Humber Estuary Coastal Authorities Group

Flamborough Head to Gibraltar Point Shoreline Management Plan

Interim Plan

December 2010

Prepared for

Humber Estuary Coastal Authorities Group


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Revision Schedule

Flamborough Head to Gibraltar Point Shoreline Management Plan
December 2010

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Preface

This document is the Flamborough Head to Gibraltar Point Shoreline Management Plan and should be read in conjunction with the accompanying appendices. A non-technical summary of this document has also been produced. This document has been prepared for the Humber Estuary Coastal Authorities Group.

Funding for development of the Flamborough Head to Gibraltar Point Shoreline Management Plan was provided by Defra and the Environment Agency.

The document, non-technical summary and accompanying appendices are available electronically on the project website: www.hecag-smp2.co.uk . Copies can also be viewed at the Council offices shown below:

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Table of Contents

Figures

Tables

1 Introduction

1.1 This chapter provides some background information on the Flamborough Head to Gibraltar Point Shoreline Management Plan and covers the following topics:

- An introduction to Shoreline Management Plans;
- A brief description of the Flamborough Head to Gibraltar Point coastline;
- An overview of the Shoreline Management Plan development process;
- Set out the principles within which the Plan was developed;
- How relevant guidance, legislation and related plans have been taken into account; and
- The structure of the Flamborough Head to Gibraltar Point Shoreline Management Plan and accompanying appendices.

The Shoreline Management Plan and the planning framework

1.2 A Shoreline Management Plan (SMP) provides a large-scale assessment of the risks associated with coastal processes and presents a long-term policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner. An SMP aims to manage risk by employing a range of methods which reflect both national and local priorities, to:

- Reduce the threat of coastal flooding and erosion to people and their property; and
- Benefit the environment, society and the economy as far as possible, in line with the Government's 'sustainable development principles '.

1.3 An SMP forms an important part of the wider planning framework. It is important to recognise the position the role of the SMP in the broader context. An overview of how the SMP fits into the wider planning framework and its relationship with other Plans, Delivery Plans, Projects and Actions is provided in Figure 1.1.

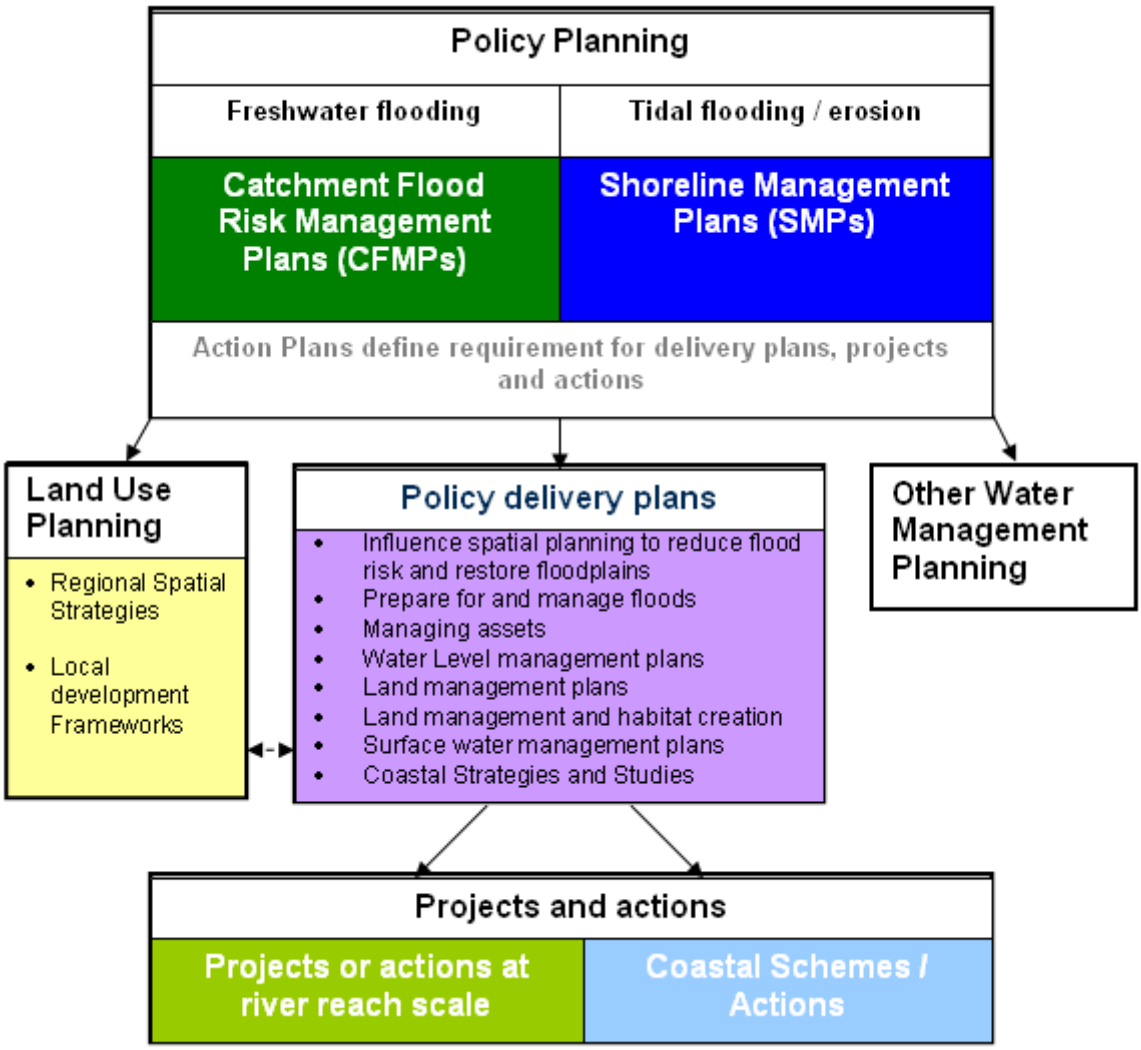


Figure 1.1 Diagram showing how the SMP fits with the wider planning framework.

1.4 SMPs sit on the same level as Catchment Flood Management Plans (CFMPs) in the wider planning framework. SMPs assess coastal risks and present a long term policy framework to manage and reduce them. CFMPs give an overview of the flood risk across river catchments and estuaries, and like SMPs, they recommend ways of managing risks now and over the next 50-100 years. CFMPs consider all types of inland flooding including rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea, (coastal flooding), which is addressed by Shoreline Management Plans. SMPs and CFMPs also take into account the likely impacts of climate change, the effects of how we use and manage the land, and how areas could be developed to meet our present day needs without compromising the ability of future generations to meet their own needs.

1.5 SMPs comprise the first stage in the Department for Environment, Food and Rural Affairs (Defra) hierarchy of plans for achieving coastal and flood defence protection (Figure 1.2). SMPs are high-level non-statutory planning documents which identify policies to manage risks. The next stage is the production of strategies which identify appropriate schemes to put the SMP policies into practice. The final element of work is undertaken at scheme level where different options are compared and a preferred option selected and designed in order to put the preferred scheme into practice.

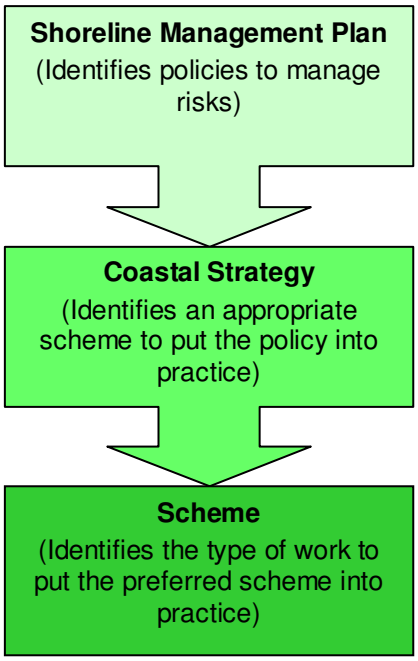


Figure 1.2 Defra's hierarchy of coastal plans

1.6 SMPs present recommended objectives for specific areas and undertake a high level assessment of risks and recommend management policies within this supporting framework. Specific measures to manage risk will not be identified in these Plans, but these may be progressed as part of more detailed studies at the lower planning or action levels lying beneath the SMP.

1.7 The current program of SMPs is a review of the first generation of SMPs produced in the 1990s. The first generation of SMPs were undertaken based on guidance published in 1995 by the former Ministry of Agriculture, Fisheries and Food and were based on sediment cell boundaries, relating to the movement of sand and shingle along the coast.

1.8 It has always been recognised that SMPs will need to be reviewed on a regular basis to take into account improved understanding of coastal processes (through new studies and monitoring programmes), changes in legislation, changes in national flood and coastal defence planning requirements etc.

1.9 Lessons learned from evaluation of the strengths and weaknesses of the first round of SMPs have been documented following a nationwide review undertaken by Defra in 2000. SMP guidance documents formalising the requirements for second round SMPs have resulted (Defra, 2006a), and this guidance has been integral in the development of the Plan.

1.10 The second generation SMPs also play a vital role in facilitating Government's objectives of reducing the threat of coastal flooding and erosion to people and property, as outlined in Defra's 'Making Space for Water' strategy (Defra, 2005). The focus of the second generation SMPs is on the identification of sustainable policies to manage risk, working with natural processes wherever possible. They:

- Set out the risks from coastal flooding and erosion to people and the developed, historic and natural environment within the SMP area;

- Identify opportunities to maintain and improve the environment by managing the risks from coastal flooding and coastal erosion;
- Identify the preferred policies for managing risks from coastal flooding and erosion over the next century;
- Identify the consequences of putting the preferred policies into practice;
- Set out procedures for monitoring how effective these policies are;
- Inform others so that future land use, planning and development of the shoreline takes account of the risks and the preferred policies;
- Discourage inappropriate development in areas where the flood and erosion risks are high; and
- Meet international and national nature conservation legislation and aim to achieve applicable biodiversity objectives.

1.11 The four generic SMP policy options available for shoreline management in the second generation SMPs are presented in Table 1.1. The choice of policy for shoreline management depends on the technical, environmental, social and economic characteristics of each section of coastline. The intent of management is typically formulated in terms of the effect of shoreline management on land use and environment. It describes what we want to achieve through managing the shoreline. However, for use in coastal flood and erosion management, the intent of management has to be expressed as one of four polices that describe the actual management of the shoreline itself.

1.12 The SMP needs to provide the intent of management and associated policy for each section of the shoreline, and for the short, medium and long term up to 2105. All SMPs use the following three time periods, referred to as epochs:

- Epoch 1: from present day to 2025;
- Epoch 2: 2025 to 2055; and
- Epoch 3: 2055 to 2105.

1.13 For the later epochs, as uncertainty increases, the intent of management and associated policies are less ‘fixed’. Shoreline management planning is an on-going process and SMPs will be reviewed as new information and knowledge becomes available. In principle, this review will occur every five to ten years.

Table 1.1: Shoreline management policies

Shoreline management policy	Description of policy
Hold the line (HTL)	Hold the existing defence line. This policy will cover those situations where work or operations are carried out on the existing defences (such as beach recharge, rebuilding the toe of a structure, building offshore breakwaters and so on). Included in this policy are 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.
Advance the line (ATL)	Advance the existing defence line by building new defences on the seaward side of the original defences. Using this policy should be limited to those policy units where significant land reclamation is considered.
Managed realignment (MR)	Managed realignment by allowing the shoreline to move landwards, with management to control or limit movement (such as building new defences on the landward side of the original defences).
No active intervention (NAI)	A decision not to invest in providing or maintaining defences.
* These policies may be applied to any of the three timescales: short-term (up to the year 2025); medium-term (between 2025 and 2055); and long-term (between 2055 and 2105). These three periods are known as 'epochs' within the SMP.	

1.14 In addition to the four generic shoreline management policy options described in Table 1.1, this SMP has made use of a fifth policy: hold the line on a realigned position (HR). This has been used for reasons of clarity in areas where the policy is managed realignment for an early epoch. The policy of hold the line on a realigned position may then be specified for subsequent epochs (in preference to a hold this line policy) as this gives greater clarity over which defence line is being held.

1.15 It is important to note that the central decision in the SMP concerns the outcome that is intended, described as 'the intent of management' within this SMP. This constitutes the actual plan; the policies provide the means to implement the Plan.

1.16 The first three policy options in Table 1.1 typically involve defences. Conventionally the SMP policies do not imply any particular standard of protection against flooding. They could be implemented by maintaining or changing the standard of protection. Often, decisions regarding standards of protection are considered to be beyond the scope of the SMP, and would be undertaken in a strategy or scheme. However for extensive low lying areas, such as the Lincolnshire and outer Humber Estuary coastlines within this SMP area, the standard of protection provided by defences is such a vital element of shoreline management that the partner authorities have agreed to indicate a 'ball park' preferred standard within the SMP itself.

1.17 SMP policies focus purely on the location of the shoreline, but in addition, there are areas in the HECAG SMP where policy decisions for the shoreline may also have implications for tidal flooding inland of the defence. Inland flood risk from rivers and other sources is assessed by Catchment Flood Management Plans (CFMPs) and each policy used in these plans is defined as 'a sustainable aspiration or proposed overall direction to manage current and future flood risk in a sustainable manner'. Therefore, for each area of coast where flood risk is an issue, a preferred CFMP-defined flood risk management policy has been put forward to indicate the aspiration of management regarding the future standard of protection against tidal inundation.

1.18 Although the flood risk management policies put forward by this SMP are not 'fixed', they have been put forward to indicate the preferred management intent for the future, but the

implementation of these flood risk management policies will depend on future funding (see section 8.48 - 8.50) and will be subject to review as a result of future detailed strategy studies. The CFMP flood risk management policies (P1-P5) are defined below and they have been assessed in terms of viability/applicability for the flood risk of specific sections of the coast. P1 – P5 are defined as:

- P1: No active intervention;
- P2: Reduce existing flood risk management actions, accepting increase of risk over time;
- P3: Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this baseline;
- P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from climate change); and
- P5: Take further action to reduce flood risk.

1.19 Note that in determining flood risk within the SMP, we have taken the CFMP policy headline only to capture a description of the intended approach to managing risk over the plan period. Therefore it should be noted that:

- The flood risk policies described in this SMP have not been appraised in the same manner as the policies derived for inland flood risk within CFMPs;
- The policy wordings differ slightly to how they appear in the CFMPs themselves due to being adapted for use in shoreline management; and
- Flood risk policies have been used across each epoch, in a way that is different to their use in CFMPs.

1.20 The final policy for each relevant policy unit will be a combination of the location-based SMP policies across all epochs and the long-term sea flooding risk management policy, e.g.:

- HTL (P3): Hold the defence in its current location and maintain risk at its current level, accepting increase of risk due to future changes.

1.21 Or:

- HTL (P4): Hold the defence in its current location, sustaining the risk at its current level, ensuring it does not increase in the future.

1.22 It is intended that SMPs will inform statutory coastal decision-making and as such, SMPs are part of the evidence base for strategic planning documents, such as Regional Spatial Strategies and Local Development Frameworks. The recognition of planning initiatives within the SMP facilitates the wider application of the SMP for different sectors of coastal management.

