approach, 'Readjustment of the Shoreline' provides the premise for another two 'Do Something' options for the frontage. It is evident that readjustment of the shoreline provides enough protection for the frontage to make it technically feasible. In addition, either two of the options within this approach (detached breakwaters and fishtail breakwaters) can be seen to achieve a large number of the objectives outlined in Section 4.1. At a more specific level, the choice between Detached Breakwaters and Fishtail Breakwaters requires more detailed appraisal. The difference between the two lies largely in that the former brings the whole shoreline forward, whilst the latter offers a more selective approach to readjustment.

This discussion is summarised in .

Table 5-7: Summary of Long List of Options Appraisal

Defence Methods	Problems Solved?				Further Comments
	Low Residual Life		Overtopping	Long-Term Sustainability	
	Foundations	Above Foundations			
Do Nothing	X	X	X	X	Provides no protection to the frontage. Rejected but appraised as the baseline.
Do Minimum	✓	✓	✓	X	Provides protection but only over a short time period.
Do Something:					
Linear Defence					
Sea wall Strengthening	x	✓	✓	X	Can be undertaken alone. But not sustainable as beach levels will continue to lower.
Rock Revetment	✓	✓	✓	X	Would provide a medium term solution over the whole frontage but is not sustainable.
Sediment Management					
Beach Management	X	X	X	X	Rejected as an option, but would be required in the future of any Do Something options to renourish the frontage.
Beach Nourishment	✓	X	✓	✓	Rejected as an option in itself, because it is unsustainable. Taken forward if used with groynes, if shingle were used for nourishment, as part of a more sustainable variation of 'Do Minimum'. Also taken forward in combination with beach control structures as part of options to readjust the shoreline.
Groynes	✓	X	✓	X	Cannot be undertaken alone and therefore rejected. Considered if undertaken with shingle nourishment as part of phased development of coast protection.
Readjustment of the Shoreline					
Detached Breakwaters	✓	X	✓	✓	Cannot be undertaken alone. Viable if undertaken with sand nourishment.
Fishtail Breakwaters	✓	X	✓	✓	Cannot be undertaken alone. Viable if undertaken with sand nourishment.
Sea Wall Strengthening	✓	✓	✓	X	Still required to provide stability to coastal slope (retaining structures) and to maintain access (amenity).
Rock Revetment	✓	✓	✓	X	Potentially required to address local areas of defence.
Groynes	✓	X	✓	X	Potential for maintaining areas of defence as a more sustainable approach than 'Do Minimum', as part of phased development of coast protection.

5.3.5 Development of the shortlisted options

The initial assessment carried out has fulfilled its purpose in ruling out a number of the generic options for the frontage. In addition, a 'hybrid' option of rock groynes with shingle renourishment has emerged from the Sediment Management approach, providing an approach which lies between 'Do Minimum' and 'Do Something'. Table 5-8 provides an overview of the resulting short list of options. Linear Defence has been rejected as a 'Do Something' option but options previously contained within it are used in the 'Readjustment of the Shoreline' options.

Table 5-8: Shortlist of options

Category and Name		Description	Comments
1	**Do Nothing**	As given in Sections 3.2 and **Error! Reference source not found.**.	Used as a baseline for appraisal only.
2	**Do Minimum**		
2.1	Patch and Repair	Patch and repair using sea wall strengthening and rock revetment techniques.	Does not provide protection for 100 year appraisal period. Cost profile in Section **Error! Reference source not found.** used to define when it becomes more than 'Do Minimum' and therefore protection ceases without more significant interventions.
2.2	Patch and Repair with Sediment Management	Patch and repair using sea wall strengthening and rock revetment techniques and Beach Renourishment (shingle) with groynes.	Provides more protection to the foreshore platform and existing defences than Patch and Repair alone, but at greater cost. However it does not prevent long-term beach lowering. Therefore this is also considered as a 'Do Minimum' option.
3	**Do Something**		
3.1	Detached Breakwaters	Detached Breakwaters with sand Beach Nourishment. Sea wall strengthening and potential rock revetment also required to maintain the backline of defence.	Brings the whole shoreline forward. This option builds and develops upon the 'Do Minimum' approach with staged construction of breakwaters as 'Do Minimum' reaches its critical cost and resource point.
3.2	Fishtail Breakwaters	Fishtail Breakwaters with sand beach renourishment. Sea Wall Strengthening and potential Rock Revetment	Selective bringing forward of the shoreline, between headlands. This option builds and develops upon the 'Do Minimum' approach with

Category and Name		Description	Comments
		also required to maintain the backline of defences, in addition to local areas in the centre of embayments.	staged construction of groynes as 'Do Minimum' reaches its critical cost and resource point.

This shortlist of options is now further refined by considering them in relation to the specific context of the three Strategic Management Zones. The management needs of each zone, described in Section 4.2, play an important role in this refinement process. At this stage, the criteria set out in the SEA[3] are also used in the appraisal of the refined options.

6 DEVELOPMENT OF THE SHORTLISTED OPTIONS

6.1 General Discussion

The generic high level and 'Do Something' approaches to the frontage have been identified, described and appraised in the previous section. This has led to a number of options being ruled out and the development of the shortlisted options. This section now looks in detail at the application of those options to the three Strategic Management zones; Clacton Resort (Zone A), Clacton Town (Zone B) and Residential Clacton (Zone C).

Looking at the application of the shortlisted options to specific areas in Clacton allows this Management Plan to consider first and foremost what the desired outcome for the frontage is in the long term; and second, what pathways there are to achieve that outcome, in line with the constraints and opportunities in different areas of the frontage. This identification of pathways of management can be used to develop a decision making tool, applicable over the 100 year Management Plan appraisal period. As discussed in Section 3.4 this, as well as providing a means to identifying a preferred option for the frontage in terms of risk management, can also be seen as fulfilling the aim of providing a platform for future collaborative partnership. It is envisaged that this decision making tool would provide the correct information to allow alternative pathways of management to be taken, as and when the availability of funding occurs.

For all three zones, the known constraints in terms of funding for any long-term solution at Clacton means that the Plan includes a period of taking a 'Do Minimum' approach whilst the availability of collaborative funding is being explored. The 'Do Minimum' patch and repair approach continues what is happening at present but provides a better estimate of when work might be needed in the future, allowing this to be planned. The types and timings of works have been identified and their associated costs quantified in Section 5.2.3 leading to the definition of the 'Do Minimum' time period for each zone. The residual life of the defences therefore remains the key determination of when, and where, works are required. It must be noted, however, that as soon as collaborative funding becomes available, it is always preferable to move toward the preferred long-term solution; the end of the 'Do Minimum' period therefore indicates a decision point after which the patch and repair management pathway becomes much more difficult to reverse.

In the case of Zone C, there are a variety of defences that might fail over the next 15 years, some of these are relatively short lengths but with more extensive lengths of work required by year 15. Consideration of 'Do Minimum' therefore ends in year 15. In Zone B there is a relatively immediate risk due to the poor condition of the Wave Walkers (year 5). After this, 'Do Minimum' can also only be taken to last until year 15. In Zone A, the defences are generally in better condition and there are fewer requirements for immediate investment. However, over the medium term (year 20), the deterioration of beaches results in year 20 being defined as the recommended time for adopting a change to a more sustainable approach to management.

Further discussion of the specific 'Do Minimum' works required is given per zone in the following sections. In the context of developing a decision making tool, reference is

made to critical decision points in all the following assessments. These decision points are based on defence residual life and, due to their impact on the phasing of construction, play an important role in the cost appraisal of options. At these points, critical choices will have to be made in terms of approach to future defence; and in terms of when significant investment would need to occur, as well as what the future use of the shoreline may be. Whilst these critical decision/cost points are given as a specific year, it is recognised that this would be subject to monitoring of beach behaviour and defence condition. They are presented as flow charts for each of the Strategic Management Zones.

6.2 Local Approaches

6.2.1 Zone A: Clacton Resort

Overview

The location of defence lengths and general layout of the frontage is shown in Figure 6.2. Starting from this, overall decision pathway for the frontage is set out in Figure 6-3 and is discussed below. The specific issues and opportunities for this zone are described in Section **Error! Reference source not found.**.

The SMP2 policy is taken as defining the approach to the frontage to the south of the study area. This means that Defences A and B in this zone will continue to be maintained by the Environment Agency over the next 50 years but that in epoch 3 (50 to 100 years) there is the possibility that defence of the shoreline to the immediate southwest might be set back.

In examining the approach to Zone A, therefore, the aim is to ensure that the integrity and continuity of defence is maintained between the Clacton frontage and that of Jaywick but in a manner that does not predetermine the long-term need for maintaining the full extent of the shoreline defence to the south.

Figure 6-2: Defences in Zone A

Overall, the basic condition of the defence is good and only local improvements are required in the short term. Of the two Tendring District Council maintained defence lengths in this zone, Defence C is most critical. It is assessed that, if this defence line is to be maintained, works involving construction of a rock toe will be required at this location by 2025 (Option A2.1 - year 15, Figure 6-3 3). This would provide continued flood defence and would improve integrity of the overall defence to Zone A.

Defence D is at present protected by a more substantial beach. As it becomes harder to maintain this beach and as the defence behind continues to deteriorate, it is estimated that more substantial intervention would be required in 2030 (year 20). Without this work, Defence C would be outflanked, potentially opening up risk of flooding and erosion would commence to the coastal slope behind. If this point were reached and investment occurred to reinforce the existing sea wall, without also addressing further beach loss,

there would be little incentive to move towards a more adaptive approach. There would also be little opportunity to develop upon the use of the frontage and little opportunity for collaborative funding to take forward management in a more progressive manner.

Year 20 (depending on monitoring of condition and beach change) is, therefore, seen as being the critical point when, if continued, 'Do Minimum' option (Option A2.1) would evolve to an approach of 'Linear Defence'. Whilst this would continue to provide risk management over the next 100 years and would satisfy the hold the line policy for the area, such an approach would eventually lead to an increasingly unsustainable approach to long-term management. As such this option is not discussed further in this Management Plan.

An alternative to the approach of reinforcing the existing defences to the frontage could include changing to an approach of sediment management. This is a technically realistic approach (Option A2.2), using rock groynes and shingle nourishment, potentially providing adequate baseline defence for a further 40 years (until year 60). However, even this approach limits use of the frontage and, as significantly, reduces the opportunity for adaptation, becoming more difficult to sustain as the beach and clay platform continues to erode. Although it would be technically feasible to move back to a more sustainable approach of management following implementation of Option 2.2, the likely costs associated with this option are not seen as being cost effective in the long-term, in attempting to meet specific objectives for the zone.

Alternatively, there are two 'Do Something' approaches available. They would involve construction of either Detached Breakwaters (Option A3.1) or Fishtail Breakwaters (Option A3.2). Either of the options would typically be taken following from 'Do Minimum' whilst collaborative funding is being explored, but at the latest in year 20, prior to the more major works required to Defence D. The critical decision point would, therefore, be in year 20, although clearly these options could be advanced if sufficient funding related to management were brought forward.

The options are discussed in more detail below.

Figure 6-3

Option A2.1 'Do Minimum' - patch and repair

Description

'Do Minimum' for this zone would likely require some sea wall strengthening at Defence C in year 15 or before (Figure 6-4). This is likely to involve repairs to the existing structure and construction of a rock toe, with concrete encasement. In short, this would hold the line at Defence C for 25 years before further works would be needed. Further works at this location would involve more reinforcement of the rock toe and gradual replacement of the existing structure with a rock revetment. As this is next to the RNLI slipway, works would need to ensure that access is maintained.

Expenditure on 'Do Minimum' would cease in year 20, therefore, it is assumed that Defence D, with a residual life of 20 years, would still fail in this scenario. Overall, 'Do Minimum' only delays failure of Zone A for a total 5 years.

Figure 6-4: Zone A Do Minimum patch and repair defence lengths

Economic assessment

The costs and benefits are set out in Table 6-1. These are summarised in comparison with other options for the whole Plan area in Table 6-13.

Table 6-1: Economic Damages and Benefits following Option A2.1 in Zone A

Erosion Damages Number of properties	Medium term (0-20yrs)	Long term .(20-100 years)	Total (100 years)	Present Value Damages** (PVd) (£k)
Residential	0	1037	1037	£26,844
Commercial	1	31	32	£1,184
Infrastructure				£0
Amenity				£107,112
Total Erosion PVd (£k)				£135,140
Flooding* Damages Number of properties	High Risk (> 5%)	Significant Risk (<5% to >1.3%)	Moderate Risk (1.3% to >0.5%)	Present Value Damages** (PVd) (£k)
Residential	33	9	1	£18,384
Commercial	46	44	79	£3
Total Flooding PVd (£k)				£18,387
Total Do Minimum PVd (£k)				**£153,527**
Total PVd determined for Do Nothing Zone A				£169,516
Total Present Value Benefits* (PVb) of Option A2.1 (£k)				**£15,989**

*Present Value Benefits is the difference between Do Nothing PVd and Do Minimum PVd.

Cost: ***£1,516k*** *by year 20 with a PV cost of* ***£932k.***
Benefit Cost Ratio: ***17.16***

Discussion of Opportunity
As the beach is currently very low in front of Defence C, the initial management approach of 'Do Minimum' is unlikely to have a negative impact on land use in the short term at this section.