1.23 The main aim of the SMP is to develop an intent of management for the shoreline that achieves the best possible balance of all the features and issues that occur along the shoreline over the next 100 years. This intent of management is mainly about managing the shoreline and its flood and erosion defences, but there is a strong relationship with social, economic and environmental activities along the shoreline. SMP policies are not therefore driven by flood or erosion risk management economics. They do, however, have to be realistic. This is especially relevant for the policies for the short term. Implementing SMP policies will require funding, which may be national, local and/or third-party funding.

1.24 The SMP does not make decisions about land use and environmental values. It does, however, set one of the parameters within which coastal land use and the coastal environment will function. The SMP has therefore been developed through a partnership approach between the Environment Agency, the local authorities, Natural England, English Heritage and the National Farmers' Union who have an interest or responsibility in those fields. The SMP has been set up to take full account of the plans that these organisations make. Similarly, these organisations intend to take full account of the SMP in their decisions (such as the Local Development Framework for the local authorities' land use planning). Paragraph 1.38 explains how the SMP takes account of other related land use plans and procedures.

Project Area

1.25 This SMP has been commissioned by the Humber Estuary Coastal Authorities Group[1] (HECAG) and covers the coastline from Flamborough Head to Gibraltar Point. Scott Wilson has been commissioned to prepare the Shoreline Management Plan.

1.26 This SMP covers an area which comprises an amalgamation of two first generation SMPs; the first HECAG Shoreline Management Plan covered the coast from Flamborough Head to Humberston Fitties and was published in 1998. The Lincolnshire coast from Humberston Fitties to Gibraltar Point was considered separately in the Lincolnshire Shoreline Management Plan, prepared under the direction of the Anglian Coastal Authorities Group in 1996. Work undertaken since 1996 has established that sediment transport occurs across the mouth of the Humber so processes along the Holderness coast have an impact along the Lincolnshire coastline. The boundary for the second Shoreline Management Plan has therefore been extended to ensure effective management of these wider coastal processes; the SMP covers the coastline from Flamborough Head to Gibraltar Point, which comprises sediment cells 2a, 2b and 2c. A sediment cell refers to a length of coastline and its nearshore area within which the movement of sand and shingle is largely self-contained. Figure 1.3 shows the SMP study area. The CFMPs (see paragraph 1.4) which overlap the SMP area are also shown for reference purposes.

1.27 This plan area covers a highly dynamic coastline with a great diversity of land use and environments. Much of the Holderness coastline has been subject to rapid erosion over recent centuries. The floodplain of the outer Humber Estuary includes some of the most productive agricultural land in the UK and major concentrations of industrial and commercial properties. In Lincolnshire flooding is the core issue, as there are extensive areas of land at or just above present day sea level. There are many conflicting local issues and objectives along the coastline.

1.28 The northern open-coast boundary of the SMP is at Flamborough Head (as shown on Figure 1.3) where this SMP joins the adjacent North East Coastal Authorities Group (NECAG) SMP, to the north. Consideration of this area will need to take into account the No Active Intervention policy selected for Flamborough Head in the NECAG SMP and the fact that there are environmentally designated areas around the Flamborough Head coastline which straddle both SMPs.

1.29 The southern open-coast boundary of the SMP is at Gibraltar Point (as shown on Figure 1.3) where this SMP joins the adjacent Wash SMP to the south. The boundary runs along the right bank of the River Steeping. Gibraltar Point spit system provides a morphological break

[1] Since commencing this study, coastal groups in England have been reconstituted as part of the Environment Agency's strategic overview of the coast role. This SMP is now within the area administered by the North East Coastal Group, covering the coastline from St Abb's Head to Gibraltar Point.

between the sandy beaches to the north and the mudflats and salt marsh of the Wash; the Gibraltar Point spit system is included within this SMP.

1.30 The estuary boundary of the SMP is the boundary of sediment cells 2a and 2b (HR Wallingford, 1993); Stone Creek on the north bank of the Humber and the eastern jetty at Immingham on the south bank of the Humber.

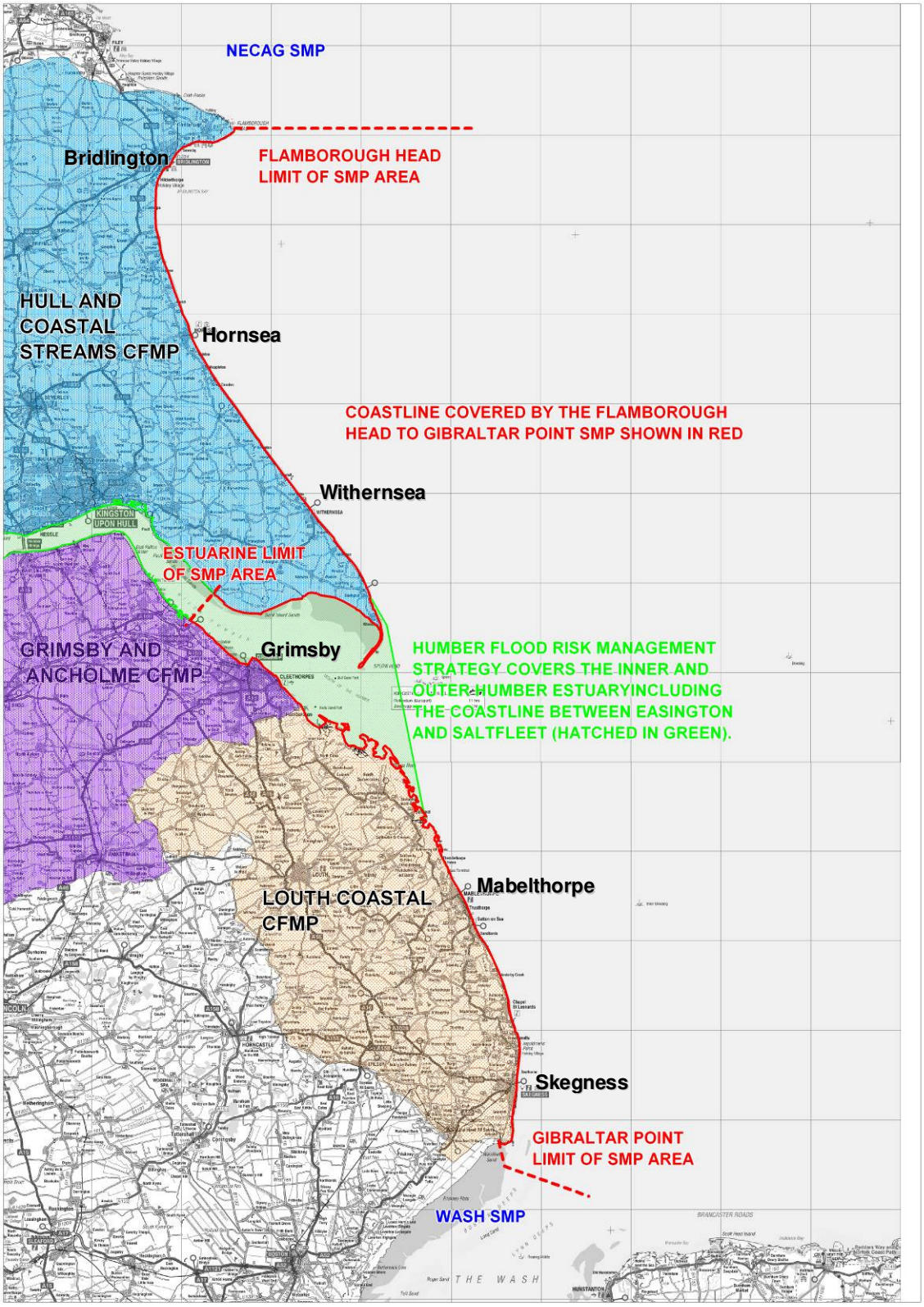


Figure 1.3: Flamborough Head to Gibraltar Point Shoreline Management Plan area (CFMP boundaries shown for reference only).

The Plan Development Process

Organisations Involved

1.31 The Shoreline Management Plan has been developed with the involvement of the following organisations throughout the process:

- East Riding of Yorkshire Council;
- North East Lincolnshire Council;
- East Lindsey District Council;
- Lincolnshire County Council;
- Environment Agency;
- Natural England;
- English Heritage; and
- National Farmers' Union.

1.32 The above organisations formed a Client Steering Group to oversee progress and direction of the SMP. These organisations represent a range of interests; decisions within the Client Steering Group were reached through minuted consensus.

1.33 An Elected Members' Forum was established to strengthen the linkages between the SMP and elected members within the SMP area. Each local authority was represented by two elected members on the Forum. In addition, the Environment Agency, Anglian and North East Regional Flood Defence Committees and Natural England were represented on the Forum. This model reflects the Cabinet-style approach to decision-making familiar to local government. The Elected Members' Forum has been involved throughout the project to review and consider each element of work.

1.34 Scott Wilson Ltd, consultants for the natural and built environment, has worked in partnership with the Client Steering Group and Elected Members' Forum to develop and the Shoreline Management Plan.

Stakeholder Involvement

1.35 Appendix B contains a detailed description of how stakeholders have been involved in developing the SMP and how the feedback received has influenced its development. The SMP development process has sought involvement from over 800 stakeholders including residents directly affected by coastal processes, national and local organisations and businesses. Consultation on the draft SMP took place between 2 November 2009 and 5 February 2010. The principal stakeholder engagement activities undertaken during development of the SMP are listed below. Further details about stakeholder involvement are provided in Appendix B.

- A Stakeholder Engagement Strategy was developed for the SMP to ensure that stakeholder groups were identified, their main concerns analysed and engagement methods and timings agreed. This was a live document, updated throughout the process of developing the SMP.
- All stakeholders identified by the Client Steering Group (over 900) were contacted with: a letter introducing the purpose of the SMP; a leaflet providing information about the SMP; and a questionnaire covering key issues. The aim was to raise awareness of the SMP, request additional information and collect views on important local issues and features.

- Interviews were conducted with 29 key stakeholders identified by the Client Steering Group to obtain opinions on key features, issues and their importance.
- Two workshops were held for invited key stakeholders in order to develop support and participation. The local features identified along the coast by the project team were presented and the workshop participants reviewed and evaluated the features and developed objectives.
- A Strategic Environmental Assessment Scoping Report was issued to the statutory consultees (see Appendix J) for a period of five weeks.
- A series of ten public exhibitions were held throughout the SMP area to build understanding and commitment. The exhibitions provided information about work undertaken to date, including coastal process assessment, mapping of flood and erosion likelihood, issue identification and objectives.
- Public consultation on the draft SMP, including exhibitions and workshops along the frontage. Comments received were collated and the draft SMP was revised to take account of those comments.

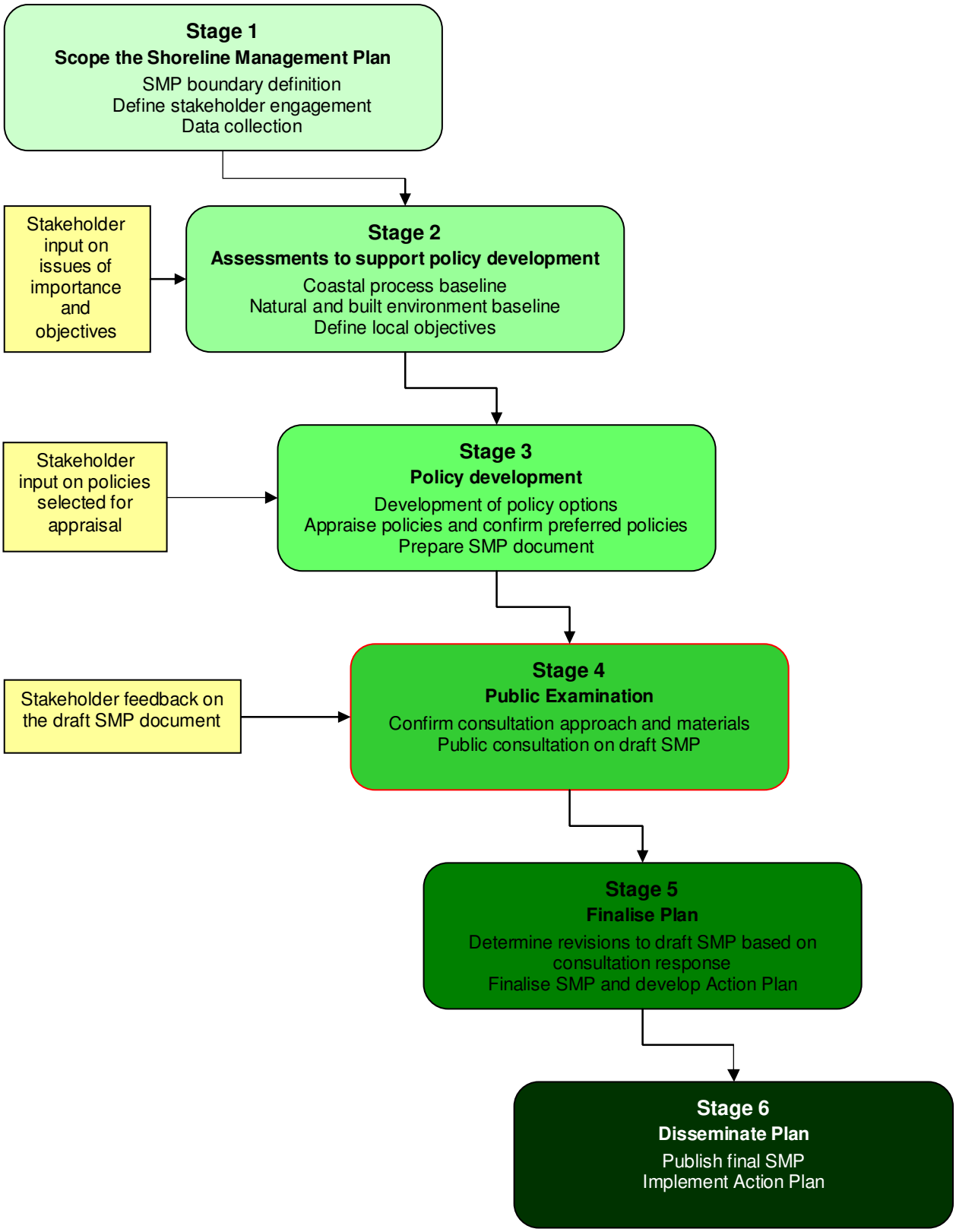


Figure 1.4: SMP development process

Principles for Shoreline Management for the Project Area

1.36 As a starting point for the development of shoreline management policies that reflect the range of interests on the coast, a set of principles was agreed among the organisations involved in developing the SMP. These principles summarise what the SMP aims to achieve across the breadth of issues affected by the SMP. Some of these principles may be contradictory; during the development of shoreline management policies, the intention is that an acceptable balance is sought between these competing coastal interests.

1.37 The following set of principles forms the basis for setting policy appraisal objectives for shoreline management. In applying the principles it should be understood that all principles are to be considered in conjunction with one another and that their order is not significant.

- To balance flood and erosion risk management in a sustainable manner appropriate to the overall value of the features affected.
- To ensure that shoreline management policies encompass longer term adaptation options, and give time for communities and individuals to adapt to changing climate conditions and levels of risk.
- To develop policies for flood and erosion risk management that will inform spatial planning processes and provide a robust evidence base for Local Development Frameworks.
- To support sustainable patterns of development and consider possible effects on communities and their welfare.
- To support the nationally, regionally and locally important social and economic assets of the area in a sustainable manner.
- To consider the effects of coastal change on local industries, agriculture and employment and provide a secure environment for economic activity and development.
- To ensure that local decisions do not have a disproportionately adverse affect on the natural balance of the coastline and shoreline management elsewhere.
- To contribute to the positive management and enhancement of environmentally designated sites and protected species, subject to natural change.
- To support the conservation and enhancement of biodiversity in the wider coastal zone.
- To support the maintenance and enhancement of the character of the coastal landscape.
- To support the preservation and enhancement of the historic environment.
- To comply with legislative requirements and contribute to a safe and healthy environment.

Compliance with Procedures and Related Plans

1.38 This SMP has been developed taking account of relevant guidance, legislation and related plans throughout.

1.39 A Habitat Regulations Assessment (incorporating Appropriate Assessment) has been carried out in order to comply with the requirements of Article 6 of the EC Habitats Directive 1992 (transposed into English and Welsh law by Regulation 48 of the Conservation (Natural Habitats &c) Regulations 1994, as amended)). The Habitat Regulations Assessment has been drafted as a stand-alone document and is also included as Appendix L.

1.40 A Water Framework Directive Assessment has been carried out in order to comply with the requirements of European Directive 2000/60/EC (passed into UK law in 2003). The Water Framework Directive Assessment has been drafted as a stand-alone document and is also included as Appendix K.

1.41 Preparation of Strategic Environmental Assessment (SEA) is not a statutory requirement for SMPs, however, in line with best practice, a fully integrated SEA approach has been adopted in order to develop the SMP. The approach adopted complies with the requirements of European Directive 2001/42, known as the SEA Directive. The SEA is provided in Appendix J.

1.42 There are a number of other plans relevant to the SMP area that have been taken into consideration throughout development of the SMP. In particular, there are close links with the Humber Flood Risk Management Strategy and the Lincolnshire Coastal Study.

1.43 The HECAG SMP 2 is the second generation of SMPs to review the Yorkshire and Lincolnshire shoreline between Flamborough Head and Gibraltar Point.

1.44 The first generation of SMP 1s, divided the Yorkshire and Lincolnshire shoreline into 2 individual plans : Flamborough Head to Sunk Island including Immingham to Donna Nook SMP and the Donna Nook to Gibraltar Point SMP. The Tidal Estuary was covered separately by the Humber Estuary SMP (HESMP).

1.45 Following the first round of SMPs, a number of key strategies to manage flood risk were completed with Government support and funding. The Humber Flood Risk Management Strategy (HFRMS) was founded on the HESMP and provides a long-term comprehensive evaluation of coastal processes between the inner and outer estuary balancing environmental and flood defence needs. The Lincshore Beach Nourishment Program is the key strategy which provides Lincolnshire with its current standard of protection to maintain its 'Hold the Line' policy between Donna Nook to Gibraltar Point.

1.46 The HECAG SMP 2 is now a single SMP, which aims to provide sound policies for the complete shoreline between Yorkshire and Lincolnshire. All future coastal strategies should provide an integrated approach to deliver the right outcomes which both manage and reduce flood risk.

1.47 The HFRMS is already delivering its approved Government funding for the first 25 years and the HECAG SMP 'Action Plan' will soon start developing its future strategies for achieving its policies up to 2105. Strategies and SMPs will be reviewed periodically and will include key stakeholders and partners from the Elected Members Forum to ensure strategies and SMPs are fully integrated.

1.48 Attention has also been paid to boundary issues in the areas adjacent to the NECAG SMP and Wash SMP at the northern and southern extent of this SMP.

Structure of the HECAG Shoreline Management Plan

Main Document

1.49 Chapter 1: Provides the background information, principles, objectives and structure of the plan and summarises the SMP development process.

1.50 Chapters 2 - 7: Describes the basis for the development of the plan and places the SMP into context. This section also provides an understanding of the relevant limitations and constraints of the policies.

1.51 Chapter 8: This chapter provides an overview of the Plan and describes the rationale behind the selection of the policies and implications of the Plan.

1.52 Chapter 9: This chapter provides further details of the Plan as well as mapping.

1.53 Chapter 10: Contains the Action Plan which sets out the future activities agreed by the partner organisations to implement the SMP. The Action Plan will be prepared following public consultation and will be based on the final policies, so this SMP does not contain an Action Plan.

1.54 Chapter 11: This chapter provides the reference documents that have been used during development of the SMP.

1.55 Glossary providing information about some of the specialist wording used within the SMP document.

Supporting Appendices

1.56 The supporting appendices provide details of the full information which fed into the process of developing policies. This provides the technical details which fed into the decision-making process. The appendices are divided into ten sections as follows:

- Appendix A: SMP Development - A description of the stages and tasks illustrating the policy decision-making process.
- Appendix B: Stakeholder Involvement - Details of stakeholder involvement together with information arising from the consultation process.
- Appendix C: Assessment of Coastal Behaviour and Baseline Scenarios – Summary of understanding of coastal processes, existing coastal defences and assessment of baseline scenarios.
- Appendix D: Theme Review (Natural and Built Environment Baseline) - Identification of environmental features (human, natural and historic).
- Appendix E: Policy Development and Appraisal – Description of the policy development process including objective setting, policy appraisal and high-level assessment of sediment linkages along the coast.
- Appendix F: Not used.
- Appendix G: Not used.
- Appendix H: Economic Appraisal - Provides a high-level economic assessment of the preferred Plan.
- Appendix I: Metadatabase and Bibliographic Database – Provides a record of bibliographic and metadata information.
- Appendix J: Strategic Environmental Assessment – Report setting out how the requirements of the SEA Directive have been fulfilled during policy development.
- Appendix K: Water Framework Directive Assessment – Assessment of policies against the objectives from the draft River Basin Management Plans.

- Appendix L: Habitat Regulations Assessment – Report setting out how the requirements of the Habitats Directive have been fulfilled during policy development.

2 Basis for development of the Plan

2.1 The following chapters provide a summary of the background information which fed into the policy development and decision-making process. Further details are provided in the appendices to the SMP. The topics summarised are:

- Chapter 3: Sustainable shoreline management and its importance within the second generation of SMPs;
- Chapter 4: Overview of coastal processes and coastal defences within the SMP area;
- Chapter 5: Description of the role of shoreline management in shaping the future coastline;
- Chapter 6: Overview of the land use and environment within the SMP area; and
- Chapter 7: Description of the process through which the items above were combined and appraised to select draft preferred policies for the SMP frontage.

3 Sustainable Shoreline Management

3.1 Within the second generation SMPs, there is a renewed focus on the importance of identifying sustainable policies to manage risk, working with natural processes wherever possible. Defra's SMP guidance (Defra, 2006a) defines sustainable policies as those that "lead to coastal defence solutions that avoid committing future generations to inflexible and expensive options for defence. They will usually include considering relationships with other defences and likely developments and processes with a coastal [sediment] cell or sub-cell".

3.2 The Flamborough Head to Gibraltar Point coastline is very varied with a wide variety of land uses, some dependent on a coastal location. In some areas, there may be conflicting demands on the shoreline and a particular approach to shoreline management may benefit some aspects whilst being detrimental to others. The aim of the SMP is to find an acceptable balance between the competing interests on the coast.

3.3 In some areas, natural coastal processes and sediment transport processes are highly complex and are not yet fully understood. The SMP must define robust policies based on the best scientific understanding currently available whilst remaining flexible

3.4 For the Flamborough Head to Gibraltar Point SMP, the difficult choices that need to be considered are summarised below, for each area:

Holderness cliffs

- There are three coastal towns along the eroding Holderness frontage as well as several villages and individual properties. Currently, coastal defences protect the towns of Bridlington, Hornsea and Withernsea, the village of Mappleton and the gas terminals at Easington. Defending the entire frontage would support the coastal communities of Holderness as well as the farming community, however;
- The material eroded from the Holderness cliffs travels south and provides coarse sand and gravel to maintain Spurn Head (which in turn provides shelter to the frontages of Grimsby and Cleethorpes). Eroded fine sediment from Holderness feeds into the Humber Estuary and adds to the extensive mudflats and saltmarsh which provide a buffer in front of the estuary defences. Fine sand crosses the Humber mouth and supplies the coastline of Lincolnshire; the wide sandy beaches of Lincolnshire provide a significant part of the coast defence in combination with engineered structures or dunes at the back of the beach. The continuation of erosion along the Holderness coast is crucial for the downdrift frontages. Allowing the natural process of erosion to continue on these undefended cliffs also benefits the natural environment and landscape.

Outer Humber Estuary

- The floodplain of the outer Humber Estuary includes major industries such as power stations, refineries and the country's largest port complex. The Humber is also surrounded by high grade agricultural land. The towns of Grimsby and Cleethorpes are within the tidal floodplain as well as a number of villages and individual properties on both banks of the Humber. All these assets would benefit from a continued hold the line policy, however;
- The importance of the estuary's wildlife and habitats has led to its designation under the Birds Directive and the Habitats Directive, which provides them with legal safeguards under

the Habitats Regulations. Continuing to hold the line will mean that as sea levels rise, if the defence line stays in the same position, the area of intertidal habitat will reduce (coastal squeeze), having a negative effect on the wildlife of the Humber Estuary.

Lincolnshire coast

- There are significant coastal towns along Lincolnshire's coastal strip including Mablethorpe and Skegness as well as numerous coastal villages. This area is heavily dependent on the tourism industry which is largely based around the appeal of Lincolnshire's wide sandy beaches, however;
- In the future, sea level rise will mean that the coastline in this area is likely to look significantly different. If the current defence line is held in the same position, defences will increasingly need to be large structures in order to cope with sea level rise and the beach narrowing that is expected. There may be a need to adapt to these changes and reconsider how defences are managed.

4 Coastal Processes

4.1 An important part of the SMP is to understand what is happening along the coastline and how it is currently developing. Appendix C of the SMP provides a review of current knowledge of coastal behaviour and dynamics. The following paragraphs provide a brief summary of the information provided in Appendix C.

4.2 The Flamborough Head to Gibraltar Point coastline can be considered to be a single coastal behaviour system since there are interactions between the areas.

4.3 The following sections summarise the five components of the shoreline of this SMP:

- Chalk cliffs (Flamborough Head to Sewerby);
- Holderness cliffs (Sewerby to Kilnsea);
- Spurn Head;
- Outer Humber; and
- Lincolnshire coast (Donna Nook to Gibraltar Point).

Chalk cliffs

4.4 At the northern end of study area, Flamborough Head is a headland composed of 30-50 metre high near-vertical chalk cliffs. The cliffline has formed into a series of small bays in which sandy and rocky beaches occur, such as at South Landing and Danes Dyke. The chalk is relatively hard in comparison to the clay cliffs of Holderness to the south. The cliffs are eroding at a slow rate (0 - 0.4 metres per year) and this is the reason that a headland has formed. The headland provides shelter to the coastline to the south from the dominant north-easterly waves. In this area, the coastline runs approximately east-west.

4.5 At the foot of the cliffs is a rocky platform cut into the chalk which extends for up to 1 kilometre offshore of Flamborough Head, in places.

4.6 Figure 4.1 shows the chalk cliffs of Flamborough Head as well as the cobble and boulder platform at the foot of the cliffs.

Figure 4.1: Flamborough Head cliffs (view from South Landing)

4.7 There is a 10 kilometre-long sandbank to the south of Flamborough Head, known as the Smithic Sand. This sandbank is believed to provide a sediment transport connection between Filey Bay to the north and Bridlington Bay to the south (see Appendix C, section C1.20).

Holderness cliffs

4.8 The Holderness cliffs extend for 60km from Sewerby to Easington and are glacial till cliffs ranging from less than 3 metres to around 40 metres in height. The cliffs are composed of a series of silty clays (as shown in Figure 4.2) with the oldest sequence formed approximately 130,000 to 300,000 years ago.

4.9 Along much of the Holderness frontage, the cliffs are fronted by a thin veneer of sand forming a beach which overlies a clay base layer.

Figure 4.2: Holderness cliffs (view at Auburn Sands, just south of Bridlington)

4.10 The cliffs are rapidly eroding at average rates in the order of 1.8 metres per year. The process of cliff erosion along the Holderness cliffs is not new and has been occurring since the end of the last ice age. Over the last 1,000 years, the Holderness coast has retreated by around 2 kilometres, causing the loss of 26 villages listed in the Domesday survey of 1086.

4.11 Erosion of the Holderness cliffs takes place through repeated landslide activity. Waves reaching the base of the cliffs eventually lead to a notch being cut into the base of the cliff. Removal of this small volume of material at the base of the cliff causes the cliff face to steepen to the point at which it collapses under its own weight, aided by rain water seeping into the cliff top lubricating the soils within the cliff face. For a detailed explanation of the process see Appendix C (C1.35).

4.12 Erosion of the Holderness cliffs and shore platform are a major source of coarse and fine sediment (i.e. gravel, sand and muds); the coarse sediment supplies Spurn Head and offshore sand banks. It is likely that gravel and coarse sand cannot cross the Humber mouth, although fine and medium sands are transported to the Lincolnshire coastline. The dominant movement of fine sediment is southwards, contributing to the ongoing deposition in the Humber Estuary and the Wash. This cliffline is sub-divided into a series of sub-units by lengths of coast protection works (e.g. at Bridlington, Hornsea, Mappleton, Withernsea and Easington).

4.13 The clay cliffs of Holderness and the beach fronting the cliffs are shown in Figure 4.3.

Figure 4.3: Holderness cliff tops (view at Auburn Sands)

Spurn Head

4.14 The peninsular of Spurn Head is an important feature at the mouth of the Humber Estuary. Spurn Head is a narrow sand and gravel ridge which extends from the southern end of the Holderness cliffs and forms a barrier extending 5.5 km into the mouth of the Humber Estuary. Spurn Head comprises a sand and gravel barrier, a nearshore platform and largely derelict defences of various types. Spurn Head receives coarse sediment from erosion of the Holderness cliffs. The barrier changes orientation along its length, as can be seen in Figure 4.4. Spurn Head's historic and predicted future behaviour is complex.

4.15 During the 17th and 18th centuries, the length of Spurn increased rapidly (recorded by the requirements for new lighthouses. East Riding of Yorkshire Council monitoring data indicate that Spurn Head has lengthened by 30m since 1997.

4.16 Spurn Head is believed to have breached repeatedly in historic times. In 1996 there was a severe breach of the dunes requiring a section to be infilled to maintain access along the Spurn Head road. East Riding of Yorkshire Council monitoring data shows the neck of Spurn Head has narrowed by approximately 20 metres between 2003 and 2008, making the barrier increasingly vulnerable to a breach.

4.17 Spurn Head provides shelter for the extensive mudflats of Spurn Bight that have formed within the Estuary. It also affords a limited degree of protection from waves from the north east to the frontages of Cleethorpes and Grimsby on the south bank of the Humber Estuary.

Figure 4.4: Aerial view of Spurn Head

Outer Humber Estuary

4.18 Within this SMP, the term 'outer Humber Estuary' describes the shoreline from Kilnsea to Stone Creek on the north bank of the Humber and from Immingham (eastern jetty) to Donna Nook on the south bank of the Humber. This stretch of the Humber is influenced both by the tide and the flow from the river.

4.19 Fine sediment that has been eroded from the Holderness cliffs is pulled into the Estuary by the tide. Much of this fine material is deposited within the Estuary and forms the mudflats, salt marsh and beach areas that line both the north and south banks. In order to keep pace with the predicted rates of sea level rise, a considerable additional volume of sediment is likely be required in the future to be deposited in inter-tidal areas.