Disadvantages
A 'Do Minimum' approach alone at Defence D would mean an acceptance that the beach and promenade here, which are presently the main tourist attractions for the whole frontage, would no longer exist. This would have a significant impact on the tourism revenue for the wider Clacton Town. In addition, it would also result in a loss of the setting of the historic Pier, as well as causing significant residual economic damages. There are also likely to be longer-term loss of the Conservation Area. Although the minimal works associated with this option mean that there would be a low cost, and low carbon footprint, there is likely to be a significant resultant cost and carbon implication associated with the need for development and relocation elsewhere.

Conclusion
Do Minimum is taken forward as an interim step before any of the 'Do Something' options. Do Minimum is considered over the first 20 years in Zone A.
Potential FDGiA contribution towards option: **£1,156k**

Option A2.2 'Do Minimum' – patch and repair with sediment management

Description

This would involve the implementation of 'Do Minimum' Patch and Repair until year 20. Following this, in year 20, six Rock Groynes, with Shingle Nourishment would be required (Figure 6-5. The short length of this zone means that all groynes would be constructed in this initial year. It is estimated that this option would last until year 60, after which the costs associated with it become too high to justify, largely because the clay platform would not be fully protected and would continue to lower.

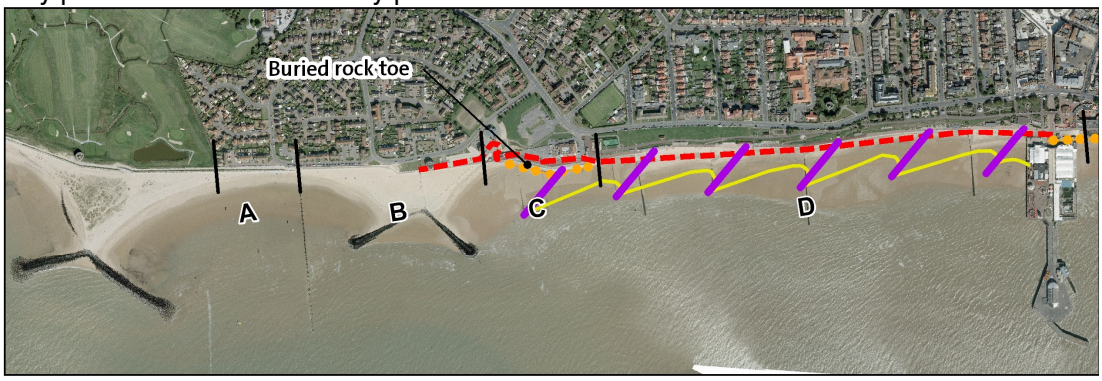


Figure 6-5: Zone A Do Minimum sediment management layout

Economic assessment

Costs and benefit are set out in **Error! Not a valid bookmark self-reference.** and are summarised in comparison with other options for the whole strategy area in Table 6-13.

Table 6-2: Damages following Option A2.2 in Zone A

Erosion Damages Number of properties	Medium term (0-20yrs)	Long term .(20-100 years)	Total (100 years)	Present Value Damages** (PVd) (£k)
Residential	0	786	786	£8,669
Commercial	0	22	22	£391
Infrastructure	0	0	0	£0
Amenity	0	0	0	£52,887
Total Erosion PVd (£k)				£61,947

Flooding* Damages Erosion Damages	High Risk (> 5%)	Significant Risk (<5% to >1.3%)	Moderate Risk (1.3% to >0.5%)	Present Value Damages** (PVd) (£k)
Residential	0	0	0	£0

Date

Years

2011

0

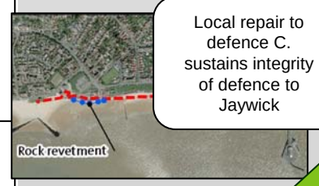
? Year 0

Do Nothing

Option A1

2020

10



Local repair to defence C. sustains integrity of defence to Jaywick

Local maintenance over first 15 years

No further maintenance

Option A2.1 Do Minimum

? Year 15

Revert to Do Nothing

Defence C fails

2030

20

Delays failure by 5 years

Advance long term solution, subject to funding

? Year 20

Option A2.2 Enhanced Do Minimum

Delays need for long term solution but with significant investment

Do Minimum then Do Nothing Defence D starts to fail

Major investment in rock toe works to defence D tending towards Linear defence.

2040

30

Option A3.1 Detached Breakwaters

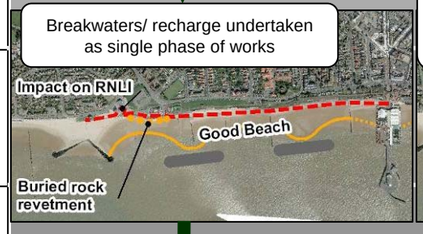
Option A3.2 Fishtail Breakwaters

Delays need for long term solution but with significant investment

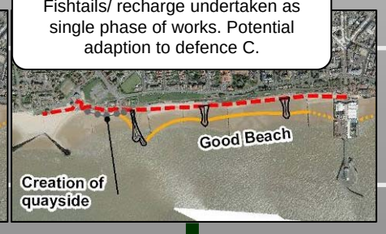
2050

40

Breakwaters/ recharge undertaken as single phase of works



Fishtails/ recharge undertaken as single phase of works. Potential adaption to defence C.



Major investment in groynes and shingle beach recharge.

? Year 40 - 45

2060

50

Deteriorating condition of beach

Significant further investment in rock revetment.

2070

60

Opportunity for sustainable defence. Improved beach area. Constrains adaption to funding.

Opportunity for sustainable defence. Improved beach area.
Creates opportunity for developing use. Subject to funding.

? Year 60

2080

70

2090

80

2100

90

2110

100

OUTCOME:
Maintains sea front , provides a sustainable approach to future management.

OUTCOME:
Loss of sea front , unsustainable approach to management.

Zone A

Commercial	0	0	0	£0
Total Flooding PVd (£k)				£0
Total PVd (£k)				**£61,947**
Total PVd determined for Do Nothing Zone A				£169,516
Total Present Value Benefits (PVb) of Option A2.2 (£k)				**£107,569**

Initial cost of Do Minimum (Option A2.1): £1,516k by year 20 with a PV cost of £932k

Cost: ***£8,723k*** *by year 60 with a PV cost of* ***£4,108k***
Benefit Cost Ratio: ***21.34***

Discussion of Opportunity
This option would sustain the defences at the base of the cliff over a longer time period than patch and repair alone. There is scope to use the location of the present groynes as a basis for the location of new rock groynes, and to refurbish some of the present groynes as smaller, interim groynes. As discussed in the initial assessment this would be based on rock groynes with shingle nourishment. Shingle would form a steep beach between these groynes which would provide the required protection to the foreshore, immediately in the vicinity of the defence foundations. This option would maintain some amenity value of the zone, although this value would likely be significantly affected by the change from sand to shingle. It does allow for some flexible adaptation to changing sea levels, enabling management to benefit from improving knowledge over time.

Disadvantages
The major issue associated with using this option is in the placement of shingle on a currently popular sand beach. This is likely to have a negative impact on the tourism and amenity value of the area. This option also tends to preclude a more adaptive approach, because shifting from this 'Enhanced Do Minimum' approach, to one providing a longer term sustainable approach enhancing the values of the area for continued beach use would be difficult. The relatively short profile length over which the steep shingle beach would be placed would also not fully protect the clay platform. Subsequently, this option would require significant investment in year 60 in order to sustain it over the full appraisal period.

Conclusion
For the reasons outlined above regarding the impact on tourism and amenity value of this popular sandy beach means that this local option does not deliver the specific objectives of management for this zone. It is therefore not developed in any further detail in this Management Plan. It does, however, remain a technically viable option in the options contained in the decision pathway for this zone.

Option A3.1 Detached Breakwaters
Description
The area over which Detached Breakwaters have an influence, combined with the relatively short length of this zone, mean that the whole zone would be considered in one construction phase. Two detached breakwaters would be constructed over this area in year 20, following 'Do Minimum' works prior to this. The beach behind the

breakwaters would be nourished with sand. Figure 6-6 provides the typical layout of the Detached Breakwaters in this zone.

Figure 6-6: Zone A Detached breakwater layout

Economic assessment

Costs and benefits are set out in Table 6-3 and are summarised in comparison with other options for the whole strategy area in Table 6-13. The scheme would provide long-term protection to the area and would not result in loss of amenity. The benefits of the scheme are taken as the 'Do Nothing' damages avoided.

Table 6-3: Damages following Option A3.1 in Zone A

Erosion Damages Number of properties	Medium term (0-20yrs)	Long term .(20-100 years)	Total (100 years)	Present Value Damages** (PVd) (£k)
Residential	0	0	0	£0
Commercial	0	0	0	£0
Infrastructure	0	0	0	£0
Amenity				£0
Total Erosion PVd (£k)				£0
Flooding* Damages Erosion Damages	High Risk (> 5%)	Significant Risk (<5% to >1.3%)	Moderate Risk (1.3% to >0.5%)	Present Value Damages** (PVd) (£k)
Residential	0	0	0	£0
Commercial	0	0	0	£0
Total Flooding PVd (£k)				£0
Total Do Minimum PVd (£k)				**£0**
Total PVd determined for Do Nothing Zone A				**£169,516**
Total Present Value Benefits (PVb) of Option A3.1 (£k)				**£169,516**

Initial cost of Do Minimum (Option A2.1): £1,516,156 by year 20 with a PV cost of £932,465.

Cost: ***£10,990k*** *by year 100 with a PV cost of* ***£4,631k***
Benefit Cost Ratio: ***30.47***

Discussion of Opportunity
In terms of coastal protection this option provides long term protection of people, property and business and retains the integrity of the pier and other heritage features along the coast. Implementing Detached Breakwaters in Zone A would maintain significant beach levels which would provide protection to the backline of defence. In effect, the whole beach would be pulled forwards, creating a wide sandy foreshore, which, in this zone, would be of large benefit as this is presently where the beach is used most by visitors to the frontage. Overall, therefore, this option maintains the amenity values over the lifetime of the scheme. From a landscape/visual perspective, the wide beach would provide a relatively natural setting for the public gardens built behind the promenade.

Disadvantages
Careful consideration would be required for the management of the interface, in terms of coastal processes, between the Detached Breakwaters and the Fishtail Breakwater field, which extends south west to Jaywick. Consideration of coastal processes interaction would also apply to the interface between the Detached Breakwaters and the historic Clacton Pier.

There is a possibility that sand nourishment may smother the Clacton Cliffs and foreshore SSSI. This is only relevant if this geological feature is currently exposed. However, the fact that the clay platform is protected under this management option means that the long term erosion of this feature is prevented. In addition, major works have the potential to disturb archaeological remains, as the Strategic Environmental Assessment indicates the presence of wreck sites in the area.

Despite the positive visual aspects of creating a long, wide sweeping beach in this zone, there are also some negative impacts associated with the construction of offshore structures. In a line of sight southwest from the pier, the Detached Breakwaters would be visible as a straight line along the coast. In comparison to the Jaywick Fishtail Breakwaters this would also represent a change in beach shape, making coastal management appear more discontinuous.

The offshore structures would create a significant barrier between the sea and the beach. This would result in potential access/navigation issues for the RNLI and other water users. This is particularly important given the regeneration desire for this area to be associated with watersports.

In terms of timing, this option is a relatively inflexible approach to management as it relies on a one-off major engineering activity. In terms of its spatial impact, it is also fairly inflexible. The length of the zone would mean that two Detached Breakwaters would be required to provide adequate coast protection. This, as stated, would pull the beach out in a uniform manner, across the whole zone, removing the opportunity for local adaptation in terms of land use.

Conclusion
Despite its relative inflexibility, this option is considered to be suitable as a management option for Zone A. It meets the Plan Level Objectives in Section 4.1, and considers the use of the frontage. It is therefore taken to the next stage of appraisal.
Potential FDGiA contribution towards option: **£12,507k**

Option A3.2 Fishtail Breakwaters

Description

The Fishtail Breakwaters' function, in creating headlands between which an embayment forms, would be tailored so that they would be used only where their influence is required. Option A3.2 therefore involves 'Do Minimum' works for the first 20 years, and then in year 20 Fishtail Breakwaters, adapted in size to this zone, would be constructed to maintain the beach in front of the defences. **Error! Reference source not found.** gives an indication of the potential form of the fishtail breakwaters. It is important to note here that this layout is, at this stage however, indicative rather than being a suggested final layout.

Figure 6-7: Zone A fishtail breakwater indicative layout

Economic assessment

Costs and benefit are set out in **Error! Not a valid bookmark self-reference.** and are summarised in comparison with other options for the whole Plan area in Table 6-13. The scheme would provide long-term protection to the area and would not result in loss of amenity. The benefits of the scheme are taken as the Do Nothing damages avoided.

Table 6-4: Economic Damages and Benefits following Option A3.2 in Zone A

Erosion Damages Number of properties	Medium term (0-20yrs)	Long term .(20-100 years)	Total (100 years)	Present Value Damages** (PVd) (£k)
Residential	0	0	0	£0
Commercial	0	0	0	£0
Infrastructure	0	0	0	£0
Amenity				£0
Total Erosion PVd (£k)				£0
Flooding* Damages	High Risk	Significant Risk	Moderate Risk	Present Value Damages**

Erosion Damages	(> 5%)	(<5% to >1.3%)	(1.3% to >0.5%)	(PVd) (£k)
Residential	0	0	0	£0
Commercial	0	0	0	£0
Total Flooding PVd (£k)				£0
Total Do Minimum PVd (£k)				**£0**
Total PVd determined for Do Nothing Zone A				**£169,516**
Total Present Value Benefits (PVb) of Option A3.2 (£k)				**£169,516**

Initial cost of Do Minimum (Option A2.1): £1,516k by year 20 with a PV cost of £932k
Cost: ***£15,501k*** *by year 100 with a PV cost of* ***£6,206***
Benefit Cost Ratio: ***27.31***

Discussion of Opportunity
As stated, this option would provide adequate coast protection to local historic monuments as well as material assets and infrastructure in the zone. The replenished embayments would protect the clay platform and would also draw out the beach in strategic places, in accordance with the final design of the structures.