4.20 The strong tidal flows into and out of the estuary intersect the north-south sediment transport pathway along the open coast, preventing gravels and coarse sands crossing the Humber mouth. Medium and fine sands eroded from the Holderness cliffs are able to cross the Humber channel during storm events and build up in offshore sand banks in the vicinity of Donna Nook. On the south bank of the Estuary between Immingham and Donna Nook, sand moves westwards into the Estuary. From Donna Nook southwards sediment moves towards Gibraltar Point along the Lincolnshire coastline.

4.21 The north and south banks of the Humber are very different in their land use and this has affected how they have developed, as shown in Figure 4.5. The north bank is low-lying with historic reclamation in the 17th century forming the area now known as Sunk Island. The south bank from Immingham to Grimsby and Cleethorpes is defended through hard structures with significant industrial assets within the coastal floodplain.

Figure 4.5: North bank of the Humber (Kilnsea) and south bank of the Humber (Immingham)

Lincolnshire coastline

4.22 The Lincolnshire coastline includes wide inter-tidal sand flats between Grimsby and Donna Nook, decreasing in width towards Mablethorpe. The sand flats are currently accreting, fed by sediment from the eroding Holderness cliffs and the foreshore is steepening. Between Tetney Haven and Donna Nook and also at Gibraltar Point, extensive mature salt marsh exists sheltered by the wide sand flats. In various areas along the Lincolnshire coastline (including at Donna Nook, Saltfleetby and Gibraltar Point), sand dunes have formed (see Figure 4.6).

Figure 4.6: View looking out to sea from Saltfleetby-Theddlethorpe Dunes National Nature Reserve

4.23 Between Saltfleetby/Theddlethorpe and Gibraltar Point, the inter-tidal beaches were formerly a thin sand veneer over a glacial till foundation. The sand veneer comes from fine and medium grained sands (originating from the eroding Holderness cliffs and offshore banks) moving southwards by longshore drift. Much of this frontage is backed by a variety of 'hard' defences

(armoured revetments) as shown in Figure 4.7 and dunes which together with the beach provide the standard of protection. Historically, during storms, the thin sand cover moved seaward and the underlying till was exposed and eroded. To counter this erosion, the Environment Agency has undertaken a major beach renourishment scheme (known as Lincshore) along the entire coast between Mablethorpe and Skegness which started in 1994.

Figure 4.7: Armoured dune at Chapel Six Marshes

4.24 Along this entire stretch of coastline, the defences provide protection for land which is low-lying for several kilometres inland.

4.25 Future sea level rise is likely to cause more erosion of the beaches which will place more pressure on the hard defences and dunes at the rear of the beaches.

Sea level rise

Facts and Figures

4.26 Climate change is occurring due to both human and natural factors. Some facts and figures have been produced by the International Panel for Climate Change in 2007 to show how the climate has changed over recent times:

- The linear global warming trend over the last 50 years (approximately 0.13°C per decade) is nearly twice as much as that for the last 100 years.
- The total temperature increase from 1850–1899 to 2001–2005 is approximately 0.76°C.
- Global average sea level has risen at an average rate of approximately 1.8 millimetres per year over the period 1961 to 2003. The rate was faster over the period between 1993 and 2003 at about 3.1 millimetres per year.
- The total 20th-century rise in sea level is estimated to be approximately 0.17 metres.

- In the Flamborough Head to Gibraltar Point SMP region, the historic rate of sea level rise is just over 1.1 millimetres per year, based on the sea level measured at Immingham over the period between 1960 and 1995.

How does climate change cause sea levels to rise?

4.27 A warming climate affects mean sea levels in three principal ways:

- Melting of glaciers following the last Ice Age has led to a long-term slow and progressive re-adjustment of the land mass of Great Britain (this is known as isostatic rebound);
- A physical increase in water volumes is occurring globally due to the melting of contemporary ice caps and ice sheets (this is known as eustatic change); and
- Ocean water is thermally expanding on a global scale due to rising temperatures.

4.28 The change in sea level directly observed at the coast is the result of a combination of isostatic and eustatic changes (see below). The combined effect is known as the relative sea level change.

Isostatic component

4.29 The first change is the result of a very long-term process that operates over geological timescales. During the last Ice Age, northern and central parts of the land mass of Great Britain were covered with glacial ice. As this ice melted, so the loading on the land mass altered. The result of this is the gradual and long-term re-adjustment of the land mass, with the north of Great Britain lifting up and the south sinking as a consequence.

Eustatic component

4.30 The second and third effects of climate change on sea level combine to cause a change in absolute water elevation due to an increase in volume or mass. This is known as eustatic sea level rise and such changes are felt on a relatively uniform basis around the UK coast.

4.31 Of the above contributors to global sea level rise, it is the thermal expansion of ocean waters in response to rising temperatures that yields the greatest proportion. The implication of this is that even if greenhouse gas emissions were stabilised or reduced, there would remain an inescapable consequence of the emissions already 'locked-in' to the atmospheric system, meaning that further global warming and sea level rise would occur. This is because there is such a long time-lag inherent within global-scale system responses between global warming and the resulting thermal expansion.

Future sea level rise predictions

4.32 There is considerable uncertainty about the scale of future climate change and sea level rise; however, the rate of future sea level rise is expected to accelerate due to continued global warming and more rapid melting of the ice caps and ice sheets. In addition, it is likely that climate change will bring about increased storminess.

4.33 Despite the uncertainty over rates of future sea level rise, it is essential that this SMP takes into account the possibility of sea level rise, regardless of the cause. Along with other second generation SMPs, this SMP has adopted the recommended Defra 2006 sea level rise allowances (Table 4.1) to develop the Plan. These allowances for future sea level rise take account of the scientific research undertaken by the Intergovernmental Panel on Climate Change and are the most up-to-date predictions available at the time of SMP development.

The figures in Table 4.1 account for predicted isostatic and eustatic changes and suggest a total rise in sea level of just less than 1 metre by 2105.

Table 4.1: Defra sea level rise guidance (East of England and East Midlands – south of Flamborough Head)

Time period	Net sea level rise (mm per year)	Total sea level rise in each epoch (mm)	Cumulative sea level rise (mm)
Epoch 1 (2009 – 2025)	4.0	64	64
Epoch 2 (2026 – 2055)	8.5	255	319
Epoch 3a (2056 – 2085)	12.0	360	679
Epoch 3b (2086 – 2105)	15.0	300	979

4.34 An updated set of climate change and sea level rise projections (UK Climate Projections 09) was released towards the completion phase of this SMP, but as yet, updated sea level rise allowances have not been formally issued by Defra for use in SMPs. Following completion of all SMPs, a separate study will consider whether the UK Climate Projections 09 figures should have an impact on the policies selected within SMPs.

Uncertainties in coastal processes understanding

4.35 There are many uncertainties in existing knowledge and understanding of shoreline processes and behaviour, including:

- The future rates of cliff recession under different sea level rise rates;
- The yield of beach building material and fine sediment from the Holderness cliffs, shore platform and seabed;
- Discrepancies between the estimated coarse sediment yield and the modelled longshore sediment transport rates;
- The impact of coast protection works on the supply of sediment from the Holderness coast;
- The long-term and contemporary behaviour of Spurn Head;
- The protection provided by Spurn Head to the low-lying land around the Humber; and
- The transport of coarse sediment across the mouth of the Humber to the Lincolnshire coast.

Coastal Defences

4.36 Appendix C summarises the major coastal defences along the SMP frontage. There are a range of different structures in different parts of the frontage. Along much of the frontage, there are beaches fronting the defences and these contribute to the protection provided by the defence. If beaches are eroded and beach levels fall, the defence (whether natural or man-made) is exposed to more severe wave conditions and becomes increasingly likely to suffer damage.

4.37 Along the Holderness frontage, there are a series of man-made defence structures, for the most part protecting the coastal towns of Holderness, separated by stretches of undefended glacial till cliffs. The structures are generally near-vertical seawalls (see Figure 4.8) owned by East Riding of Yorkshire Council which provide a good standard of protection against overtopping. The seawalls are fronted in places by groynes and/or rock armour. There is a rock revetment protecting the cliff in front of the Dimlington and Easington gas terminals.

Figure 4.8: Concrete seawall and groyne field at Hornsea

4.38 Within the Humber Estuary, the defences along the north bank consist primarily of earth embankments providing flood protection to a wide area containing high grade agricultural land and settlements. There is an extensive area of mudflats and sandflats fronting the defences and these will provide an element of natural protection to the north bank defences. The standard of protection provided by the defences is variable with some areas offering a locally low standard of protection. The south bank of the Humber consists primarily of hard defences fronted in some areas by fine sediment, protecting a wide, commercially developed floodplain.

4.39 Along the Grimsby frontage, there are a variety of hard structures including seawalls, revetments and docks (see Figure 4.9) which provide flood protection to the wide flood plain which includes a significant proportion of the town of Grimsby. The majority of the defences are owned by Associated British Ports and form part of the infrastructure of the Port of Grimsby.

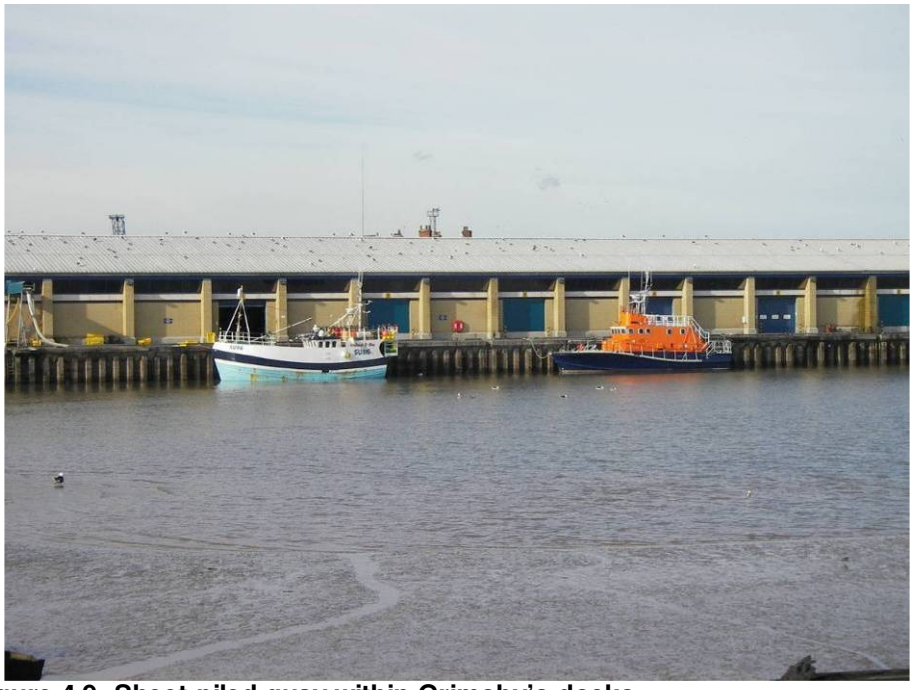


Figure 4.9: Sheet-piled quay within Grimsby's docks

4.40 Along the Cleethorpes frontage, the defences are near-vertical seawalls owned by North East Lincolnshire Council fronted by a groyne field retaining a wide sandy beach. At Humberston Fitties, the front line of defence is a North East Lincolnshire Council-owned dune embankment reinforced with gabions and fronted by a groyne field and sandy beach (formerly saltmarsh 10-15 years ago). There is an Environment Agency-owned secondary flood defence in the form of an earth embankment which provides a high standard of flood protection to the properties behind the embankment, however there are a number of chalets situated between the primary and secondary defence lines.

4.41 Within East Lindsey, the defences between Donna Nook and Mablethorpe are predominantly natural, formed of wide sand beaches and sub-tidal sandflats (reducing in width towards Mablethorpe), salt marsh (particularly between Donna Nook and Tetney Haven) and sand dunes. There are also a number of flood banks within this area, providing a good standard of protection and for the most part owned by the Environment Agency. To the south, between Mablethorpe and Skegness, the defence is provided by a veneer beach (thin sand veneer overlying a glacial till foundation) combined with engineered structures (see Figure 4.10) or armoured dunes (see Figure 4.7). In this area, the beach is artificially renourished through the Environment Agency's Lincshore scheme. Virtually all the defences along the Lincshore frontage currently offer protection to the 1 in 200 standard of protection.

Figure 4.10: Seabees at Skegness

4.42 At Gibraltar Point, the defence is predominantly natural, provided by a series of sand dune ridges interspersed with salt marsh. This provides a good standard of protection and this is supplemented by earth embankments.

5 Role of Shoreline Management

5.1 This section illustrates the way in which shoreline management decisions have an impact on the coast, which as a result, affects communities, land use, landscape and the natural and historic environment. Two scenarios have been assessed in order to show the effects on the shoreline of two contrasting sets of shoreline management policies. The two management scenarios are defined below:

5.2 No active intervention (NAI): this scenario illustrates the evolution of the shoreline assuming that there is no expenditure on maintaining or improving defences. As a result, defences would fail at a time dependent upon their residual life and the condition of any beaches fronting the defences. This scenario does not involve active removal of existing defences, so for an initial period of time, the defences would continue to provide some protection while they were failing.

5.3 With present management (WPM): this scenario illustrates the evolution of the shoreline assuming current management practices continue to be applied over the lifetime of the SMP. The different management practices operating along the SMP frontage produce different actions for different stretches of the coastline. The situation assumed for each stretch of coastline is summarised below:

- Flamborough Head to Kilnsea coast
    - Currently undefended coastline would be allowed to erode naturally without any intervention
    - Where defences exist, the standard of protection would be maintained or improved for epochs 1, 2 and 3. This would take into account sea level rise and defences would be raised accordingly.
    - Where short lengths and minor defences are present, a review would be undertaken to assess the epoch in which they are deemed to be ineffective due to outflanking.
    - No new defences would be constructed (e.g. to prevent outflanking of current defences)
- Spurn
    - Currently defences are largely derelict as they have not been maintained since the 1960s. These would continue to be allowed to deteriorate and would not be maintained or repaired. However, breaches of the Spurn access road would be repaired because of access requirements for the Humber Pilots, RNLI etc.
- Outer Humber Estuary
    - For the purposes of this theoretical baseline, it is assumed that current management practices would continue and the flood defences and standard of protection would be maintained for all epochs. This would involve repairing, maintaining and raising the defences to take account of sea level rise.
- Lincolnshire
    - The current Lincshore strategy between Donna Nook and Gibraltar Point provides a 1 in 200 standard of protection. To continue with the current standards of protection for Lincolnshire, sea defences would need to be maintained and improved to keep pace with sea level rise over the plan period..

'No active intervention' scenario

Chalk Cliffs (Flamborough Head to Sewerby)

5.4 Under the 'No Active Intervention' scenario, climate change and sea level rise are expected to result in increased cliff recession rates.

5.5 Historic cliff recession rates along the 30-50m high chalk cliffs between Flamborough Head and Sewerby are low, in the range 0.03 to 0.4 metres per year. It is predicted that future recession rates may increase as a result of sea level rise but will remain low in comparison with erosion rates on the clay Holderness cliffs to the south.

Holderness Cliffs (Sewerby to Kilnsea Coast)

5.6 For the undefended frontages, under the 'No Active Intervention' scenario, sea level rise is expected to cause increased cliff recession and shore platform lowering rates. This would result in an enhanced supply of a range of sediment sizes to the shoreline and sea bed. The coarse sediment supplies Spurn Head and offshore sand banks which contain predominantly gravels and coarse sands. It is likely that the gravel and coarse sand cannot cross the Humber mouth, although fine sands are transported to the Lincolnshire coastline. Failure of the defences along the cliffline would restore full sediment connectivity between the source areas and sinks such as Spurn Head.