Importantly, Fishtail Breakwaters overcome some of the problems highlighted with the use of Detached Breakwaters as discussed in Option A3.1. For example in terms of coastal processes, the groyne structures, in extending from the shore, would mean a continuation of management from Jaywick in the south west and do not pose the same potential interface related problems as Detached Breakwaters, adjacent to the pier.

In creating sandy embayments, this option enhances the amenity and community/development opportunities over the medium to long term. The option could be designed so as not to prevent access for the RNLI, and would allow the development of the area as a watersports zone. The ability to adapt the location of the structures according to a desired end shape means that it is flexible and has the potential to aid the development of a quayside in this area. As such, it can be said that this option results in a more 'interesting' coastal zone, tailored to local requirements.

Following the above discussion of the opportunities, it is envisaged that the fishtail approach is taken forward more in the form of long groynes in this zone. This would develop upon the natural alignment seen on the frontage at present.

Disadvantages
It is not considered a major issue but careful consideration would need to be given to the proximity of the most north eastern groyne to the historic Clacton Pier.

As for any option which involves recharge of the beaches, the Clacton Cliffs and Foreshore SSSI is likely to be further buried. However, the protection provided to the clay platform means that erosion (and subsequent loss) of this feature would be prevented. In addition, as for Option A3.1, major works have the potential to disturb archaeological remains, as the SEA indicates the presence of wreck sites in the area.

In terms of the visual impact of the Fishtail Breakwaters, there will be a change in comparison with what is in existence in Zone A at present as the new groynes will be

larger and constructed from rock. However, as described in the discussion of opportunities, it will involve a continuation of current coastal management from the south west.

Conclusion
Through discussion of the opportunities brought about by the Fishtail Breakwaters option, it can be seen that, at this stage and converse to the Detached Breakwater option, it is more of an approach rather than a scheme. This means that there is still enough flexibility in design to be able to mitigate against some of the disadvantages of the option. As such, in taking this approach forward, there is room to capitalise on the needs of potential contributors to the funding of such an option. This is critical for the successful implementation of any long term Strategy and therefore, this option is taken forward.
Potential FDGiA contribution towards option: **£15,501k**

6.2.2 Zone B: Clacton Town

Overview

The location of defence lengths and general layout of the frontage is shown in Figure 6.8. Starting from this an overall decision pathway for the frontage is set out in Figure 6-9 and is discussed below. The specific issues and opportunities for this zone are described in Section **Error! Reference source not found.**.

The management approach to Zone B is to ensure the integrity and continuity of defence to sustain Clacton, as this zone is in close proximity to the town centre and Clacton Pier.

Figure 6-8: Defences in Zone B

Overall, the basic condition of the defences is poor. The zone is dominated by a 1,500m section of Wave Walker units (Defence E) which have an estimated residual life of approximately 5 years. In a 'Do Nothing' scenario (Option B1, Figure 6-9), therefore, failure of Defence E in year 5 would be followed by failure of Defence F in year 20 (2030) and failure of Defence G by year 25 (2035) (subject to ongoing monitoring). The outcome would be the loss of the sea front and significant loss to the core area of the town.

Year 5 can be seen as the first critical decision point at which it has been recommended that 'Do Minimum' works are carried out to secure the integrity of Defence E.

If these 'Do Minimum' works were carried out, year 15 would then be the next critical decision point. At this point, there is a clear decision:

- Start investing money into sustaining coastal defence, but in a sustainable way by ensuring that a beach is maintained, which enhances the area; or

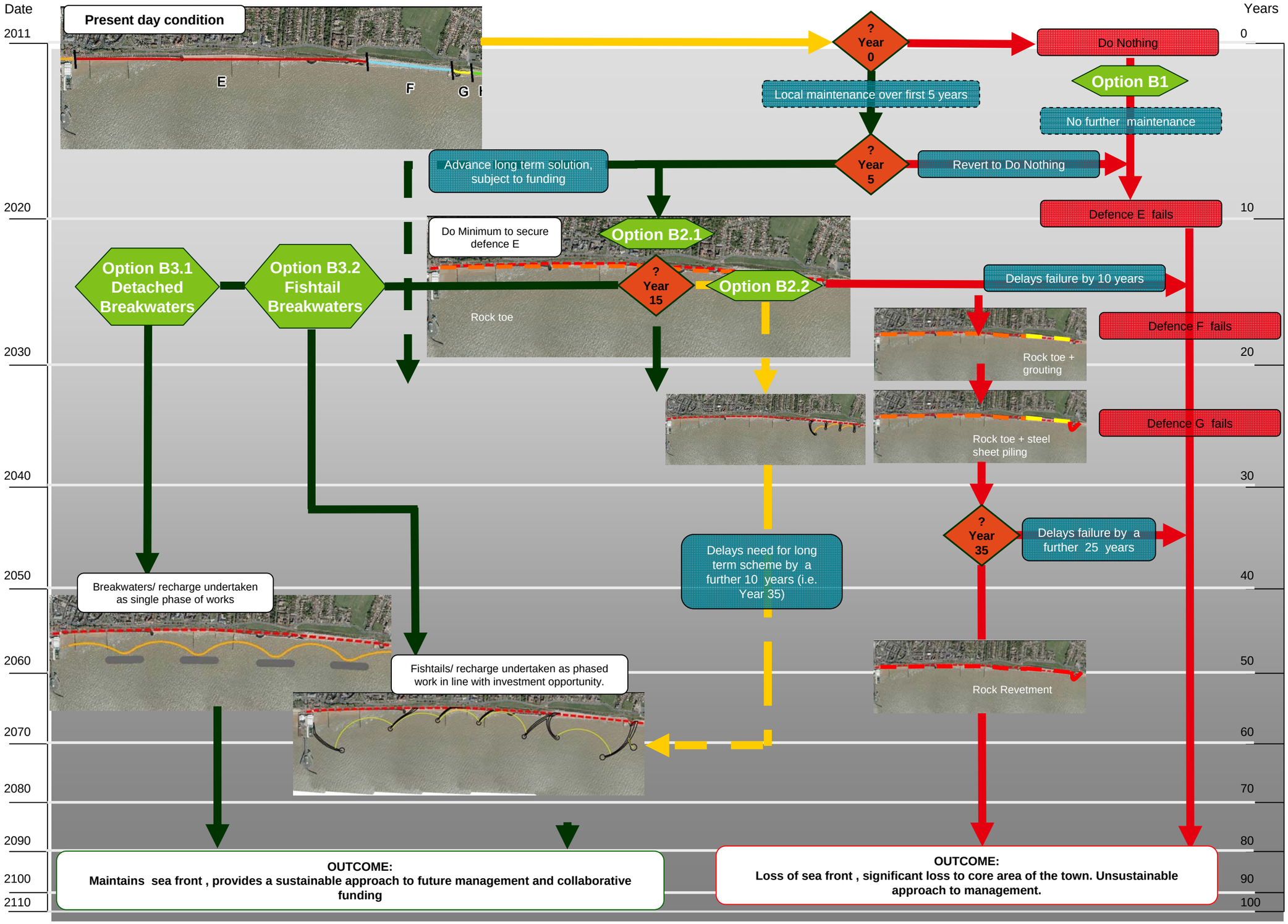
- To start going down the path of increasing expenditure which ultimately results in a Rock Revetment being constructed along the whole 1,500m section?

Continuation of 'Do Minimum' after this point would result in the latter of the two, and a move towards 'Linear Defence' with rock toe and grouting works at Defence F and rock toe and steel sheet piled wall construction at Defence G. Once this decision pathway had been taken it would be increasingly difficult to move back towards a more sustainable, long term approach as beach levels would continue to fall, probably at the expense of access to the frontage. For this reason, this option is not discussed in further detail in this Management Plan. Therefore, it is recommended that in year 15, a decision should be made which results in the maintenance of the integrity of the sea front by improving and maintaining beach levels. This could be secured through the construction of either Detached or Fishtail Breakwaters, both in conjunction with sand nourishment, and phased along the zone according to defence residual life (Options B3.1 and B3.2 respectively– year 15, Figure 6-9). Both Options B3.1 and B3.2 would provide a long term sustainable approach to the future management of Zone B, and would maintain the heart of Clacton Town, and the Pier. Both options would provide a greater width of beach, which would protect the shore platform over the appraisal period.

Of these two options, Option B3.2 (Fishtail Breakwaters) also has greater opportunity to be phased in line with collaborative investment. Under this principal option there is an alternative option, which is an "Enhanced Do Minimum" approach (Option B2.2, year 15,Figure 6-9) in which smaller Rock Groynes with Shingle Nourishment could be constructed at the eastern end of this zone, in front of Defences F and G. This would buy 20 years of time before the improvements previously made to the Wave Walker units would need to be revisited, as part of another major investment. At this point, either the Detached or Fishtail Breakwater Options (B3.1 or B3.2) could be pursued.

As for Zone A, although the phasing of the options is based on the condition of the present defences in this Management Plan, there remains the opportunity to bring forwards any of the options. This would be dependent on alternative funding sources. Further discussion of this is provided in Section 6.3, using Zone B as an example of this opportunity.

The options are discussed in more detail below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90
100
Present day condition
E
F
G
? Year 0
Local maintenance over first 5 years
Do Nothing
Option B1
No further maintenance
? Year 5
Revert to Do Nothing
Advance long term solution, subject to funding
Defence E fails
Do Minimum to secure defence E
Option B2.1
Option B3.1 Detached Breakwaters
Option B3.2 Fishtail Breakwaters
? Year 15
Option B2.2
Rock toe
Delays failure by 10 years
Rock toe + grouting
Defence F fails
Rock toe + steel sheet piling
Defence G fails
? Year 35
Delays failure by a further 25 years
Delays need for long term scheme by a further 10 years (i.e. Year 35)
Breakwaters/ recharge undertaken as single phase of works
Fishtails/ recharge undertaken as phased work in line with investment opportunity.
Rock Revetment
OUTCOME:
Maintains sea front , provides a sustainable approach to future management and collaborative funding
OUTCOME:
Loss of sea front , significant loss to core area of the town. Unsustainable approach to management.

Zone B

Option B2.1 'Do Minimum' – Patch and Repair

Description

'Do Minimum' for this zone would involve placement of rock at the toe of Defence E. This solution would sustain this defence length for 10 years (until year 15). At this point, 'Do Minimum' alone would lead to the progressive deterioration and eventual failure of Defences F and G. The promenade, and significant numbers of beach huts would be lost. The Gunfleet Sailing Club would cease to operate from the site around Defence G, marking the end of its 60 year lifetime at this location. In addition, this option detracts from the potential aim to turn this area into one of tranquillity and informal recreation, as envisaged through the Celebrate-on-Sea[9] report. Nonetheless, as an interim option, in the context of funding, the initial work to support the failing Wave Walkers is a feasible short-term approach. Figure 6-10 indicates the length over which works in this patch and repair approach would be located.

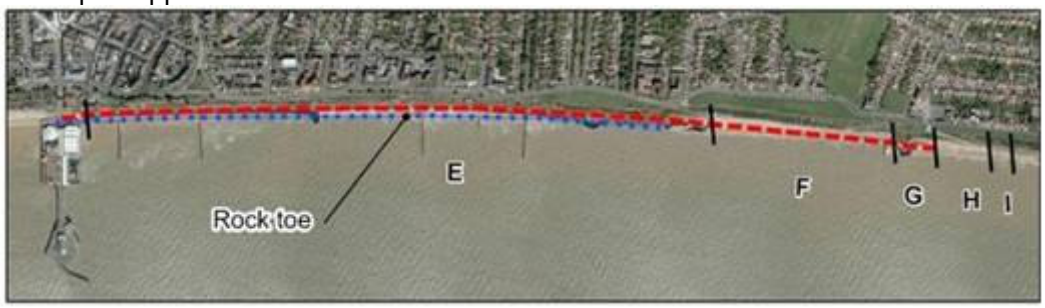


Figure 6-10: Zone B 'Do Minimum' patch and repair defence lengths

Economic Assessment

The costs and benefits are set out in Table 6-5 and are summarised in comparison with other options for the whole Plan area in Table 6-13.

Table 6-5: Economic Damages and Benefits following Option B2.1 in Zone B

Erosion Damages	Medium term (20yrs) No.	Long term.(50 yrs) No	PVd (£k)
Residential	1	1397	£32,390
Commercial	2	128	£3,574
Infrastructure	-	-	£0
Amenity			£53,556
Total			**£89,520**
Total damages determined for Do Nothing (Table 5-1)			**£113,859**
Present Value Benefits (PVb) of Option B2.1			**£24,339**

Cost: ***£5,046k*** *by year 15 with a PV cost* ***of £4,251k***
Benefit Cost Ratio: ***5.73***

Discussion of Opportunity
As the beach is currently very narrow and underused, the initial management approach of 'Do Minimum' is unlikely to have a large positive impact on land use in the short term at this section. This approach does, however, allow the short-term protection of the critical Wave Walker defence (Defence E). Importantly, this approach also does not preclude a 'Do Something' intervention in the medium term. In the context of an immediate lack of sufficient funding, and in using defence residual life as the determination of phasing, these 'Do Minimum' works would be required in any 'Do Something' intervention. This option would provide 15 years in which a strategy for procuring sufficient funding can be developed and implemented.

Disadvantages
Despite providing a means to continue protection, 'Do Minimum' is not technically sustainable past year 15. As such, after the 15 year period, there are likely to be negative effects on the Conservation Area in the main town, through the failure of defences adjacent to Defence E. The Pier and other historic assets would then be at risk from the unzipping of the defences in this zone. There would also be loss of infrastructure within the town, and tourism-focused infrastructure and amenity. Linked to the physical loss of what draws people to this area, there is also no opportunity with this option alone, to provide a beach in this area.

Conclusion
Do Minimum is taken forward as an interim step before any of the 'Do Something' options. 'Do Minimum' is considered over the first 15 years in Zone B. If sufficient funding were available, however, the decision could be made to move onto a Do Something pathway of management earlier in the appraisal process.
Potential FDGiA contribution towards option: **£5,046k**

Option B2.2 'Do Minimum' – patch and repair with sediment management
Description
This option would continue from Option B2.1 Patch and Repair and would sustain the defences adjacent to the Wave Walker defence (Defence E). Six groynes would then typically be required in front of Defences F and G (Figure 6-11), with shingle nourishment between them. Due to the added protection that this option provides the defences, it would last longer than Option B2.1 Patch and Repair alone. Shingle would form a steep beach between these groynes, and although it would provide more protection to the shore platform, this protection would not be complete and it would continue to lower. It is estimated that this option would sustain the Zone until year 35, when repairs to Defence E would again be required.

Figure 6-11: Zone B Do Minimum Sediment Management Layout

Economic Assessment
The costs and benefits are set out in Table 6-6 and are summarised in comparison with other options for the whole Plan area in Table 6-13.

Table 6-6: Damages following Option B2.2 in Zone B

Erosion Damages	Medium term	Long term	Total	Present Value Damages** (PVd) (£k)
Number of properties	(0-20yrs)	.(20-100 years)	(100 years)	
Residential	0	1397	1397	£37,613
Commercial	0	130	130	£4,415
Infrastructure	0	0	0	£0
Amenity	0	0	0	£26,443
Total Erosion PVd (£k)				**£68,471**
Total damages determined for Do Nothing (Table 5-1)				**£113,859**
Present Value Benefits (PVb) of Option B2.2				**£45,388**

Initial cost of Do Minimum (Option B2.1): £5,046k by year 15 with a PV cost of £4,251k

*Cost: **£8,103k** by year 35 with a PV cost of **£4,451k***
*Benefit Cost Ratio: **5.22***

Discussion of Opportunity
The groynes already in existence in this zone are currently largely derelict. However, there is scope to use their location as a basis for the location of new rock groynes. The shingle beach would provide the required protection to the foreshore, immediately in the vicinity of the defence foundations. Overall, it maintains a level of coast protection over the medium term, providing more time to acquire funding for a long term solution than Patch and Repair alone. The Gunfleet Boating Club would also be sustained in this option, until the failure of Defence E in year 35.

In terms of coastal processes this option does not mark a significant change in what is already in place at this location. Although not considered to be a significant problem over this time period, this option allows for some flexible adaptation to changing sea levels, enabling management to benefit from improving knowledge over time.

The placement of groynes at the north eastern end would also not preclude Option B3.2 (see below) which could be added as a second stage of construction, extending the option into the long term. The approach would also not preclude initial phased work to the west under option B3.2, with the intent that the groynes in front of defences F and G would be integrated into the longer term management in the future. As such a further benefit with this interim option is that in the future, long term, sustainable works could be focussed on Defence E, leaving the opportunity to manage the specific values of the Gunfleet Sailing Club in the north east section. As such, there is the opportunity, in this area in front of Defences F and G, to take advantage of the wider coastal slope with local realignment or cliff reprofiling.

At present, there is little beach at this north east section, but a large number of beach huts. Therefore, placing a shingle beach in front of Defences F and G would enhance the amenity value of this short section, compared with the present situation and under a 'Patch and Repair' alone, or 'Do Nothing' approach. There may, however, be problems with public acceptance of a shingle beach.

Visually, Defence sections F and G are already characterised by a groyne field. There would be a change in this section from wooden to rock groynes, and the new groynes would be larger, but overall it does not represent a large change in shape of the coastline or visual setting of the area.

Disadvantages
This option only sustains the defences over a period of 35 years. It also does not enhance the area directly adjacent to the Pier. Therefore, it does not tap into the potential amenity value of this section or act as an advert for what could be done to enhance this important aspect of Clacton.

As this is an important zone of the frontage, providing protection to people, critical infrastructure and many businesses (the main Clacton town is located behind it), this option should be seen as an interim step before a longer term solution is identified. In that respect, as stated above, this option has a benefit in that it can lead to the longer term Option B3.2. This would, however, be with the associated difficulty in adapting the area of shingle renourishment to one of sand again.

Conclusion
Because of the strong justification to provide a beach adjacent to the Pier in Zone B, this 'Extended Do Minimum' option is limited in that it only focuses shore platform protection works over a relatively short length of the zone. The Rock Revetment in front of the Wave Walker units, placed there as part of the initial 'Do Minimum' works would not provide any protection to the beach and clay platform, which would subsequently continue to lower. This option is therefore not looked at in any more detail in this Management Plan.

Option B3.1 - detached breakwaters

Description

Following a maximum of 15 years of 'Do Minimum', Detached Breakwaters would be constructed and would act to pull out the shoreline along this whole zone (Figure 6-12). It is estimated that five breakwaters would be required for this zone. Sand Nourishment would be required behind them. This option is phased according to current defence residual life, resulting in the construction of three breakwaters in year 15, and then two more Breakwaters in year 35. Works to protect the backline of the defence adjacent to the terminal breakwater would be required, as it would pull sediment into its lee. This is included in the cost assessment.

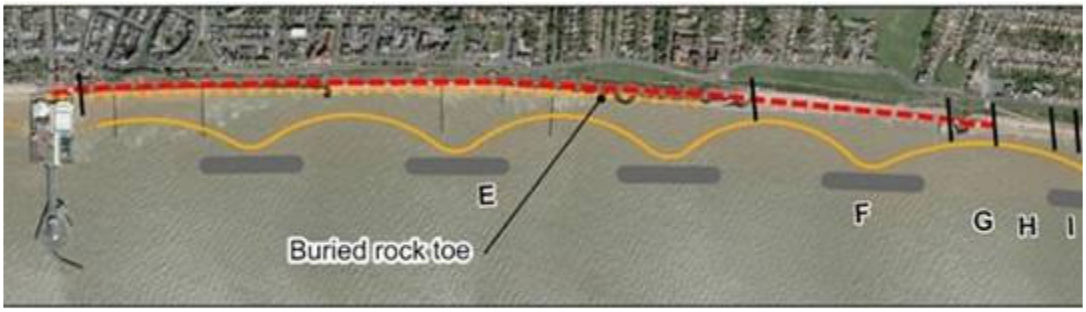


Figure 6-12: Zone B Detached Breakwater layout

Economic Assessment

The costs and benefits are set out in Table 6-7 and are summarised in comparison with other options for the whole strategy area in Table 6-13.

Table 6-7: Damages following Option B3.1 in Zone B

Erosion Damages	Medium term	Long term	Total	Present Value Damages** (PVd) (£k)
Number of properties	(0-20yrs)	.(20-100 years)	(100 years)	
Residential	0	0	0	£0
Commercial	0	0	0	£0
Infrastructure	0	0	0	£0
Amenity	0	0	0	£0
Total Erosion PVd (£k)				**£0**
Total damages determined for Do Nothing (Table 5-1)				**£113,859**
Present Value Benefits (PVb) of Option B3.1				**£113,859**

Initial cost of Do Minimum (Option B2.1): £5,046k by year 15 with a PV cost of £4,251k

*Cost: **£25,793** by year 100 with a PV cost of **£10,626k***
*Benefit Cost Ratio: **7.65***

Discussion of Opportunity

Detached breakwaters offer a long term solution to the problem of falling beach and clay platform levels. The beach would provide adequate protection to the back line of

defence and the promenade. This would then provide adequate coastal defence for the Conservation Area in this zone, and would sustain the commercial integrity of the town. The main amenity and opportunity benefit brought by the construction of the offshore structures and beach renourishment is the wide sandy beach. This would bring the largest pull for visitors to the area and would maintain the attraction to beach huts. As this Zone is also adjacent to the town, key infrastructure and the pier, this beach would provide a real opportunity to attract further investment in the tourism industry and provides a continuation of the high amenity value of Zone A. In looking at the layout of the town moving towards the coast, it is evident that the Pier has been intended to be the focal point. By enhancing and developing Zone B into one of amenity and recreation, the Pier, once again becomes the central feature along this coastline, improving the setting of this historic feature.

Visually, the offshore breakwaters would create a wide, sweeping beach. This would improve the setting of the beach huts and promenade, giving a more natural character. The increase in usable space at the shoreline would enable beach users to view the pier, and other features, from along the coast.

Disadvantages
Although the placement of a wide beach would immediately benefit Zone B, careful consideration would be required for the management of the interface, in terms of coastal processes, between the Detached Breakwaters and the historic Clacton Pier. Detached Breakwaters would have a strong influence on the coastline immediately adjacent to them as they pull sediment into their lee. Therefore, as has been included in the cost assessment, consideration of protection works immediately to the north east of the terminal breakwater is required, to ensure that defences are not put under added pressure.

Although the breakwaters and beach would provide adequate protection to heritage features on the coast, there is the risk that construction works would interfere with potential wreck sites offshore.

The improvements to the visual setting of Zone B from the viewpoint of the beach itself would potentially be offset by the visual impacts of the line of rock breakwaters, from the Clacton Pier.

In terms of navigation, the construction and operation of the breakwaters could pose a hazard to fishing, and there would have to be careful consideration of hazard mitigation to the users of the Gunfleet Boating Club in the north east of the zone.

Overall, this option provides limited but important opportunity to specify the shape of the coastline, in order to capitalise on local opportunities to attract collaborative funders. In terms of funding, there is limited opportunity for phasing over the zone.

Conclusion
Despite the limitations of this option in terms of the resulting end shape of the coastline, they are not considered significant enough to consider ruling it out of the Management Plan for the frontage. The opportunities that this option brings in terms of creating a wide amenity beach, and the fact that it provides a sustainable solution to coastal defence means that it is considered in further detail in this Management Plan.
Potential FDGiA contribution towards option: £21,170k

Option 3.2 - fishtail breakwaters

Description

As for Zone A, Fishtail Breakwaters would be constructed from rock and would pull out the shoreline selectively by forming headlands, between which sand would be used for nourishment. For the purposes of providing a cost estimate for the option, a typical layout is provided in Figure 6-10. This has been based on the ideas presented by Celebrate-on-sea[9]. However, the opportunity that these structures bring is that they can be designed around alternative concepts for regeneration. This means that this option should be viewed more as an approach to management than the final outline of a scheme. Further discussion of this is provided below. In this Management Plan, the phasing of construction is based on currently estimated defence residual life, resulting in the construction of three Fishtail Breakwaters in year 15 in the north east of the zone, and then a further four Fishtail Breakwaters from the Pier, towards the west. An alternative to this is discussed in Section 6.3.

Figure 6-10: Zone B fishtail breakwater indicative layout

Economic Assessment

The costs and benefits are set out in **Error! Not a valid bookmark self-reference.** and are summarised in comparison with other options for the whole Plan area in Table 6-13.

Table 6-8: Damages following Option B3.2 in Zone B

Erosion Damages Number of properties	Medium term (0-20yrs)	Long term .(20-100 years)	Total (100 years)	Present Value Damages** (PVd) (£k)
Residential	0	0	0	£0
Commercial	0	0	0	£0
Infrastructure	0	0	0	£0
Amenity	0	0	0	£0
Total Erosion PVd (£k)				**£0**
Total damages determined for Do Nothing (Table 5-1)				**£113,859**
Present Value Benefits (PVb) of Option B3.2				**£113,859**

Initial cost of Do Minimum (Option B2.1): £5,046k in year 15 with a PV cost of £4,251k

Cost: ***£29,810k*** *in year 100 with a PV cost of* ***£11,655k***
Benefit Cost Ratio: ***7.16***

Discussion of Opportunity
As stated, the Fishtails' function, in creating headlands in which an embayment forms, can and would be tailored so that they would be used only where their influence is required. In this respect, Figure 6-10 shows only an indicative layout. As part of this suggested layout, one of the rock structures extends from the pier itself, in order to create a wide beach in this area. This approach is in line with enhancing the area immediately adjacent to the pier. This would need to be considered further in mitigating the visual impact on the Pier.

Overall, in terms of coastal processes, the fishtail structures would require less consideration of their influence on adjacent sections of coastline than Detached Breakwaters. They would not pose the same problems in terms of interaction with processes around the Pier, which can also be seen as a structure which protrudes from the coastline.

There is a key opportunity with this option with regards to the creation of a number of sandy, pocket beaches. As for Option B3.1, this opportunity is realised through the location of this zone, which fronts the main town and is adjacent to the Pier and the already popular Zone A. The difference with this option, compared to Option B3.1 is that the primary focus for tourism would be on the creation of specifically designed spaces and shapes rather than one continuous beach area. With this option, there is the added opportunity of extending the width of the promenade in specific places; either where the structures protrude from the shoreline, or at the narrow central part of any of the embayments. At the latter, linear defence techniques would be required to protect the more seaward promenade. This opportunity makes this option therefore more flexible and adaptable around the requirements of potential developers in the area, creating the opportunity for greater open space at the coastal edge.