5.7 The coastal response to climate change and sea level rise would include:

- The on-going development of a bay between headlands at Flamborough Head and Spurn Head. In the long-term the overall shape of the bay may change because, in the past Spurn Head has failed and reformed to the west. The available accommodation space within the Humber mouth is also an important control on the long-term evolution of Spurn Head.
- The continued recession of cliffs between the defended frontages at Bridlington, Hornsea, Mappleton, Withernsea and Easington. The undefended cliffs adjacent to these frontages would continue to recede rapidly enhancing the offset between the defended line and the natural cliffline and reducing sediment transfers between adjacent bays. This process would continue until the defences fail, triggering a renewal of cliff recession. It may take decades after defence failure for the currently protected sections to "catch-up" with the unprotected sections.
- Accelerated cliff recession and shore platform lowering rates on the unprotected clifflines, controlled by the rate of relative sea level rise. In general, beaches would remain narrow and thin, despite the increasing sediment inputs. However, there would be continued beach accretion on the updrift margins of the defended frontages until the groyne systems and seawalls fail.

5.8 For the defended frontages, under the 'No Active Intervention' scenario, the coastal response to sea level rise and climate change would include shore platform lowering and beach loss in front of the defended frontages along the Holderness Cliffs. This would increase the potential for defence failure.

5.9 Defence failure would trigger a renewal of cliff recession on the currently protected frontages of East Riding. The rate of future recession would be controlled by the extent to which the failed structures continue to provide some protection to the shoreline. Over time, these frontages would "catch-up" with the adjacent cliffline positions and re-establish a continuous bay between Flamborough Head and Spurn Head.

5.10 The towns of Bridlington, Hornsea and Withernsea are protected by coastal defences which are unlikely to fail within the next 25 years. Defences were constructed in front of Mappleton village in 1991, with a design life of 50 years. The defences at Easington were constructed in 1999 and have an expected life of 25 years of operation. In the 'No Active Intervention' scenario these defences would remain in place until they fail (probably before 2055). Short lengths of defences exist at Ulrome and coastal and flood defence structures are present at Tunstall Drain and Barmston Drain. Due to their short length, these sections of defence are highly susceptible to breaching and outflanking. It is not anticipated that these defences would remain in place beyond Epoch 1 under the 'No Active Intervention' scenario. Other sections of private defences are also not expected to remain in place beyond 2025 (Epoch 1).

5.11 Defence failure may be associated with:

- A general deterioration over time, i.e. due to general wear and tear. At some point in the future the defence will cease to be effective.
- Design conditions being exceeded, e.g. destroyed by a storm, or undermined by falling beach levels (forcing conditions).

5.12 On the protected frontages along the East Riding coastline, the defences have simply delayed the recession process. Once the defences fail, cliff recession would re-commence. However, the post-failure retreat may differ from natural retreat, at least for some period of time. This might take two forms:

- Initial slow retreat rate, with the residual effects of the failed defences still offering some limited protection and not allowing full cliff instability and erosion to take place.
- Rapid (probably non-linear) catch-up process, i.e. the cliff reassuming its position had defences not existed by initially eroding at a rate much faster than the natural rate.

Spurn Head

5.13 Relative sea level rise is expected to accelerate the dynamic behaviour and trends experienced over the last few centuries, such as shoreline erosion, overwashing, and barrier realignments with increased potential for breaching of the barrier.

5.14 As the current derelict defences deteriorate further, Spurn Head is expected to continue to be affected by shoreface erosion. A theory is that the barrier may also migrate westwards through roll-over, although this is highly conjectural, and historical records show the barrier position has remained largely stable over the past century. However, the barrier will probably not extend further south into the estuary because of the high tidal flows. The tendency for overwashing at vulnerable locations along its length is likely to increase into the future which may lead to eventual breaching. East Riding of Yorkshire Council anticipates that a breach may occur within 5 to 10 years time.

5.15 There are differing theories as to the outcome of future breaches. One possibility is that continued longshore sediment supply would ensure that breaches eventually self-heal. A different view is that a significant breach would not be self-healing and that the Humber will use the breach channel to drain into the North Sea causing rapid erosion and possible loss of the entire peninsula. Spurn Point, which would become an island, starved of sand would rapidly erode. Its ultimate survival will be dependent upon the time taken for the peninsula to reform. Loss of the Spurn Point and Binks system could result in major changes to the Humber mouth.

5.16 If roll-over of the barrier does occur, in order to maintain its position relative to the Holderness cliffline, the barrier could be expected to retreat by around 120 to 240m over the next 100

years. However, the relationship between Spurn Head and the cliffline has been changing over time, because of the differential retreat rates (Spurn Head has retreated at 0.5 metres per year compared with approximately 1.8 metres per year along Holderness).

5.17 Information provided by the East Riding of Yorkshire Council suggest that as Spurn has been artificially held in position over 150 years, future readjustment may cause major reshaping of the whole peninsula and a shift westward by as much as 500m or more.

Outer Humber Estuary (Kilnsea to Donna Nook)

5.18 Where the foreshore is erosional and the shoreline has retreated, damage to earth embankment defences has resulted. This pattern of erosion is predicted to continue and accelerate with relative sea level rise and with no intervention, the defences and embankments would be undermined through erosion and would fail.

5.19 Where failure occurs, regular breaching would result, and as sea level rise accelerates, the extensive tidal floodplain would be inundated with increasing frequency.

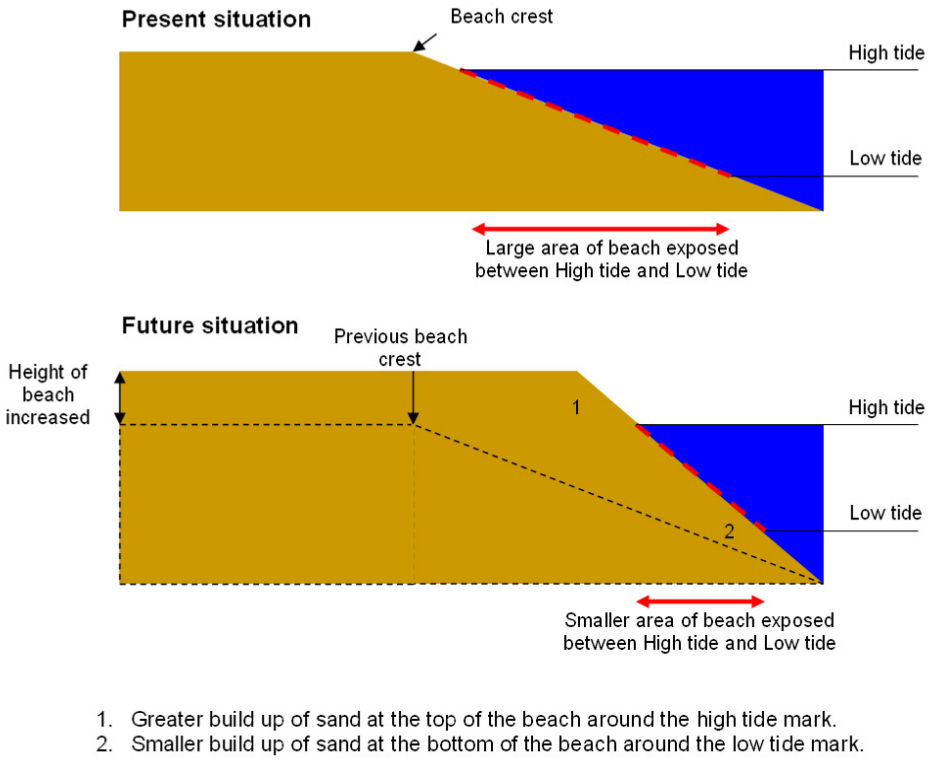
5.20 The trend for foreshore lowering and erosion would continue between Immingham and Pyewipe. This would cause toe erosion and failure of the defences, and the shoreline would then retreat at a natural rate.

5.21 The most significant erosion and defence degradation is likely to occur around Stallingborough and least deterioration is expected towards Grimsby. It is likely that the defences in the central and western parts of the southern estuarine shore would fail rapidly due to damage from erosion. This would lead to regular and widespread flooding of the low-lying floodplain behind the current defence line.

5.22 Accretion is expected to continue between Grimsby and Donna Nook, as the sediment eroded from the Holderness cliffs would continue to feed across the Humber mouth. The foreshore is likely to continue to steepen over time with sea level rise, however dune building and saltmarsh progradation is predicted to match, or more likely outpace, the rising sea levels in the SMP timeframe. This would occur as the supply of sediment from the updrift eroding Holderness cliffs would increase as current defences deteriorate and erosion accelerates due to relative sea level rise. Deposition on the foreshore between Donna Nook and Grimsby would consequently increase under this scenario.

Lincolnshire coast (Donna Nook to Gibraltar Point)

5.23 The foreshore at Donna Nook is currently accreting and this would continue, fed by sediments originating from the Holderness coastline, to the north of the Humber estuary. Foreshore steepening would continue or increase as sea levels rise due to greater deposition of sediment around the high water mark relative to the low water mark (Figure 5.1).



1. Greater build up of sand at the top of the beach around the high tide mark.
2. Smaller build up of sand at the bottom of the beach around the low tide mark.

Figure 5.1: Schematic representation of foreshore steepening on an accreting coast.

5.24 Under this scenario this supply of sediment would increase and consequently lead to further dune building and progradation of the high water mark. Greatest accretion would occur nearest to Donna Nook, with a more stable beach profile near to Mablethorpe. If the present trend for a southwards progression of the deposition zone continues, areas of accretion would extend further towards Mablethorpe.

5.25 In the longer term (epoch 3 and beyond), if sea level rise begins to outpace the foreshore deposition and dune building, or the feed of fine material is diverted into the Humber as the tidal prism increases, the natural protection offered by the dune ridges would begin to fall as the water levels rise relative to the dune crests. This would increase the threat of overtopping and breaches, especially during severe storm events.

5.26 If increased storminess results from climatic alterations, this may facilitate a greater sediment feed from the Binks to this region, and consequently accretion rates would increase, especially in the northern area around Donna Nook.

5.27 The area between Mablethorpe and Ingoldmells has historically shown erosion. Here the coastline consists of a combination of man-made 'hard' defence structures of varying type and stabilised dunes. A short distance behind the coastal defences, the majority of the terrain is at a lower level than the crest level of the coastal defences. In some areas, this low lying land extends several kilometres inland, putting large areas at risk of flooding should the coastal defences be severely overtopped or breached. The 'hard' defences along this frontage generally have residual lives of 11-20 years or greater than 20 years meaning that the majority of defences would be structurally stable until approximately the end of the first epoch (2025). Data from the National Flood and Coastal Defence Database indicate that there are a small percentage of defences along the coastline that have residual lives shorter than the first epoch. These defences have a high likelihood of failure before the end of the first epoch.

5.28 The hard defences are fronted by nourished beaches which are susceptible to erosion. Since 1994, the veneer beaches have been maintained artificially through a sediment renourishing scheme known as Lincshore. Greatest erosion occurs during storms when the top layer of sand of the veneer beaches is washed away exposing the underlying clay tills. Once the clay tills are eroded they can never return as the material is carried offshore in suspension. The sand veneer returns during calm periods as longshore transport brings materials from further north and offshore deposits; however the volume is generally insufficient to maintain the pre-storm crest levels. These veneer beaches offer protection to the 'hard' defences and dunes at the rear of the beaches. Preserving the beach frontage helps extend the residual life of those defences at the rear by reducing the wave exposure and providing structural support to the toe of the structures. The advantage of renourishment in this location is that material is transported downdrift and passes the frontages to the south.

5.29 The shoreline between Skegness and Ingoldmells is considered relatively stable however it has shown some erosion prior to the Lincshore scheme. Today it relies on a constant supply of material from the beaches immediately to the north. The Lincshore scheme presently re-nourishes the Mablethorpe to Skegness coastline with approximately 350,000 m^3 of material annually, the aim being to maintain both the crest level and the crest width of the beaches in front of the defences. The baseline scenario for the Mablethorpe to Skegness frontage with 'No Active Intervention' considers the effect of coastal morphology assuming the Lincshore renourishment scheme is abandoned.

5.30 Virtually all the defences along the Lincshore frontage currently offer protection to the 1 in 200 standard of protection. It should be noted that defences which are classified as offering a 1 in 200 standard of protection do allow for some overtopping during extreme events. Overtopping of a defence does not mean that the defence has failed. However, if the frequency and rate of overtopping significantly increases, then the defence becomes ineffective, although it may be structurally sound. In practice, overtopping contributes to breaching by undermining the defence from behind, and a defence is unlikely to remain structurally sound if subjected to frequent, substantial overtopping. For the purpose of developing the scenarios the standard of protection offered by the beaches and the hard defences at the rear of the beaches are considered to be independent. In reality it is the combination of these two defence elements that provides the current standard of protection and residual life of the hard defences.

5.31 The shoreline north of Mablethorpe towards Donna Nook is considered to be accreting. The 'No Active Intervention' scenario assumes that north of Mablethorpe (the Donna Nook area) remains accretive, although accretion is likely to slow over time as a result of sea level rise. The foreshore steepening currently occurring in this area is likely to continue.

5.32 Under a No Active Intervention scenario, erosion would lead to a loss of beach volumes along the shoreline. Over time this trend would continue, and an acceleration of erosion rates and shore platform lowering rates would occur as a result of relative sea level rise; this would consequently increase the potential for defence failure between Mablethorpe and Skegness. Defence failure along this frontage would lead to flood water inundation of extensive areas of low-lying land behind the current defence line. Frequent inundation in the future would result in the land currently within the tidal floodplain being uninhabitable due to the frequency, depth and extent of flooding. Under this scenario the veneer beaches would be eroded as material is rapidly transported out of the system, and consequently, the hard defences would be subjected to direct wave attack and would degrade rapidly.

5.33 Gibraltar Point is currently accreting, fed by longshore drift and transport of sediment from offshore. This trend would continue in the short to medium term due to a continued feed of sediment from offshore and from the longshore processes as the beaches to the north lose

sediment due to erosion. In the longer term the beaches in this area could begin to erode unless the input of sediment transported from offshore is sufficient to offset accelerating sea level rise.

'With present management' scenario

Chalk Cliffs (Flamborough Head to Sewerby) and Holderness Cliffs (Sewerby to Kilnsea Coast)

5.34 Under the 'with present management' scenario, accelerated cliff recession and shore platform lowering rates on the unprotected clifflines (the Chalk Cliffs and Holderness Cliffs) are expected, controlled by the rate of sea level rise. Beaches would remain narrow and thin, despite the increasing sediment inputs.

5.35 Increased beach lowering in front of the defended areas would increase wave loadings, leading to the need for enhanced toe protection. Defences may need to be strengthened.

5.36 Under this scenario, there would be continued development of bays between the defended frontages, with a tendency for higher recession rates immediately down drift of defences at Hornsea, Mappleton and Withernsea. If this management intent was continued into the future and beyond the SMP timescale (longer than 100 years), a decline in recession rates would occur as the bays between the defended frontages would continue to deepen.