Overall, this approach is in line with the aspirations of the Celebrate-on-Sea[9] report, which indicates a desire for the area to be one of recreational uses, such as barbequing, additional beach hut placement and recreational space.

From a visual perspective, this option would alter the shape of the coastline significantly and would involve placement of considerably sized structures close to shore. From the end of the Pier, however, there would be no associated obstruction to a view alongshore.

At a very local level, the ability to adapt this approach according to specific needs and desires means that the Gunfleet Boating Club could potentially be an integral feature of the end design. The relatively local area of influence of the structures means that the wider coastal slope in the north eastern section, at the location of the Gunfleet Boating Club, could be used as an area of realignment and reprofiling. This could be used to aid access to the coastline. At this stage in the Management Plan, this is presently just raised as a point for future discussion amongst relevant bodies, stakeholders and potential investors.

Although still based on defence residual life, there is an added opportunity with this option in that it could be constructed as a follow on from the "Enhanced Do Minimum" option or in association with this approach along the eastern section of the frontage. In this approach, the first breakwater would not need to be constructed until year 35 or could be constructed earlier depending on funding.

Disadvantages
In designing the scheme using Fishtail Breakwaters, there would be a requirement to consider the impacts of the structures' presence on the setting of the Clacton Pier. As discussed, the benefit in this approach is that there is flexibility to mitigate against this.

The construction works associated with this option also have the potential to disturb archaeological remains due to the presence of wreck sites.

There would be significant impact on the visual aspects of the frontage but this approach provides the opportunity to use defence structures to create a new landscape which is in-keeping with the aspirations of the area. Although there would be an impact on the landscape and seascape, this option would continue in concept the management form along the Jaywick frontage to the southwest.

Conclusion
Fishtail Breakwaters provide significant opportunity in that they comprise an approach which can be tailored to specific management needs. The option meets the objectives laid out in Section 4.1. There is the added benefit that, if funding is not found, 'Do Minimum' Patch and Repair, followed by 'Do Minimum' Sediment Management can be implemented prior to their construction. As such, this is taken forward in this Management Plan as a potential approach for this Zone.
Potential FDGiA contribution towards option **: £21,170k**

6.2.3 Zone C: Residential Clacton

Overview

The location of defence lengths and general layout of the frontage is shown in Figure 6.13. Starting from this an overall decision pathway for the frontage is set out in Figure 6-15.

Figure 6-13: Defences in Zone C

Zone C comprises the largest number of different defence types. The 19 defence types generally have a poor defence condition, but provide protection to a high residential population located at the cliff top. As a result, there have been major Patch and Repair works carried out in this zone over the past 10 years.

In terms of funding, there is more limited scope to attract external contributions for this zone, because it is furthest from the tourism focused area around the Pier and there are limited established amenities in the area.

A 'Do Nothing' approach (Option C1, Figure 6-15) would result in failure of Defence V in year 5, then defences L, M, Q, R, S, V and X within 10 years, and shortly afterwards failure of Defences I, K, N, O, P, T, U and W by year 15. By year 35, Defences J and H will also have failed. The overall outcome of Option C1 is a loss of promenade, infrastructure, road and property. Considering this sequence, the first critical decision point is year 5.

As with other Zones, a 'Do Minimum' Patch and Repair approach could initially be taken. Taking into account the residual life of the defences, this approach is justifiable over a 15 year period. After this point, the types of works required and the associated costs of those works would increase significantly. Although this route of management could theoretically be taken to Hold the Line, in order to move back towards a more sustainable approach after 15 years would ultimately be a much costlier undertaking. Over these first 15 years, 'Do Minimum' patch and repair (Option C2.1, Figure 6-15) would involve local maintenance and works to Defence V in year 5. In year 10, a rock toe would be required at defences L and M and a rock revetment at Defence Q. Due to the increase in cost of 'Do Minimum' after year 15, it is not considered past this point in this Management Plan.

Following Do Minimum works, the second decision point would be in year 15. At this point, there are ultimately two 'Do Something' options available. Both involve providing protection to the clay platform, they both maintain the promenade and provide a sustainable approach to future protection to properties and infrastructure. They are

Options C3.1 (detached breakwaters) and C3.3 (fishtail breakwaters) (Figure 6-15). Construction of either of these options would need to commence in year 15 but would then be phased according to current defence residual life.

In this zone, it is important to note that there are fewer benefits to be immediately drawn from amenity uses. Subsequently, there is less economic justification to ensure wide, sandy beaches in comparison with Zones A and B. There is also less economic justification in bringing a sustainable approach to management forward in time; indeed, the lower benefits means that a larger external monetary contribution is likely to be required for funding defence works. This lends the zone towards options which defer significant costs into the future.

In considering this funding issue, there is a stronger justification in following an enhanced 'Do Minimum' approach in Zone C. This would comprise 'Do Minimum' with sediment management (Option C2.2) whereby, in year 15, short rock groynes, with shingle nourishment could be constructed along the frontage. These would have the benefit of costing less than Fishtail Breakwaters, and it is assessed that they would be effective until year 60. Over this time, it is envisaged that funding might be developed for a longer term solution. If this approach were developed the logical longer term solution is envisaged to be fishtail breakwaters (Option C3.2), which would involve extending a number of the groynes to further protect the foreshore platform.

In considering the pressures facing this zone regarding funding, fishtail breakwaters (Option C3.2) are always preceded by the 'Do Minimum' with sediment management (Option C2.2), and not as an option which is likely to be implemented as early as year 15.

It is also noted here that there is some opportunity in this zone in opting to realign in the northeast section. This section comprises Defences W, X and Y. This would have to be examined in more detail. The lower benefits identified in this area, together with the fact that this frontage is of a slightly different orientation does suggest a different approach to that considered necessary over the main section of Zone C. Such an approach has the potential of creating a wider beach area but with the potential loss or need for relocation of the Boat Club. Associated with this would be the need to address the flood risk through the Gap. This approach would however rely upon holding the headlands to the southwest and to the northern point of the study area.

The options are discussed in more detail below.

Date

Years

2011

0

Present day condition

F G H I J K L M N O P Q R S T U V W X Y

? Year 0

Do Nothing

Option C1

No further maintenance

Option C2.1

Local maintenance for 5 years and works to defences V, L, M & Q over next 10 years

2020

10

Option C3.1 Detached breakwaters and fishtails

Option C2.2 Fishtail breakwaters

? Year 15

Delays failure by 10 years

Defences L, M, Q, V & X FAIL

2030

20

Delays failure by further 5 years

Defences I, K, N, O, P, R,S, T, U & W FAIL

Rock groynes and shingle recharge, with potential for realignment at eastern end, phased by assets risk of failure..

2040

30

Delays failure by further 20 years

? Year 30 -35

Defence J FAILS

Defence H FAILS

Breakwaters/ recharge undertaken as single phase of works. Groynes with sand recharge at eastern with opportunity for realignment

2050

40

Delays failure by further 10 years

? Year 40+

? Year 60

2060

50

Significant re-investment in defences

Option C3.2

Fishtails/ shingle recharge undertaken as one phase of improvement.

2070

60

2080

70

2090

80

OUTCOME:
Maintains promenade, provides a sustainable approach to future protection to property. Local assessment of works required at eastern end.

2100

90

OUTCOME:
Loss of promenade , loss of infrastructure, road an property. Unsustainable approach to management.

2110

100

Zone C

Option C2.1 'Do Minimum' - patch and repair

Description

The future 'Do Minimum' sequencing is specific to the estimated residual life and type of each defence. In this zone, the transition from 'Do Minimum' to Linear Defence would occur in year 15. Rock is placed at the toe of much of this zone already, and therefore the natural progression in the 'Do Minimum' is for more rock to be placed. This is with the exception of Defence V, where a short section of steel sheet piling is required in the next five years (Figure 6-16).

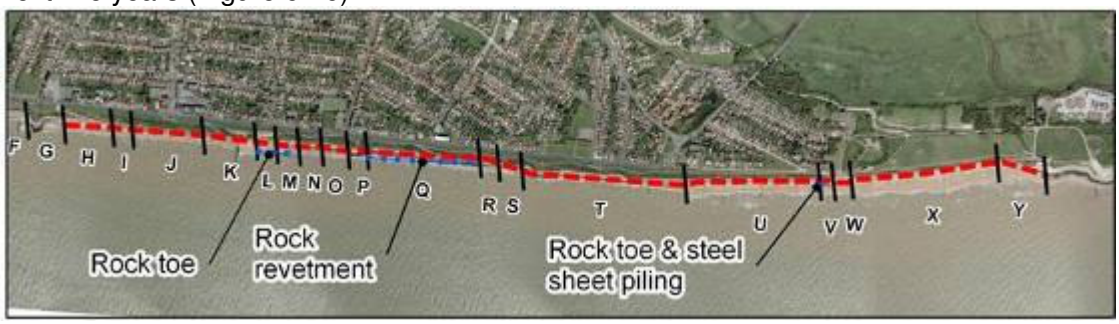


Figure 6-16: Zone C 'Do Minimum' Patch and Repair defence lengths

Economic Assessment

The costs and benefits are set out in Table 6-9 and are summarised in comparison with other options for the whole strategy area in Table 6-13.

Table 6-9: Damages following Option C2.1 in Zone C

Erosion Damages	Medium term (20yrs)	Long term.(50 yrs)	PVd
	No.	No	(£k)
Residential	26	848	£36,703
Commercial	6	13	£7,200
Infrastructure	2	2	£14,488
Amenity			£17,852
Total			**£76,243**
Total damages determined for Do Nothing (Table 5-1)			**£80,100**
Present Value Benefits (PVb) of Option C2.1			**£3,857**

*Cost: **£3,035k** by year 15 with a PV cost of **£2,210k***
*Benefit Cost Ratio: **1.75***

Discussion of Opportunity

The progressive construction of a rock revetment in this zone is not considered to represent a change in present land use for this zone. It would not impact on the present coastal processes. The option sustains defence of the zone for 10 years longer than 'Do Nothing'. In that time, funding might be sought for the next stage of works, which would not be precluded by this initial patch and repair, other than an acceptance that beaches would be lower than present day. Indeed, this is what has happened over the last 10 years. This option is therefore viable over the short term. As for Zones A and B,

however, there is still a technical justification for implementing a more sustainable approach to management, sooner.

Disadvantages
In the absence of any further investment following year 15, this option would result in the acceptance that there will not be any future beach access at this location. The defences would progressively fail resulting in loss of property, infrastructure such as the Sewage Treatment Works and amenity assets such as the Gunfleet and Clacton Boating Clubs.

In the medium term, there is the possibility for more significant impact on Holland Haven SSSI and therefore impacts also on the adjoining frontage.

Conclusion
'Do Minimum' is taken forward as an interim step before any 'Do Something' option. 'Do Minimum' is considered over the first 15 years in Zone C. If sufficient funding were available, however, the decision could be made to move onto a 'Do Something' pathway of management earlier in the appraisal process.
Potential FDGiA contribution towards option: **£980k**

Option C2.2 'Do Minimum' – patch and repair with sediment management
Description
As stated, in the context of the lower potential for generating additional amenity value in this zone, this option might be necessary in that it would sustain the defences at the base of the cliff over a longer time period than 'Do Minimum' patch and repair alone, thus pushing the more substantial works of Linear Defence or Readjustment of the Shoreline further into the future. It would also enable management to be more consistent across the zone in general. It would involve construction of rock groynes, with shingle nourishment in the bays between them, from year 15, at the end of the 'Do Minimum' works (Figure 6-17). The works are assumed to be phased according to current defence residual life in this Management Plan.

Figure 6-17: Zone C Do Minimum sediment management layout

Economic Assessment
The costs and benefits are set out in **Error! Not a valid bookmark self-reference.** and are summarised in comparison with other options for the whole Plan area in Table 6-13.

Table 6-10: Damages following Option C2.2 in Zone C

Erosion Damages Number of properties	Medium term (0-20yrs)	Long term .(20-100 years)	Total (100 years)	Present Value Damages** (PVd) (£k)
Residential	0	676	676	£11,926
Commercial	0	24	24	£1,533
Infrastructure	0	0	0	£0
Amenity	0	0	0	£8,815
Total Erosion PVd (£k)				**£22,274**
Total damages determined for Do Nothing (Table 5-1)				**£80,100**
Present Value Benefits (PVb) of Option C2.2				**£57,826**

Initial Cost of Do Minimum (Option C2.1): £3,035k by year 15 with a PV cost of £2,210k

*Cost**: £20,970** by year 60 with a PV cost of **£9,523k***
*Benefit Cost Ratio: **4.93***

Discussion of Opportunity
The groynes already in existence in this zone are currently largely derelict and do not impose any real significant constraint on the design of a new groyne field. However, their spacing is used as the basis for determining the new location, in principle, as a basis for the location of new rock groynes, and to refurbish some of them as smaller, interim groynes if necessary. Shingle would form a steep beach between these groynes which would provide protection to the foreshore, immediately in the vicinity of the defence foundations. This option would hold the line of defence for 60 years, providing protection to people, properties, infrastructure, and the Holland-on-Sea Cliffs and Foreshore SSSI.

At this location, which is the furthest from the tourist centres of Zones A and B, the use of shingle is not considered to have a large negative impact on beach users and is therefore an opportunity in offering a lower cost solution to falling beach and foreshore platform levels.

It is estimated that this option would last for 60 years before significant remedial works would be required. At this point, there would only be two feasible options:

- To continue the practice, and adopt a 'Do Minimum' patch and repair on the groynes and shingle bays, accepting that there would be a continued lowering of the foreshore with long-term implications for future cliff recession; or
- The groynes could be used as the trunk for development of longer Fishtail Breakwaters, with the potential to continue with shingle nourishment (Option C3.2).

Table 6-11: Damages following Option C3.1 in Zone C

Erosion Damages Number of properties	Medium term (0-20yrs)	Long term .(20-100 years)	Total (100 years)	Present Value Damages** (PVd) (£k)
Residential	0	0	0	£0
Commercial	0	0	0	£0
Infrastructure	0	0	0	£0
Amenity	0	0	0	£0
Total Erosion PVd (£k)				**£0**
Total damages determined for Do Nothing (Table 5-1)				**£80,100**
Present Value Benefits (PVb) of Option C3.1				**£80,100**

Initial Cost of Do Minimum (Option C2.1): £3,035 by year 15 with a PV cost of £2, 21

*Cost: **£23,924k** by year 100 with a PV cost of **£12,425k**.*
*Benefit Cost Ratio: **5.47***

Discussion of Opportunity
Detached Breakwaters would solve the problem of lowering beach levels over the full appraisal period. As such, this would offer a long term solution for defence in this zone. It would provide sustainable protection to people, properties, infrastructure, such as the Sewage Treatment Works, and amenity assets such as the two sailing clubs. It would also protect the Holland-on-Sea Cliffs SSSI and the Holland Haven SSSI. It has been noted that this section can be seen as a relic headland (Appendix A). Therefore the Detached Breakwaters would act to pull this headland out seawards. This would be beneficial in management of Zone B. The use of shingle means that the required structures are smaller than would be if sand were used, and therefore would not have as large an effect on adjacent lengths of coastline.

The use of Rock Groynes in the northeast section of this zone would provide an effective barrier to any influence of the terminal Detached Breakwater in this direction. They would also not pose such a hazard to the navigation associated with the two boat clubs.

In considering the specific issues and opportunities of Zone C it is evident that this area is relatively not as critical in its potential for attracting tourism. Therefore, shingle nourishment can be seen to maintain and improve (compared with present day conditions) access to the beach, without the associated higher costs of sand nourishment.

Disadvantages
There is a requirement for careful consideration to be given to the interaction, in terms of coastal processes, between these works and structures in Zone B. This is particularly

pertinent with respect to the use of shingle; a barrier would be required between Zone C and Zone B, if Zone B comprises sand.

Despite the use of shingle for nourishment, the larger beach would have the potential to attract increased tourism interest to the area, although this is likely to require associated investment in amenity infrastructure to the top of the cliff and possibly on the promenade to fully justify or support the cost of the works.

This option is not considered to be a flexible approach to management as it relies on one-off major engineering works.

Conclusion
Despite the limitations of this option with regards to the phasing of construction, breakwaters provide a solution which would be designed to last the full appraisal period. Therefore they meet the objectives in Section 4.1. Subsequently, this option is considered in more detail in this Management Plan.
Potential FDGiA contribution towards option: **£10,350k**

Option 3.2 fishtail breakwaters

Description

Fishtail breakwaters would be designed to selectively pull out and widen the foreshore protection. Fishtail breakwaters would follow the patch and repair (Option C2.1) approach over the first 15 years of management, and then the 'Do Minimum' with sediment management (Option C2.2) approach from year 15 to year 60. Following this, 7 of the rock groynes in the zone would be extended into fishtail B=breakwaters (Figure 6-19). Additional Shingle Nourishment would be required between these larger structures, to extend the beach profile and provide protection to a larger area of the foreshore platform.

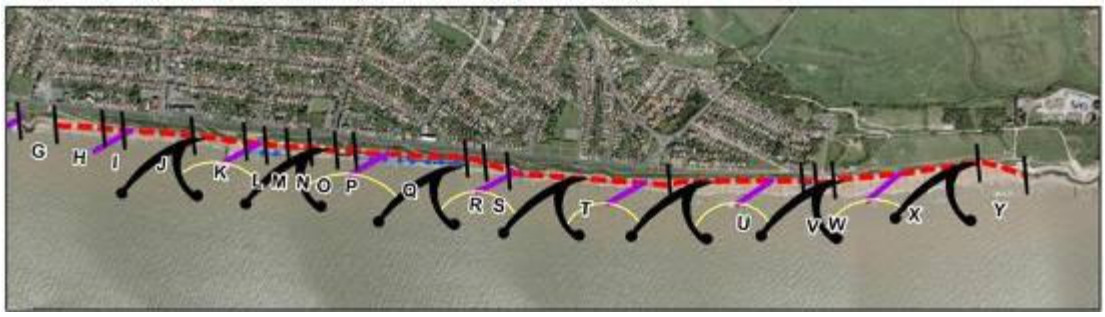


Figure 6-19: Zone C fishtail breakwater indicative layout

Economic Assessment

The costs and benefits are set out in **Error! Not a valid bookmark self-reference.** and are summarised in comparison with other options for the whole Plan area in Table 6-13. Costs include the preceding 'Do Minimum' and 'Do Minimum' Sediment Management options.

Table 6-12: Damages following Option C3.2 in Zone C

Erosion Damages Number of properties	Medium term (0-20yrs)	Long term .(20-100 years)	Total (100 years)	Present Value Damages** (PVd) (£k)
Residential	0	0	0	£0
Commercial	0	0	0	£0
Infrastructure	0	0	0	£0
Amenity	0	0	0	£0
Total Erosion PVd (£k)				**£0**
Total damages determined for Do Nothing (Table 5-1)				**£80,100**
Present Value Benefits (PVb) of Option C3.2				**£80,100**

Initial cost of Do Minimum (Option C2.1): £3,035k by year 15 with a PV cost of £2,210k.
Initial cost of Do Minimum Sediment Management (Option C2.2): £20,970,387 by year 60 with a PV cost of £9,523

Cost: ***£25,639*** *by year 100 with a PV cost of* ***£3,624***
Benefit Cost Ratio: ***5.22***

Discussion of Opportunity
If a 'Do Minimum' with sediment management approach is adopted in the initial years of management of this zone, Fishtail Breakwaters can be developed onto it over time. This progressive management would allow adaptation over a longer time period than needing to implement a 'Do Something' approach in year 15, and would mean that initial works are not abortive; rather, they tie into the overall management intent of the area.

The design would be based on the requirement to maintain access for the two boat clubs located in the northeast. It could also be tied into the existing vehicular access ramps onto the promenade.

Overall this option enhances the amenity and community/development opportunities over the medium to long term and maintains and enhances the residential area, retaining flood protection to the low-lying areas. It also maintains critical infrastructure and protects the Holland Haven SSSI.

Disadvantages
Apart from the benefits associated with providing a more sustainable solution to lowering beach levels, there are few other immediate benefits of having increased beach space in this zone. However, as for Detached Breakwaters, it is recognised that the new beach would have the potential to attract increased tourism interest in the area. The structure would also represent an impact on landscape and seascape and visual amenity.

This option is not a flexible approach to management as it relies on one-off major engineering activity.

This option would maintain the current amenity value, in sustaining access to the beach, although this value would be affected by a change from sand to shingle. The longshore access is considered to be important as the frontage is still a popular location for dog walkers and low level beach use. However, it is less critical as a focal point for attracting tourism. This option also allows for some flexible adaptation to changing sea levels, enabling management to benefit from improving knowledge over time.

The largest opportunity with this option is that as well as buying a significant time period of protection, it leads progressively into the Fishtail Breakwaters (Option C3.2), whereby this protection can then be sustained over the full appraisal period.

Disadvantages
Unless investment is increased in year 60, it is recognised that this option does not provide complete protection to the foreshore platform, which would continue to lower in the interim. After this point, if a 'Do Nothing' option were taken, the backline of defence would eventually fail, resulting in the rapid recession of the cliff and associated loss of assets.

Conclusion
In this zone, 'Do Minimum' with sediment management would allow the frontage to be held for 60 years before further significant works would be required. As this is the most critical zone in terms of finding funding, this option is considered to provide the opportunity to maintain the defences over the medium term, without precluding something more sustainable in the long term.

Option C3.1 detached breakwaters

Description
Detached breakwaters would pull out the shoreline along this whole zone. It is estimated that four breakwaters would be required for this zone, with associated Shingle Nourishment behind them. Detached Breakwaters would be constructed in year 15, i.e. at the end of the 'Do Minimum' works. All four would need to be constructed in year 15. Towards the eastern end of the zone, there would be rock groynes with shingle nourishment, although as stated previously, it is recognised that this section could be realigned in the longer term, following appropriate, full consideration of the impacts on assets such as the two sailing clubs and infrastructure. Figure 6-18 provides the typical layout of this option.

Figure 6-18: Zone C Detached Breakwater layout

Economic Assessment
The costs and benefits are set out in Table 6-11 and are summarised in comparison with other options for the whole Plan area in Table 6-13.

Conclusion
Fishtail Breakwaters provide a long term sustainable solution to the problem in Zone C. They also provide an opportunity to stagger costs associated with construction, if implemented in conjunction with sediment management (Option C2.2).
Potential FDGiA contribution towards option**: £10,350k**

6.2.4 Summary of assessment

Table 6-13: Summary of Assessment of Shortlisted Options

Zone	Option		Description	Estimated year defences sustained until	Present Value Benefit PVb (£k)	Present Value Cost PVc (£k)	Cash Cost (£k)	Benefit Cost Ratio BCR (PVb/PVc)	Selected?	Reason
A	1	**Do Nothing Damages:**	£169,516	-		-		-	No	See Section 5.2.1
	2	**Do Minimum**								
	2.1	Patch and Repair	Sustain defences based on residual life assessment until year 20.	20	£15,989	£932	£1,156	17.16	Yes	Taken forward as an interim option before leading to a more sustainable approach.
	2.2	Sediment Management	Sustain defences based on residual life assessment and construct rock groynes and nourish bays with shingle from year 20.	60	£107,569	£5,041	£10,240	21.34	No	Use of shingle would deter visitors, and significantly impact on tourism.
	3	**Do Something - all options include cost of Do Minimum up until year 20**								
	3.1	Detached Breakwaters	Carry out Option A2.1 until year 20, then construct Detached Breakwaters and nourish beach with sand.	100	£169,516	£5,563	£12,507	30.47	Yes	Large sandy amenity beach is created in this important tourism focused area.
	3.2	Fishtail Breakwaters	Carry out Option A2.1 until year 20, then construct Fishtail Breakwaters and nourish beach with sand.	100	£169,516	£6,206	£15,501	27.31	Yes	Fishtails will allow creation of pocket beaches and a readjustment of the shoreline to facilitate regeneration of the area and a move towards water sports as the main land use.
B	1	**Do Nothing Damages:**	£113,859	-		-		-	No	See Section 5.2.1
	2	**Do Minimum**								
	2.1	Patch and Repair	Sustain defences based on residual life assessment, until year 15.	15	£24,339	£4,251	£5,406	5.73	Yes	Taken forward as an interim option before leading to a more sustainable approach.
	2.2	Sediment Management	Carry out Option B2.1 until year 15, then construct rock groynes and nourish bays with shingle.	35	£45,388	£8,702	£13,149	5.22	No	Would result in more steps being taken to sustainable coastal management.
	3	**Do Something - all options include cost of Do Minimum up until year 15**								

Zone	Option		Description	Estimated year defences sustained until	Present Value Benefit PVb (£k)	Present Value Cost PVc (£k)	Cash Cost (£k)	Benefit Cost Ratio BCR (PVb/PVc)	Selected?	Reason
	3.1	Detached Breakwaters	Carry out Option B2.1 until year 15, then construct Detached Breakwaters and nourish beach with sand.	100	£113,859	£14,876	£30,839	7.65	Yes	Large sandy amenity beach created in this important tourism focused area.
	3.2	Fishtail Breakwaters	Carry out Option B2.1 until year 15, then construct Fishtail Breakwaters and nourish beach with sand.	100	£113,859	£15,906	£34,856	7.16	Yes	Fishtails will allow creation of pocket beaches and a readjustment of the shoreline to facilitate redevelopment around the promenade.
C	**1**	**Do Nothing Damages:**	£80,100	-		-		-	No	See Section 5.2.1
	2	**Do Minimum**								
	2.1	Patch and Repair	Sustain defences based on residual life assessment, until year 15.	15	£3,857	£2,210	£3,035	1.75	Yes	Taken forward as an interim option before leading to a more sustainable approach.
	2.2	Sediment Management	Carry out Option C2.1 until year 15, then construct rock groynes and nourish bays with shingle.	60	£57,826	£11,733	£24,006	4.93	Yes	Shingle beach created, increases amenity value of the zone. Taken forward as an interim option leading to Fishtail Breakwaters.
	3	**Do Something - all options include cost of Do Minimum up until year 15**								
	3.1	Detached Breakwaters	Carry out Option C2.1 until year 15, then construct Detached Breakwaters and nourish beach with sand.	100	£80,100	£14,635	£26,959	5.47	Yes	Protects assets and shingle beach created, increases amenity value of the zone.
	3.2	Fishtail Breakwaters* *Includes cost of Do Minimum Sediment Management until year 60	Carry out Options C2.1 and C2.2 until year 60, then extend a number of the Rock Groynes to Fishtail Breakwaters and renourish beach with shingle.	100	£80,100	£15,357	£49,644	5.22	Yes	Protects assets and shingle beach is created; increases amenity value of the zone. Ability to be phased so that Rock Groynes can be constructed first.