5.37 Maintenance of the coastal protection at Barmston Drain would extend its residual life under the 'with present management' scenario beyond epoch 1. Maintenance of the flood bank at Tunstall would extend its residual life under the 'with present management' scenario beyond epoch 1. However, without alterations to these two current defences, including significant extension or setback, outflanking or breaching of the defences would render the defences ineffective by epoch 2.

5.38 Towards the end of epoch 3 it is unlikely that beaches would be present in front of the Holderness defences due to shore platform lowering and drawdown. The removal of the beaches would increase the wave energy that reaches the defence line and thus would significantly increase the potential for defence failure.

Spurn Head

5.39 Erosion of the undefended Holderness cliffs would continue to supply sediment to Spurn Head under this scenario. Over time, some sediment would be retained behind defences at Hornsea, Mappleton, Withernsea and the Dimlington and Easington Gas Terminals. However due to the relatively short lengths of defences (approximately 11 kilometres of defences) in relation to the undefended areas, the overall impacts on sediment supplied to Spurn Head would not be significant over the SMP timeframe, especially as this would be offset by increased erosion rates on the undefended cliffs due to accelerating sea level rise.

5.40 For epochs 1 and 2, the supply of sediment would be maintained, or increased due to greater rates of updrift cliff erosion. By the end of epoch 3 and beyond, the Holderness defences would form increasingly significant promontories which may begin to affect the longshore transport of sediment, and consequently may reduce the net sediment volume supplied to the Spurn barrier; however, there is a great deal of uncertainty about the timing and magnitude of the relative processes.

5.41 The current management practices do not involve defence maintenance along the Spurn barrier. The 'with present management' scenario therefore assumes that continued deterioration of derelict defences would occur as repairs would not be carried out. Relative sea level rise is expected to accelerate the dynamic behaviour and trends experienced over the last few centuries, such as shoreline erosion, overwashing and possibly westward migration of Spurn Head, with increased potential for breaching of the barrier.

5.42 Although an area of much conjecture and discussion, there appear to be two main theories regarding the future of Spurn Head:

- One is that in order to maintain its position relative to the Holderness cliffline, the barrier could be expected to retreat. Westward migration could occur through washover events feeding the estuarine side of the barrier with sediment, which causes the barrier to roll over as the coastal side erodes. Under this scenario it is anticipated that any breaches that occur would be self healing, because of the continued longshore feed of sediments from the erosion of the Holderness cliffs, thus maintaining the integrity of the barrier.
- An alternative view is that the barrier is fragile and susceptible to breaching and breaches are not likely to self heal should they occur. Such a view suggests a possible outcome is for a significant breach leading to the opening of a new channel allowing exchange of estuarine and coastal waters, and effectively creating an Island of Spurn detached from the mainland. This view is founded in evidence from East Riding of Yorkshire Council data which shows that since the cessation of defence maintenance in the 1960s, rapid erosion has occurred to the coastal side of the barrier and minimal accumulation of sediment from washover has occurred on the estuarine side of the neck.

5.43 Despite the possibility of breaches not self healing, the 'with present management' scenario assumes that any breaches would be repaired to maintain access to the Spurn Point facilities, and thus the integrity of the barrier (whether in situ or having rolled back) can be assumed over the SMP timeframe under this scenario. This may become increasingly difficult to maintain if increased barrier fragility and erosion results from sea level rise.

Outer Humber Estuary (Kilnsea to Donna Nook)

5.44 On the north bank of the Humber, the defences would be repaired and maintained to provide present protection standards. As sea levels rise, foreshore lowering and direct wave attack will mean that maintaining the defences would become increasingly difficult to sustain.

5.45 On the south bank of the estuary, between Immingham and Pyewipe, foreshore lowering would continue. The current reinforcements made to the revetment toe would need to continue and be extended in terms of frequency and extent to prevent the damage and loss of defences due to destabilisation, undercutting and collapse. The crest height of defences which currently provides 1 in 200 overtopping protection would need to be raised to maintain this standard of protection as sea levels rise over the epochs.

5.46 The hard defences and port at Grimsby, and the defences at Cleethorpes, would provide a 1 in 200 standard of protection over each epoch. This standard would be maintained by repairing and upgrading the defences to account for sea level rise. The locks and dock gates are recognised as particular low points, and although the docks and port currently provide a flood storage facility which increases the standard of protection against tidal flooding, these would need substantial improvements as sea levels rise to maintain a 1 in 200 standard of protection to the residential area of Grimsby.

5.47 The foreshore between Cleethorpes and Donna Nook would also continue accreting due to the continued erosion of the Holderness cliffs. The accretion rate would be dependent on the balance of relative sea level rise and the sediment volume supplied to the frontage. In addition to acceleration in erosion due to sea level rise, if storminess increases significantly due to climate change, greater volumes of material would be transported across the Humber mouth to the sediment store at Donna Nook which may increase the accretion rate along this stretch.

Lincolnshire coast (Donna Nook to Gibraltar Point)

5.48 The Donna Nook area is currently experiencing accretion and this area would continue to gain sediments originating from the Holderness coastline to the north of the Humber Estuary. This would lead to further dune building and progradation of the high water mark. Foreshore steepening would continue as sea levels rise, as greater deposition of sediment is likely to occur around the high water mark relative to the low water mark (see Figure 5.1).

5.49 Greatest accretion would occur nearest to Donna Nook, with a more stable beach profile near to Mablethorpe. If the present trend for a southwards progression of the depositional front continues, the accretion zone would extend further towards Mablethorpe. This is likely if the feed of fine sediments to the system rises due to the accelerated erosion of the Holderness cliffs.

5.50 By epoch 3, it is possible that sea level rise may begin to match or exceed the foreshore deposition rate between Donna Nook and Mablethorpe, especially if the feed of fine material is diverted into the Humber as the tidal prism increases. In addition, by the end of the SMP timeframe, the defended promontories between increasingly segmented bays along the Holderness coast may begin to reduce the longshore sediment feed and restrict the sediment supplied across the Humber mouth to Donna Nook. Consequently, accretion rates at Donna Nook would start to slow and rising sea levels could begin to exceed the pace of accretion, the natural protection offered by the dune ridges would begin to fall as the water levels would rise relative to the dune crests. However, these processes which could reduce accretion rates may be countered by increased storminess resulting from climate change which would facilitate a greater sediment feed from the offshore sandbanks to this region. This could help maintain accretion rates, or even enhance them, especially in the northern area around Donna Nook.

5.51 These possible future outcomes relate to the relative balance of processes operating. The accretion rate over time is dependent on the relative magnitude, interactions and timings of these processes. Despite the effects of changes to current processes and climate alterations on the accretion trend at Donna Nook, the ‘with present management’ scenario assumes that the current standard of protection offered by the dunes, beaches and defences would be maintained.

5.52 The man-made defences fronted by saltmarsh and sand dunes between Donna Nook and Saltfleet would remain, and under the ‘with present management’ scenario these would need to be maintained and improved to keep pace with sea level rise over the plan period..

5.53 Between Mablethorpe and Skegness the majority of this coastline consists of a combination of man-made ‘hard’ defence structures of varying type and stabilised dunes. A short distance behind the defended foreshore the majority of the terrain is below the crest level of the coastal defences. In some areas, this low lying land extends several kilometres inland, putting large areas at risk of flooding should the coastal defences be severely overtopped or breached.

5.54 These defences are fronted by veneer beaches which offer protection to the ‘hard’ defences and dunes at the rear of the beaches. Since 1994 the beaches have been maintained by a renourishing scheme known as Lincshore. The area between Mablethorpe and Ingoldmells

has historically demonstrated erosion and is the main focus for the Lincshore renourishment scheme. Preserving the beach frontage helps extend the residual life of those defences at the rear by reducing the wave exposure and providing structural support to the toe of the structures. Under the 'with present management' scenario, coastal defences would need to be maintained and improved to keep pace with sea level rise over the plan period.

5.55 The 'with present management' scenario for the Mablethorpe to Skegness frontage considers the effect of coastal morphology with the continuation of the Lincshore scheme. The Lincshore scheme re-nourishement volume placed between Mablethorpe to Skegness in 2008 was approximately 400,000 cubic metres. The 'with present management' scenario assumes the Lincshore scheme continues nourishing the beaches to maintain the 1 in 200 standard of protection over the epochs. This includes nourishing with additional volumes of material to account for sea level rise.

5.56 The shoreline between Ingoldmells and Skegness is considered stable but relies on a constant supply of material from the beaches immediately to the north. This scenario assumes that the renourishments continue and increase in volume to account for sea level rise. As a result the beaches of this area are expected to remain stable and maintain the current standard of protection in each epoch.

5.57 The area south of Skegness to Gibraltar Point is currently accreting; this trend would continue due to a continued feed of sediment from offshore and by sediment transported by longshore processes from the renourished beaches to the north. In the longer term (epoch 3 and beyond) there is a possibility that the system could become stable or erosional if the input of sediment is not sufficient to offset the accelerating rate of sea level rise and associated increased wave exposure.

6 Land Use and Environment

6.1 The key features along the coast have been identified and were used to develop a characterisation of the SMP frontage. In order to undertake this assessment, the entire frontage was split into nineteen character areas. The divisions between areas were selected so that each area has a broadly similar character in terms of land use, geography and coastal character. A map of the character areas is shown in Figure 6.1.

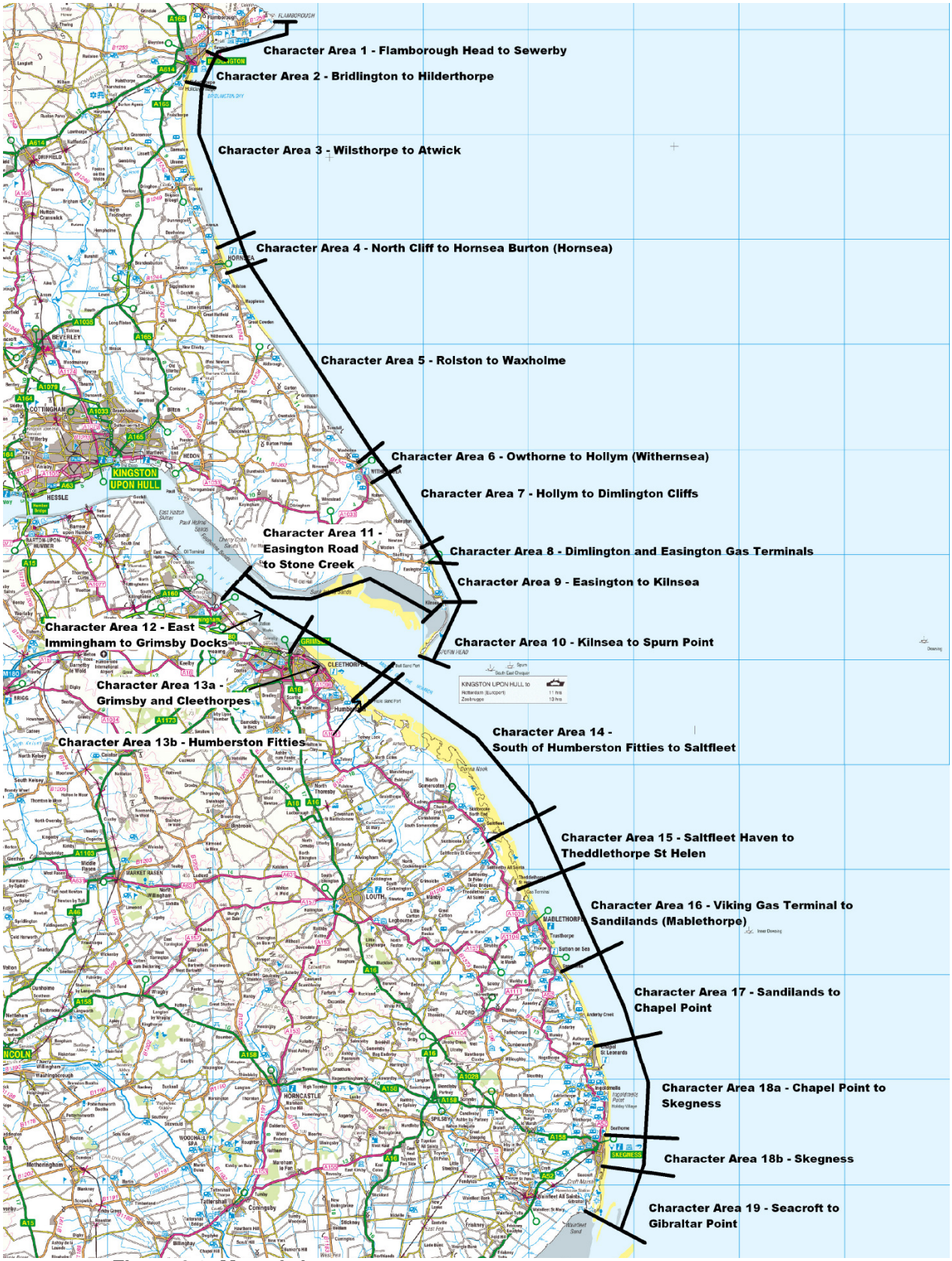
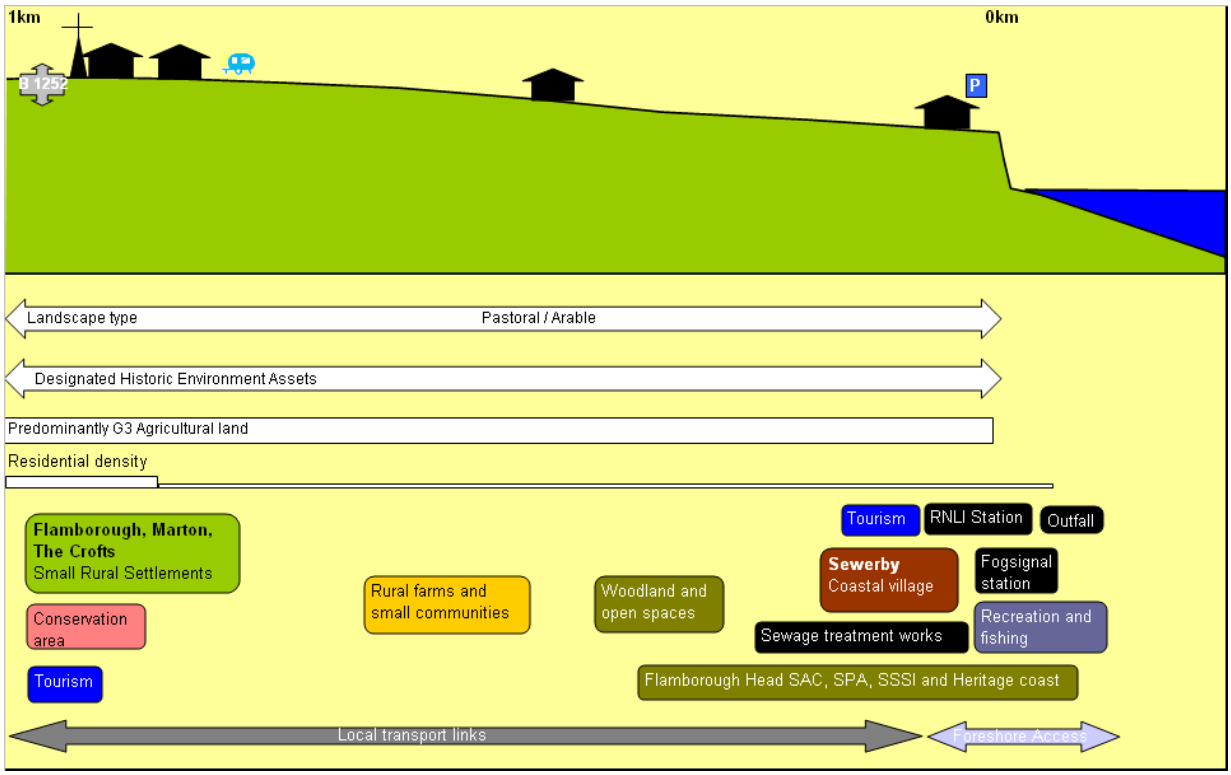


Figure 6.1: Map of character areas

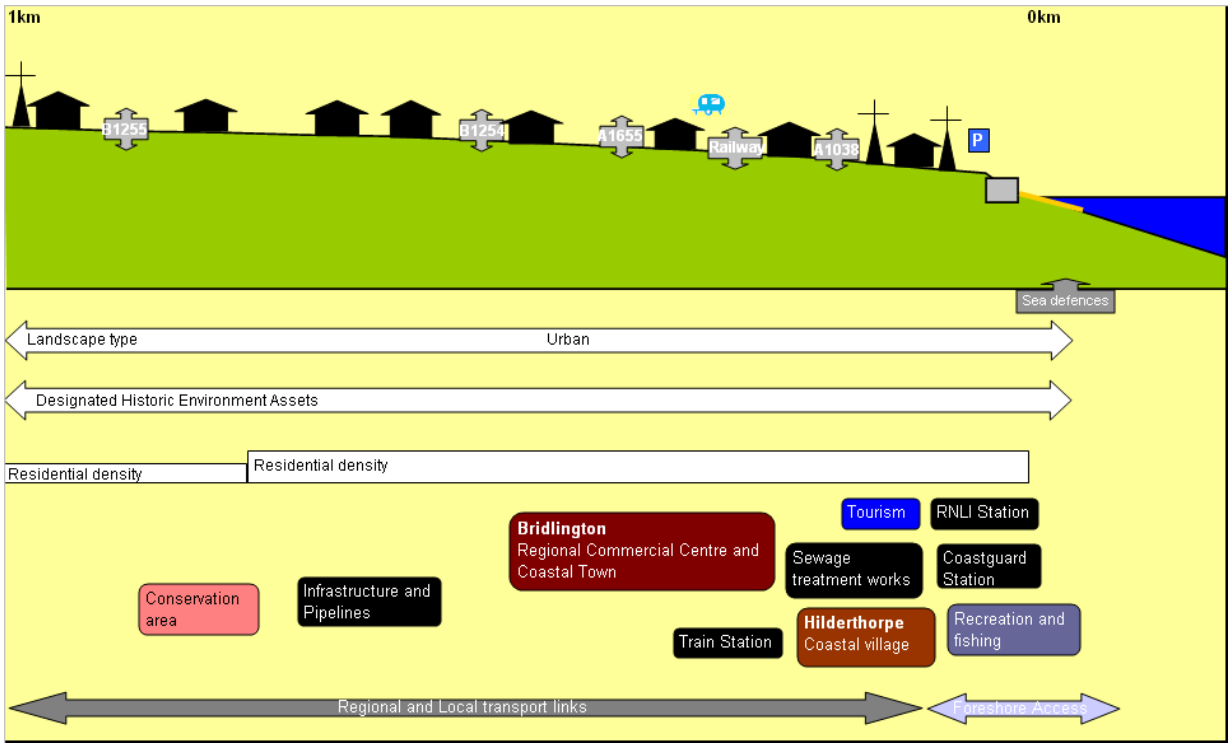
6.2 Appendix D includes the descriptions and a schematic representation of each area, including information covering land use and environment as well as a non-technical summary of the key coastal processes, flooding and erosion risks affecting each area. The schematic representations of each character area are shown below and key information from this assessment is summarised below by topic.

6.3 A key showing the colours used in the cross sections is provided below:

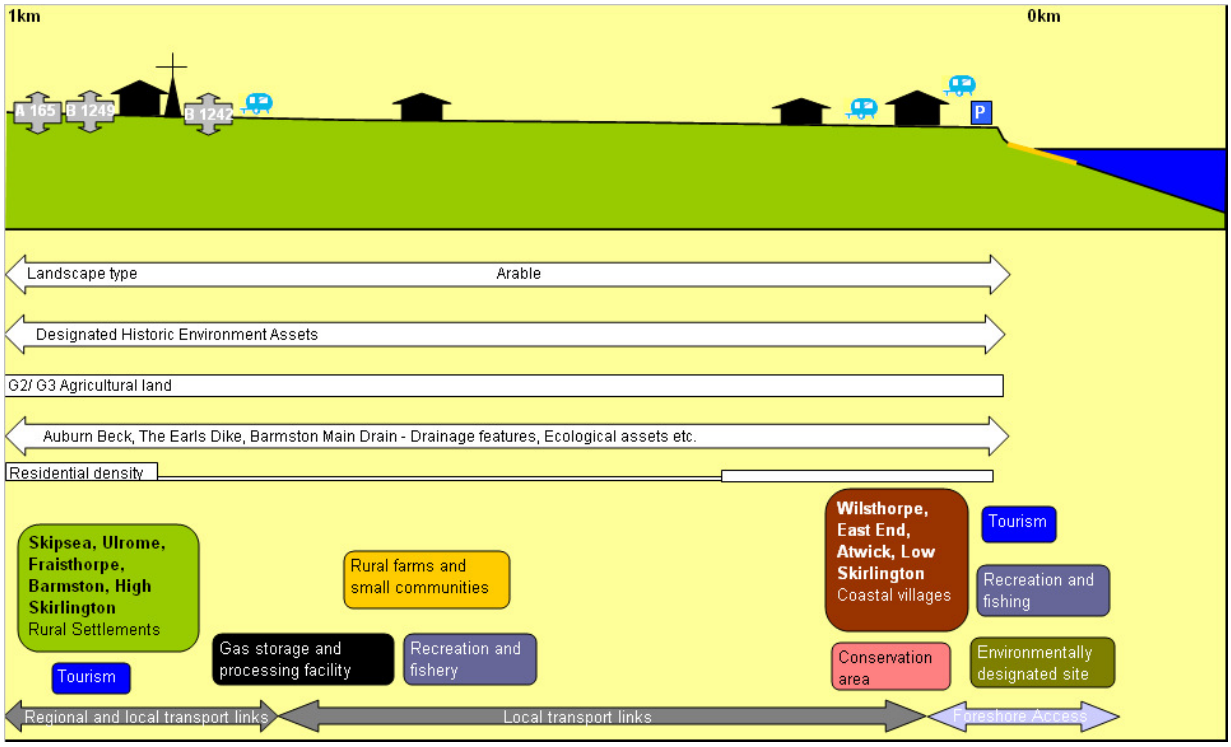
Character Area 1: Flamborough Head to Sewerby



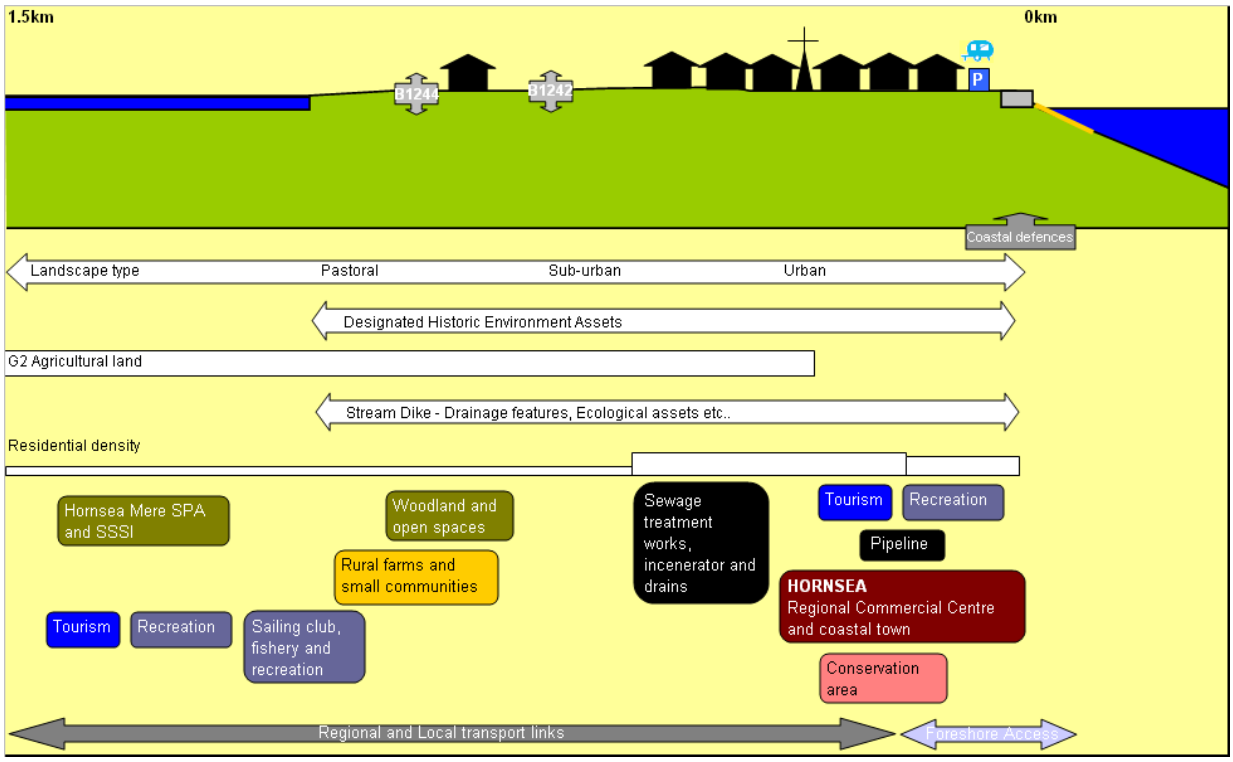
Character Area 2: Bridlington to Hilderthorpe



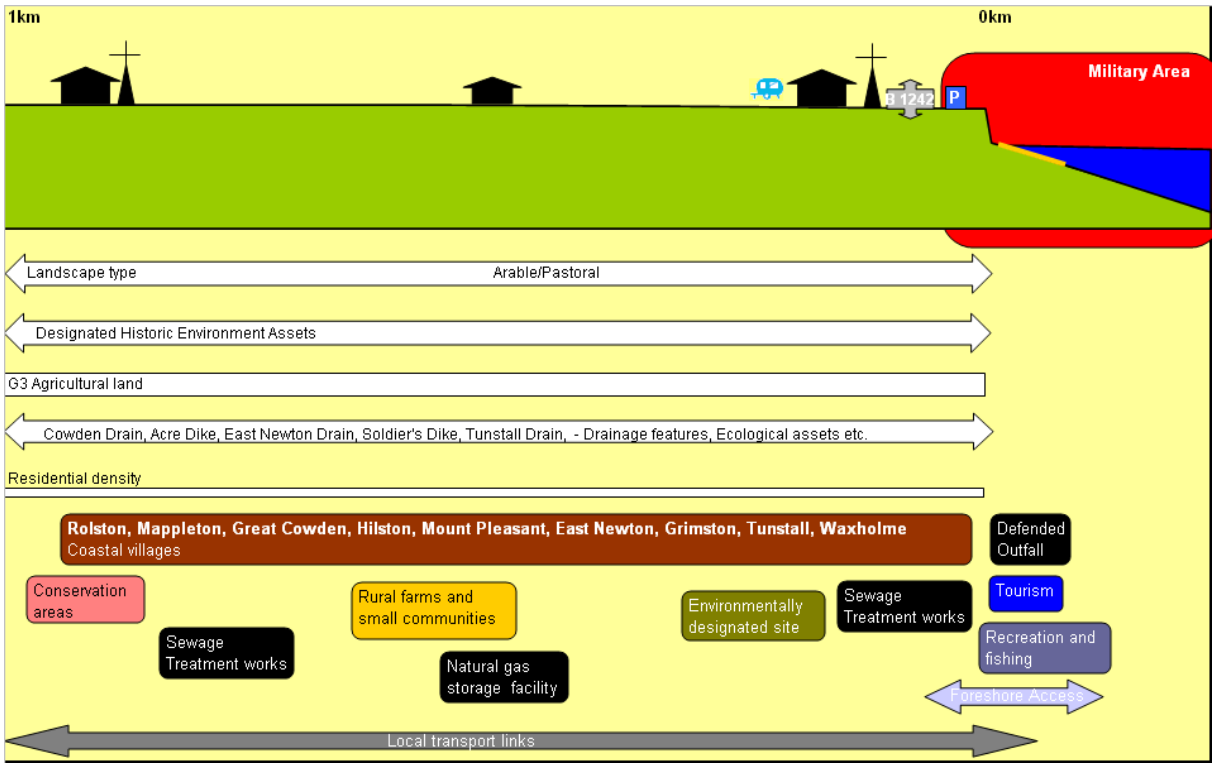
Character Area 3: Wilsthorpe to Atwick



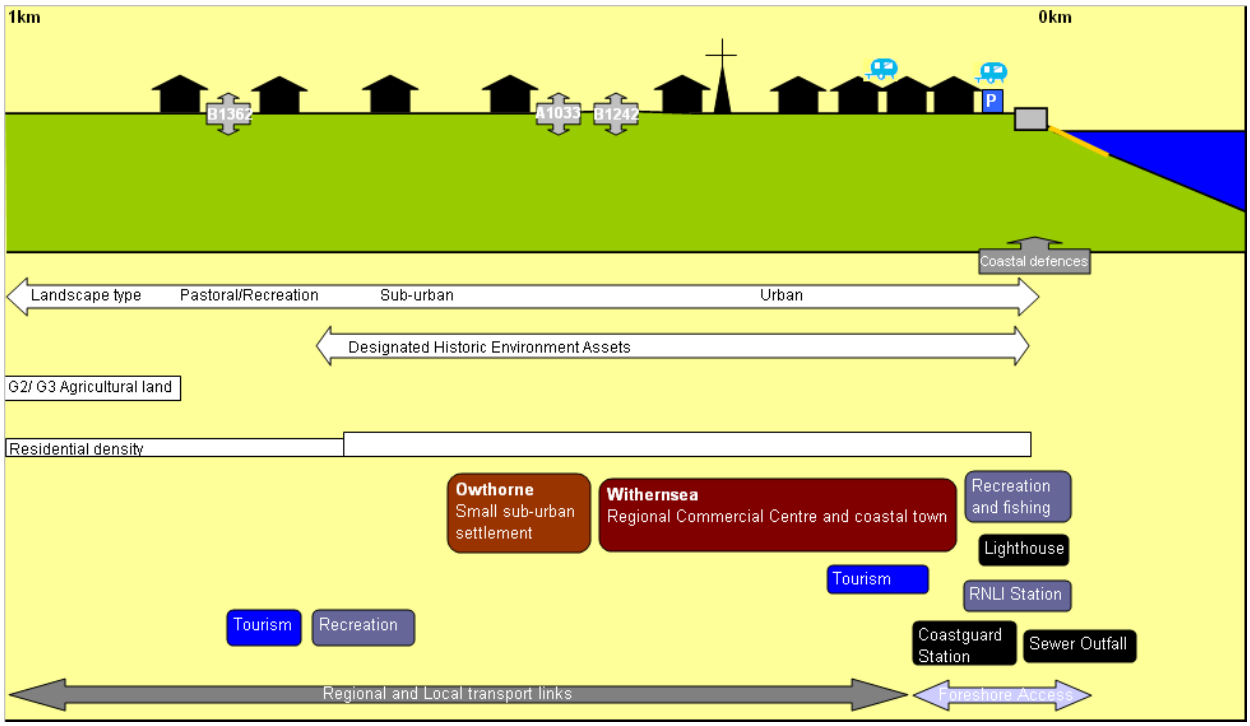
Character Area 4: North Cliff to Hornsea Burton (Hornsea)