6.3 Option Compatibility

6.3.1 Overview

Following the appraisal carried out in Sections **Error! Reference source not found.** and 6, it is evident that there is a requirement for some further consideration of the interactions between zones. Whilst the likelihood of interaction has been discussed on a zone by zone basis, this section assesses which options would work in combination, across neighbouring zones, and brings the appraisal back to the scale of the wider study area.

It can be seen from the difference in present day beach levels that Zone A is largely not under the same pressures as Zones B and C. This is in part due to the beach renourishment undertaken at the adjacent Jaywick frontage, to the southwest. It can also, and to a larger extent, is seen to be because of the change in orientation of the coastline, compared with the other two zones to the north east. Taking this into account, there is justification in treating Zone A more separately, in terms of coastal processes and interactions, compared with the other two zones.

Construction of any 'Do Something' option commences in Zone A in year 20 (at the latest, depending on availability of funding). In Zone B under any 'Do Something' option within this Management Plan, a rock revetment is constructed in year 5 at the Wave Walker (Defence E) length. It can be concluded from this that defences in both zones would be in a good condition prior to any works in the adjacent zone. Therefore, any option which potentially pulls sediment away from the adjacent area will not pose such a risk. This would mitigate against any potential impacts across zones.

6.3.2 Interactions between Zones B and C

The assessment of options relative to each other is provided in Table 6-14 and the rejected combinations are contained in the greyed out boxes.

Table 6-14: Compatibility of options in Zones B and C

		Zone B		
	Option description	**Option 2.2: Do Minimum Sediment Management** 5 groynes constructed in year 20 at boundary with Zone C.	**Option 3.1: Detached Breakwaters** 3 breakwaters constructed in year 15. 2 breakwaters constructed in year 35. Both with sand nourishment	**Option 3.2: Fishtail Breakwaters** Construction of fishtail breakwaters in years 15 and 35.
Zone C	**Option C2.2: Do Minimum Sediment Management** 1 groyne constructed in year 15 at boundary with Zone B. Groynes then constructed at various locations	**Considerations:** None which would require additional works. **Compatible**: Yes	**Considerations:** Detached Breakwaters in Zone B would potentially cause outflanking of Rock Groynes without modification of the terminal groyne in Zone C to prevent this and to also prevent the mixing of sand and shingle. **Compatible:** Not without additional control structure.	**Considerations:** The shape of the terminal fishtail between Zone B and C would need to consider the potential impact on beach levels in Zone C. However, this is not considered to be a significant problem. **Compatible:** Yes
	Option C3.1: Detached Breakwaters 4 breakwaters constructed in year 15 with shingle nourishment.	**Considerations:** None which would require additional works **Compatible:** Yes	**Considerations:** Prevention of mixing of shingle and sand would require control additional structure between zones. **Compatible:** Not without additional structure.	**Considerations:** None which would require additional works. **Compatible:** Yes
	Option C3.2: Fishtail Breakwaters Following Option C2.2, extend four Rock Groynes to Fishtail Breakwaters.	**Considerations:** None which would require additional works. **Compatible:** Yes	**Considerations:** Detached Breakwaters in Zone B potentially cause outflanking of the Rock Groynes without modification of the terminal groyne in Zone C to prevent this and to also prevent the mixing of sand and shingle. **Compatible:** Not without additional works.	**Considerations:** The shape of the terminal fishtail between Zone B and C would need to consider the potential impact on beach levels in Zone C. However, this is not considered to be a significant problem. **Compatible:** Yes

6.4 Conclusion

6.4.1 Overview

Table 6-13 indicates that there are a number of options which would work in each zone. The compatibility of options taken forward in Zones B and C has been assessed in Table 6-14, leading to the rejection of Option B3.1 Detached Breakwater construction in Zone B. The resulting options are all technically feasible, do not pose significant impacts with regards to the SEA criteria and have been appraised economically.

In terms of the short term management of the area it is demonstrated that, certainly for zones A and B there is both a clear economic benefit and good indicative support for Do Minimum approach to management of the existing defences to these areas. There is a good economic justification for continued Do Minimum to Zone C, in maintaining the important defence to the cliffs, the property and infrastructure. However, in this area there is not the same level of indicative support in terms of FDGiA and to continue for the full period envisaged for Do Minimum in this area, there would need to be additional funding support.

Even so, to maintain the overall integrity of Clacton and Holland, it has to be concluded that the preferred short term management would be this Do Minimum over the whole study frontage.

This conclusion does, however, recognise that advancing a more sustainable approach earlier to make use of the opportunity of additional funding would be beneficial both in terms of reducing overall cash cost and in establishing a clearer positive statement of intent of long term management of the Clacton Frontage.

In terms of the longer term management of the area, a preferred approach has to be seen as being integrated with the emerging vision of re-generation of the area. Table 6-15 summarises the economic appraisal of the longer term options.

Table 6-15: Option economic appraisal summary

Zone	Option	Present Value Benefits PVb (£k)	Present Value Costs PVc (£k)	Cash Cost (£k)	Benefit Cost Ratio (PVb/PVc)	FDGiA Contribution (£k)	Required External Contribution
Zone A	Option 3.1 Detached Breakwaters	£169,516	£5,563	£12,507	30.47	£12,507	£0
	Option 3.2 Fishtail Breakwaters	£169,516	£6,206	£15,501	27.31	£15,501	£0
Zone B	Option 3.2 Fishtail Breakwaters	£113,859	£15,906	£34,856	7.16	£21,170	£13,686
Zone C	Option 3.1 Detached Breakwaters	£80,100	£14,635	£26,959	5.47	£10,350	£16,609
	Option 3.2 Fishtail Breakwaters	£15,357	£15,357	£49,644	5.22	£10,350	£39,294

It can be concluded from economic appraisal that as expected, any option which provides full protection to properties and assets over the full 100 year appraisal period in Zones B and C will require significant levels of external contribution to supplement that provided from FDGiA. This is due to the relatively lower economic benefits associated with these zones, compared with Zone A. This requirement to find significant external funding for the implementation of the wider Plan consequently makes the objectives relating to the fundability of an option even more important.

At Clacton, the Plan Level Objectives considered to be specific to the fundability of any option for the frontage have been used in the discussion throughout this report, and are:

Econ 4. The Plan should recognise that future opportunity for investment has the potential to influence the economic justification. The Plan will highlight and encourage options which increase the opportunity for economic decisions to be deferred whilst sustaining an economically justified approach up until that decision point.

F 3. To develop a Plan which optimises the opportunities for collaborative funding;

F 4. To do this, the outcome of the Plan should tie in with any local frameworks for regeneration and planning.

In considering the first point, the issue of phasing is most pertinent in Zone C, because of the high level and likely difficulty in attracting sufficient external funding to this location. This is evident in Table 6-15. In the case of the two 'Do Something' options available to Zone C, fishtail breakwaters are preferential because they can be preceded by the relatively less expensive rock groynes and shingle nourishment, therefore

deferring the cost of the fishtail breakwaters until year 60, but still providing an effective medium term solution.

In considering the first two objectives, the fishtail breakwaters approach also tends to come out as the most favourable, due to the opportunities that such an approach would open up. There is considered to be greater flexibility around the needs of potential investors with this approach. In reality, their shape and spacing (while providing adequate coastal protection) can still be altered.

In relation to zone A and B, the fishtail approach is again seen as providing the most adaptable approach to management in addition to providing a long term approach which is economically justified.

6.4.2 Preferred and alternative option

While recognising the issues relating to attracting additional funding my result in adaptation of the basic indicative approach the appraisal process concludes that the **preferred option** for management of the Clacton frontage is:

Zone A:
Carry out Option A2.1 Do Minimum until year 20. In year 20, carry out Option A3.2 Fishtail Breakwaters and Sand Nourishment, and continue to maintain over the 100 year appraisal period.

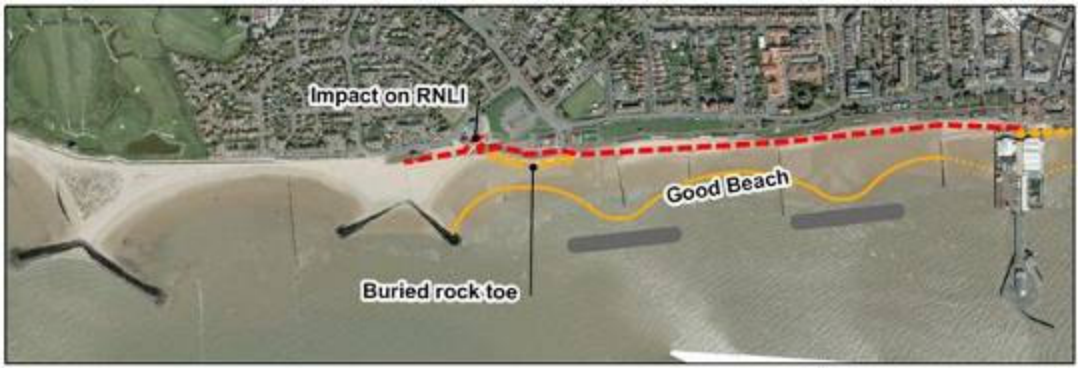
Zone B:
Carry out Option A2.1 Do Minimum Patch and Repair until year 15. In year 15 carry out Option B3.2 Fishtail Breakwaters and Sand Nourishment. Continue to maintain over the 100 year appraisal period.

Zone C:
Carry out Option C2.1 Do Minimum Patch and Repair until year 15. In year 15, carry out Option C2.2 Do Minimum Sediment Management until year 60. In year 60, carry out Option C3.2 Fishtail Breakwaters and Sand Nourishment and maintain over the 100 year appraisal period.

Further discussion of this option is provided in Section 8.

The **alternative option** for management of the Clacton frontage is:

Zone A:
Carry out Option A2.1 Do Minimum until year 20. In year 20, carry out Option A3.1 Detached Breakwaters and Sand Nourishment. And continue to maintain over the 100 year appraisal period.



Zone B:
Carry out Option A2.1 Do Minimum Patch and Repair until year 15. In year 15 carry out Option B3.2 Fishtail Breakwaters and Sand Nourishment. Continue to maintain over the 100 year appraisal period.

Zone C:

Carry out Option C2.1 Do Minimum Patch and Repair until year 15. In year 15, carry out Option C3.1 Detached Breakwaters and Sand Nourishment and maintain over the 100 year appraisal period.

7 PHASING OF OPTIONS

Throughout this Management Plan option Present Value Costs are based on the Asset Led phasing approach, which is determined by the currently estimated residual life of the defences. It is recognised, however, that the alternative Land Use Led approach to phasing gives the opportunity for phasing to be determined by the amount, and availability of funding. It is also recognised that by altering this phasing, the needs and aspirations of external contributors could also be better accommodated, which in itself would be an obvious attraction to such external contributors.

An example of how the Land Use Led approach to phasing coastal management could work at Clacton can be given using Zone B. Taking the preferred Option 3.2, fishtail breakwaters, using the current Asset Led Approach to phasing, leads to the phasing given in this Management Plan, and summarised below:

7.1 Phasing option 1 Asset Led Phasing Approach

Following 'Do Minimum' to sustain Defence E, construct fishtail breakwaters in front of Defences F and G in year 15. This will hold the line along this section until year 35, when further fishtail breakwaters would be required in front of Defence E (Figure 7-1).

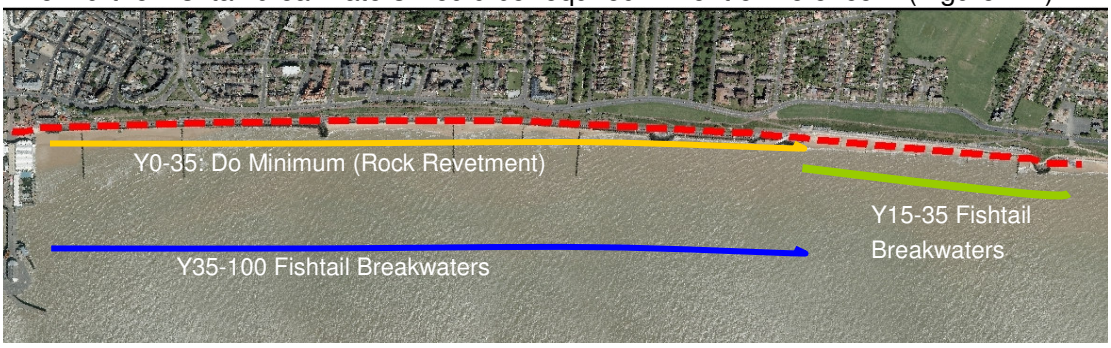


Figure 7-1: Zone B Phasing example 1

This phasing option would lead to a general deterioration of the beach and continued lowering of the shore platform at Defence E, until remedial works are required again in year 35. The benefit in this approach is that it offers a cost saving in that works are only carried out when they are needed. However, this approach also defers improvements to the quality of the beach adjacent to the Pier until year 35. In the meantime, the potential amenity benefits of this area would not be fully realised. Indeed, over the 35 year period before fishtail breakwaters would be constructed here in this option, beach access would likely be lost altogether. The cost of implementing beach nourishment could also be higher due to the larger volume of material required.

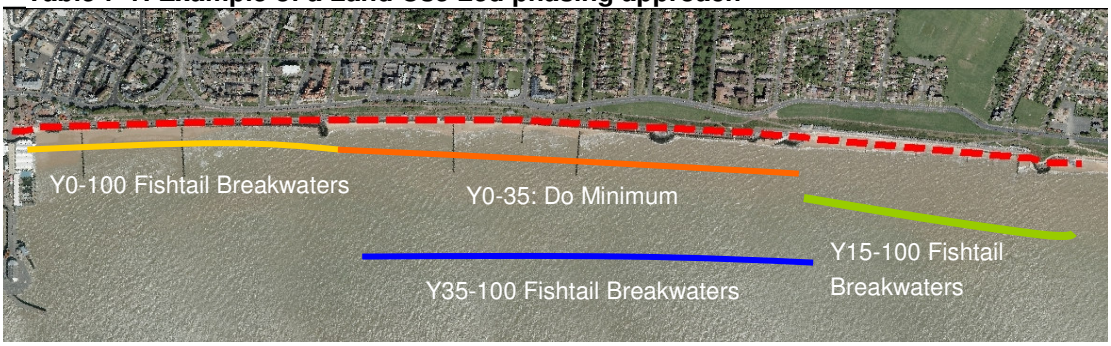
Therefore, the Asset Led approach does not capitalise on amenity and tourism, currently generated and concentrated around the Pier and in Zone A. The Land Use Led approach, could therefore be used to mitigate against these problems:

7.2 Phasing option 2 Land Use Led Approach

To realise amenity benefits earlier, there is the opportunity to bring forwards the placement of a beach (and thus protection of the shore platform), adjacent to the Pier

area, to year five. In the proposed outline layout of Option B3.2 provided in Figure 6-10 this would involve the construction of two Fishtail Breakwaters in year five. At the same time, works would also be required to the remaining length of Wave Walker units. Ten years later, in year 15, further works, in the form of Fishtail Breakwaters with sand Nourishment would be required at Defences F and G. Following this, in year 35, the area of the Wave Walker Unit section which was previously rock reveted, would require further remedial works, again, in the form of Fishtail Breakwaters and Sand Nourishment.

Table 7-1: Example of a Land Use Led phasing approach



This is just one example of how a Land Use Led approach could be phased. It is used here to highlight that if used, there would still be a necessity to act at the appropriate areas, with the appropriate mitigation measures, according to residual life and defence type. This would increase the up front option cost, but would accelerate the enhancement of the area.

8 PREFERRED APPROACH

8.1 Overview

The preferred option for Coastal Management at Clacton over the next 100 years has been developed through a full understanding of:

- The technical problem to be addressed; which is identified as long term falling beach levels. This is putting pressure on the ageing coastal defences, which have undergone a number of major repairs in the last 10 years;
- The baseline natural processes at this coastline;
- The difficulty in rising sufficient funding for any long term capital works at this frontage. This understanding has come from the knowledge that the previous Strategy was not implemented;
- The present day land use of the frontage;
- The regeneration aspirations for the frontage, of Tendring District Council. This is important in the identification of where coastal defence can enhance and create opportunities for regeneration.

The understanding of all these issues has shaped the appraisal of options for management of the frontage. As discussed, in light of this uncertainty, this Management Plan has developed, in light of the uncertainty regarding funding, decision making flow charts (Figure 6-3, Figure 6-9 and Figure 6-15). These flow charts allow the identification of the numerous pathways available to a desired outcome of sustainable coastal management. The decision points in the flow charts are based on the present day defence condition, and provide the technical solutions available at those points in time. The premise behind these decision flow charts is that when these decision points are reached, a strategy for funding should be further developed, and the appropriate choice can be made based on this improved knowledge.

Appraisal and refinement of options within this Management Plan has allowed the development of a preferred option, or preferred pathway of management over the appraisal period. Within this appraisal process, one of the criteria used to determine the preferred option has been an assessment of the level of opportunity that a particular option would bring about, for attracting funding and progressing regeneration, along the lines of that identified in the Celebrate-on-Sea report[9].

This section describes the identified preferred option.

8.2 Description of Preferred Option

8.2.1 Layout

The preferred option for the whole frontage is outlined in Figure 8-1. In all three zones of the frontage, unless funding allows works to be brought forward in time, 'Do Minimum' is assumed to be appropriate over the first: 20 years in Zone A, and 15 years in Zones B and C. It is envisaged that over the next 20 years, a small length of rock toe protection

Preferred Option

N

0 0.25 0.5 1 Kilometers

Legend

Preferred Option

- Fishtails
- Indicative Sand Renourishment
- Indicative Shingle Renourishment

ROYAL HASKONING

Clacton and Holland Flood Coastal Erosion Risk Management Plan

Environment Agency

1:15,000

September 2011

Figure 8.1

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will be required in Zone A, and lengths of rock toe protection, as well as a steel sheet piled wall will be required in Zone C. The most significant works associated with a 'Do Minimum' approach are the construction of two lengths of rock revetment; one in Zone B where the Wave Walker units are currently located, and in Zone C at Defence Q.

It is envisaged that over this period of time beach levels will continue to lower and that subsequently, beach access to Zones B and C will also reduce. Following the 'Do Minimum' works, at Zone A in year 20, fishtail breakwaters will be constructed, and the bays created will be nourished with sand. This will enhance what is already a popular sandy beach, will aid the protection of the Pier by raising beach levels beneath it at the coast and facilitate development and segregation of a water sports focussed area. The works will also not impinge on the access to the RNLI slipway.

In Zone B, following the 'Do Minimum' works, fishtail breakwaters with sand nourishment will be constructed at Defences F and G. They will provide protection to this section, and the sand nourishment will benefit the adjacent lengths of the Wave Walker units (now fronted by a rock revetment). The Gunfleet Boating Club will also be protected by these works and the beach hut owners will benefit significantly from the presence of a sandy beach at this location. No further 'Do Something' works will then be constructed in Zone B until year 35, when fishtail breakwaters and sand nourishment will be implemented in front of the Wave Walker units. Sand nourishment is then undertaken regularly following this, to provide adequate protection over the 100 year appraisal period.

In Zone C, following 'Do Minimum' works at Defences L, M, V, and Q, rock groynes with shingle nourishment will be constructed at a number of locations. This is at the boundary of Zone B and C and then further in the north east at Defences N, O, P, T, U and W and X. These works, with regular shingle nourishment, will provide protection to the backline of defence in these areas. In years 25, 30 and 35, a total six more groynes will be constructed at the remaining defence lengths. It is accepted that the shingle beach will not provide full protection to the shore platform but instead that there will be some element of movement of the placed material. In year 60, therefore, this protection will then be increased by extending every other rock groyne into a Fishtail Breakwater structure.

8.2.2 Phasing

The phasing used to assess the option costs is based on the Asset Led Approach, whereby the condition of the present day defences determines where a 'Do Something' approach is implemented first. As discussed, there is the opportunity to alter this phasing, if funding allows for it, and to focus works in areas which would benefit most (in terms of attracting further funding) from e.g. placement of a beach. This phasing approach would still need consideration of works required to hold defences according to their residual life but could bring about more funding from external contributors.

8.3 Economic Appraisal

8.3.1 Option costs

A cost profile of the preferred option is presented in Table 8-1. This table indicates the cash cost of the works, in ten year intervals, over the 100 year appraisal period.

Table 8-1: Preferred option cash cost profile

Year	Zone A	Zone B	Zone C	Total Cash Cost (£k)
0-10	£99	£4,983	£2,953	**£8,035**
11-20	£10,029	£11,854	£10,206	**£32,089**
21-30	£756	£526	£4,340	**£5,622**
31-40	£756	£12,137	£4,868	**£17,761**
41-50	£756	£895	£878	**£2,529**
51-60	£756	£895	£24,084	**£25,735**
61-70	£756	£895	£710	**£2,361**
71-80	£756	£895	£710	**£2,361**
81-90	£756	£895	£710	**£2,361**
91-100	£81	£879	£186	**£1,146**
Total	**£15,501**	**£34,854**	**£49,645**	**£100,000**

The capital costs include an allowance for preliminaries, overheads and profit and an optimum bias of 30%. In addition design and supervision of the capital works have been assumed to be 10% of the value of the capital works. The largest costs can be seen to be incurred in year 11-20, which is the period in which the 'Do Minimum' approach alters to one of 'Do Something'.

8.3.2 Option Benefits

There are no residual damages associated with the preferred option. Therefore the 'Do Nothing' total damages are the 'Do Something' benefits. The total benefits for the Clacton frontage are £363,476k.

The Benefit Cost ratio for the preferred option is: **9.70**

8.4 Timing of works

Under the preferred option the major construction works required would be spread over a period of 35 years. Table 8-2 describes where and when these works would be expected to occur.

Table 8-2: Timing of preferred option works

Year	Zone A	Zone B	Zone C
	Ongoing routine maintenance		
5		Rock Revetment Defence E	Steel sheet piled wall Defence V
	Ongoing routine maintenance		
10			Rock Toe Defences L and M; Rock Revetment Defence Q
	Ongoing routine maintenance		
15	Rock toe and concrete encasement Defence C	3 Fishtail Breakwaters and Sand Nourishment at Defences F and G	8 Rock Groynes and Shingle Nourishment (Defences H/I, N/O/P, T/U and W/X)
	Ongoing routine maintenance		
20	3 Fishtail Breakwaters and Sand Nourishment		
	Ongoing routine maintenance		
25			1 Rock Groyne at Defences L/M
	Ongoing routine maintenance		
30			2 Rock Groynes at J/Y
	Ongoing routine maintenance		
35		4 Fishtail Breakwaters and Sand Nourishment Defence E	3 Rock Groynes at Defences Q/R/S
	Ongoing Renourishment and routine maintenance		
100			

8.5 Environmental Appraisal

8.5.1 Strategic Environmental Appraisal

THIS SECTION WILL BE COMPLETED WHEN THE SEA IS FINALISED

9 CONCLUSION

9.1 Overview

This Management Plan has identified the problem of falling beach levels at Clacton and Holland-on-Sea, threatening defences and as a consequence threatening the long term sustainability of the Clacton as a Sea Side Town. Through the appraisal process, the study has concluded with a preferred approach for future management. This has been presented as a long term preferred approach to management but within the context of a decision framework allowing opportunity to be sought for the necessary contributory funding to risk management. Importantly, the preferred approach has been chosen based on its potential attraction to external contributors, and in the level of opportunity it opens up for regeneration of the frontage. It is also phased in such a way as to allow the maximum amount of time for a funding Strategy to be fully developed.

This section now provides a number of recommendations in the implementation of this Management Plan.

9.2 Recommendations

This Management Plan will be presented to both Tendring District Council and the Environment Agency's Large Project Review Group (LPRG). Subject to approval from these organisations, the following recommendations are made:

9.2.1 Funding

The successful implementation of this Management Plan is dependent on sufficient funding being found. Therefore, it is recommended that Tendring District Council use this document in combination with the development of a long term land use strategy. The Celebrate-on-Sea report has introduced some very interesting concepts and ideas for local opportunities for enhancement and it is recommended that these are further developed alongside the preferred options presented in this coastal plan..

In this respect, this Management Plan aims to help promote and develop ideas for long term enhancement of the Clacton frontage.

9.2.2 Environment

WILL BE COMPLETED ONCE THE SEA IS FINALISED

Mitigation measures

9.2.3 Engineering works

This Management Plan has identified critical defence lengths which will require works in the next five years. As part of the long term strategy, interim 'Do Minimum' works have been recommended for these critical lengths. To avoid against failure of these sections, it is recommended that Project Appraisal Reports (PARs) are developed for these defence lengths and that works are implemented.

9.2.4 Decision making tool

There are a large number of variables, directly relating to the amount and source of funding from external contributions, which means that the implementation of the specific preferred option may not be possible. In this scenario, this Management Plan remains a key document in providing the option decision flow charts for each zone (Section 6). It is recommended that Tendring District Council use these flow charts to identify key decision points and the several potential pathways to sustainable coastal management. This should be coupled with ongoing monitoring and review of the condition of the defences at the frontage.

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ROYAL HASKONING

Appendix A
Baseline Processes and Defence Inspection

ROYAL HASKONING

Appendix B
Economic Appraisal

ROYAL HASKONING

Appendix C
Reports Referenced

1. The previous Strategy was first developed in 2000:
Posford Duvivier*, 2000, Coast protection Scheme Strategy Plan, Clacton-on-Sea, Volume I and Volume II; and parts of it were subsequently updated in 2004:
Royal Haskoning, 2004, *Coast Protection Scheme Strategy Plan*, Clacton-on-Sea

2. Royal Haskoning (2011), Baseline *Processes and Defence Inspection*, Clacton and Holland Flood and coastal Erosion Risk Management Plan and Appendices

3. Royal Haskoning (2011), *Strategic Environmental Assessment,* Clacton and Holland Management Plan & Royal Haskoning (2010), *Scoping Consultation Document,* Clacton and Holland Management Plan.

4. Environment Agency (2010), *Flood and Coastal Erosion Risk management Appraisal Guidance* (FCERM-AG)

5. Royal Haskoning, (2011) Essex and South Suffolk Shoreline Management Plan2

6. 7.&8 - references in SEA documents

9 BroadwayMalyan &Hemingway Design (2010) *Celebrate-on-Sea*

10. Royal Haskoning (2011) *Holland Haven High Level Assessment*

11. Royal Haskoning, (2010) *Cliff Road Coast Protection Works*, Project Appraisal Report

12a. Environment Agency (2011) *Estimating Outcome Measure contributions and using the FDGiA Funding calculator for Flood and Coastal Erosion Risk Management projects*.

12b. Defra (2011) *Flood and Coastal Resilience Partnership Funding*

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