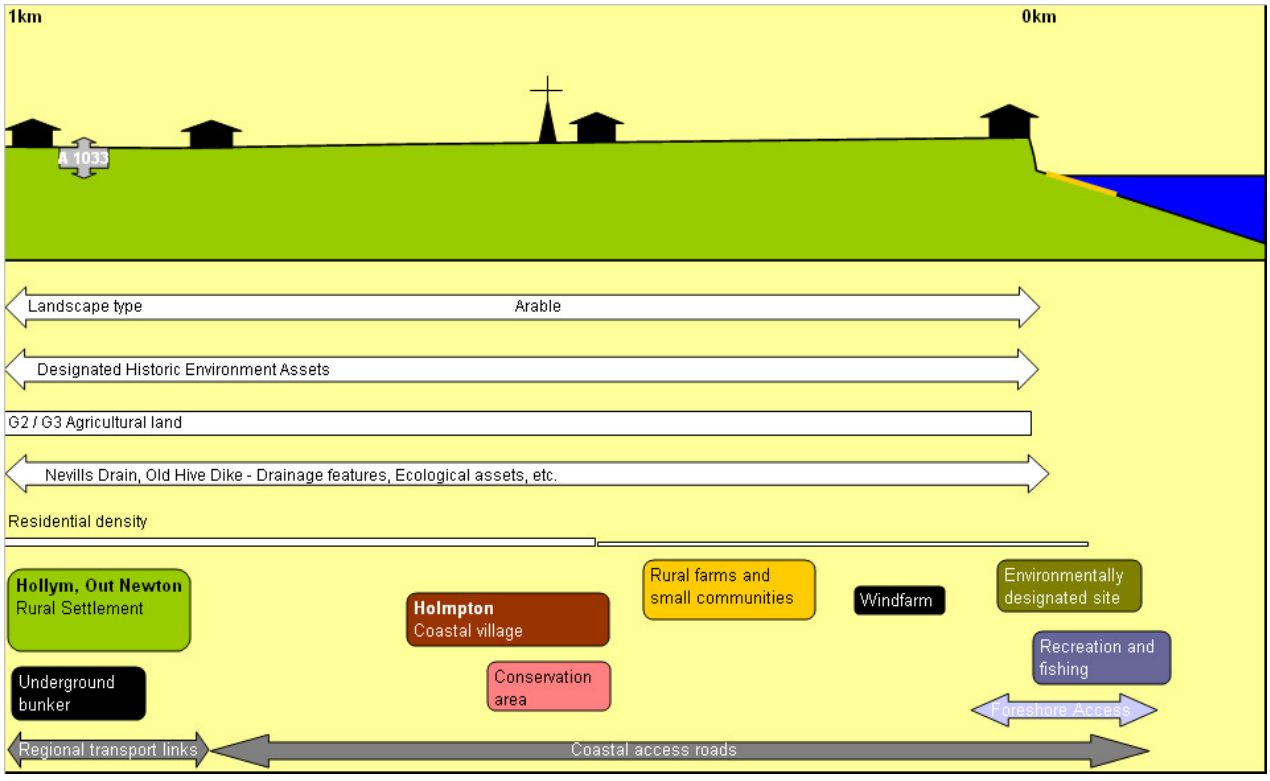
Character Area 5: Rolston to Waxholme



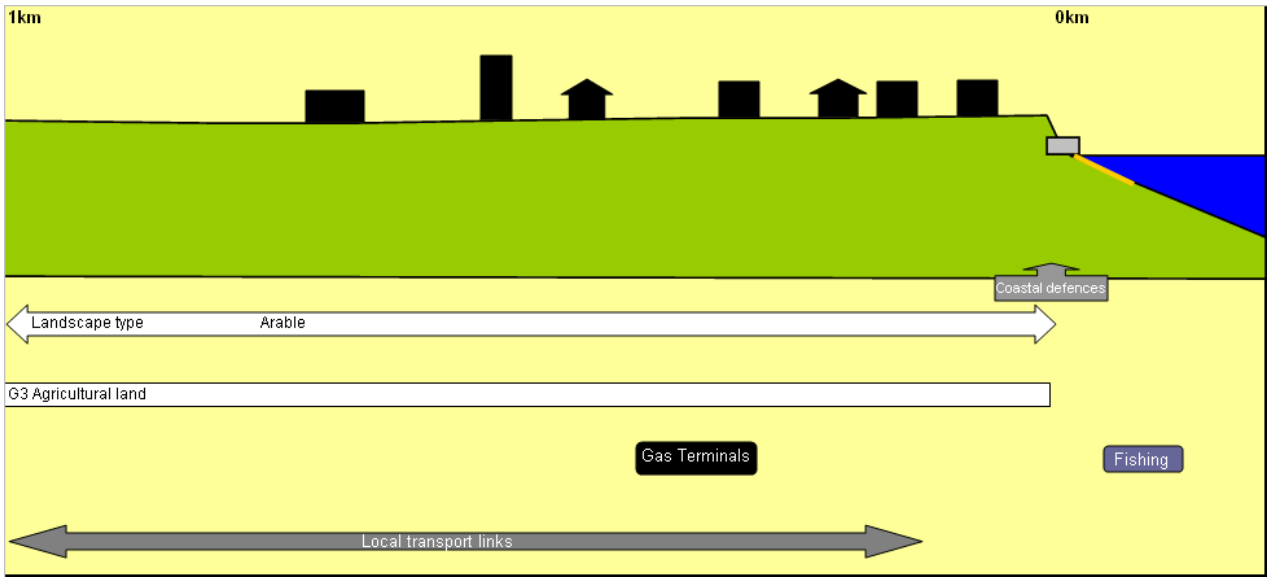
Character Area 6: Owthorne to Hollym (Withernsea)



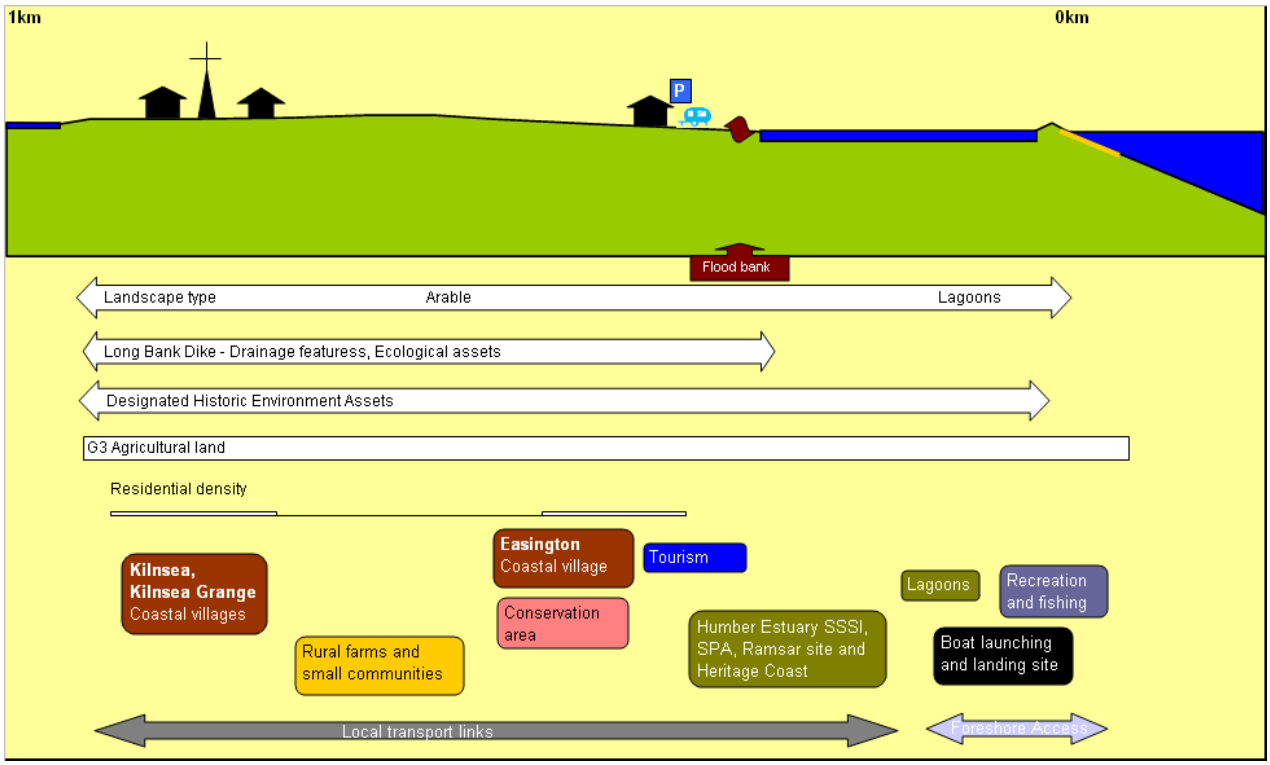
Character Area 7: Hollym to Dimlington Cliffs



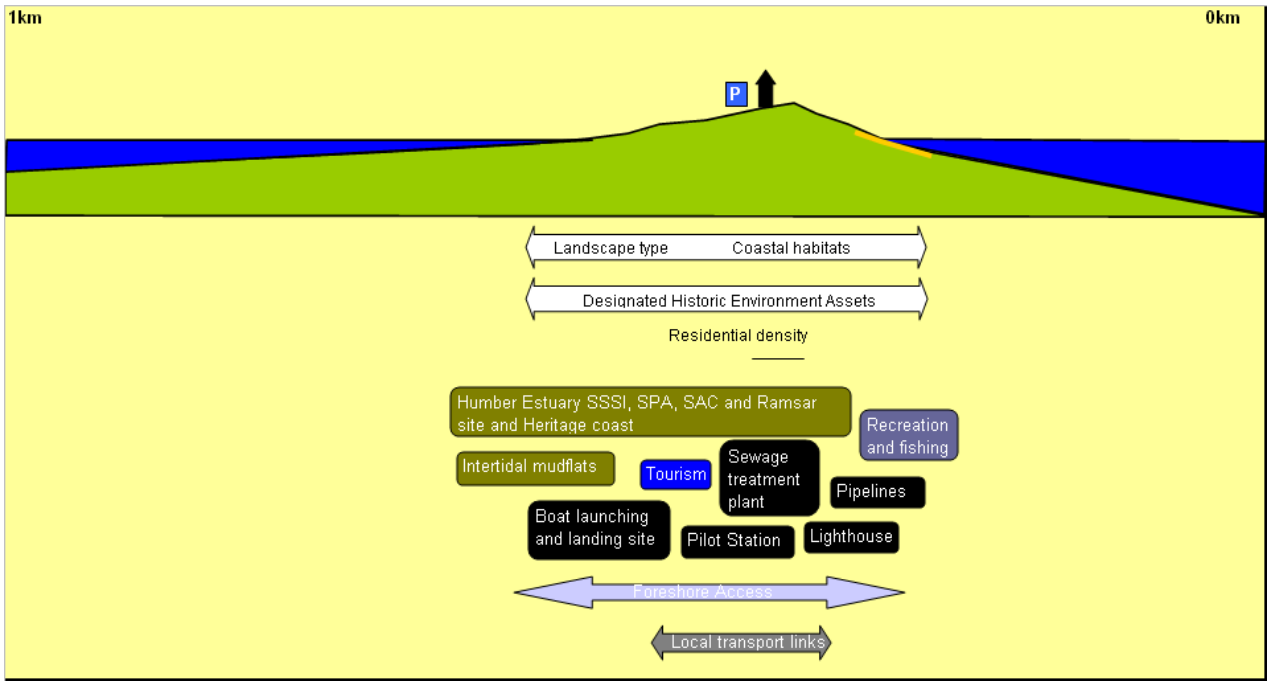
Character Area 8: Dimlington and Easington gas terminals



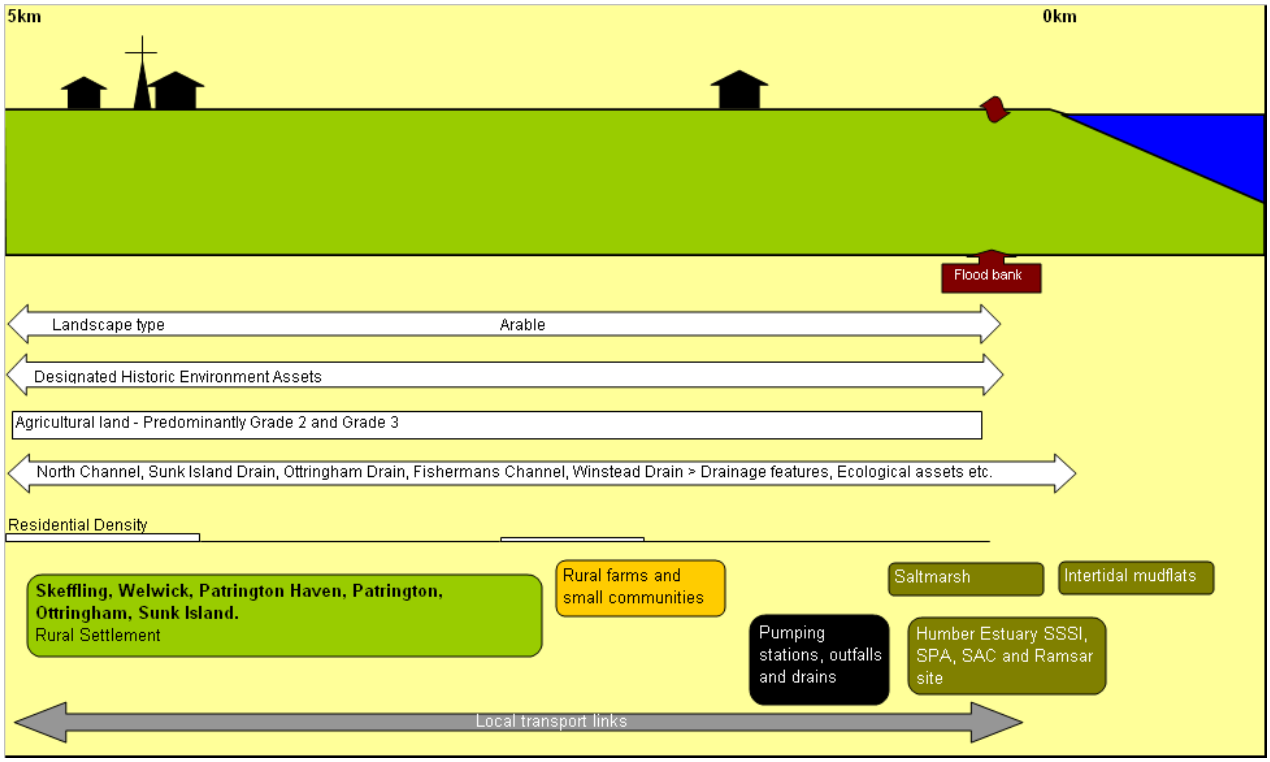
Character Area 9: Easington to Kilnsea



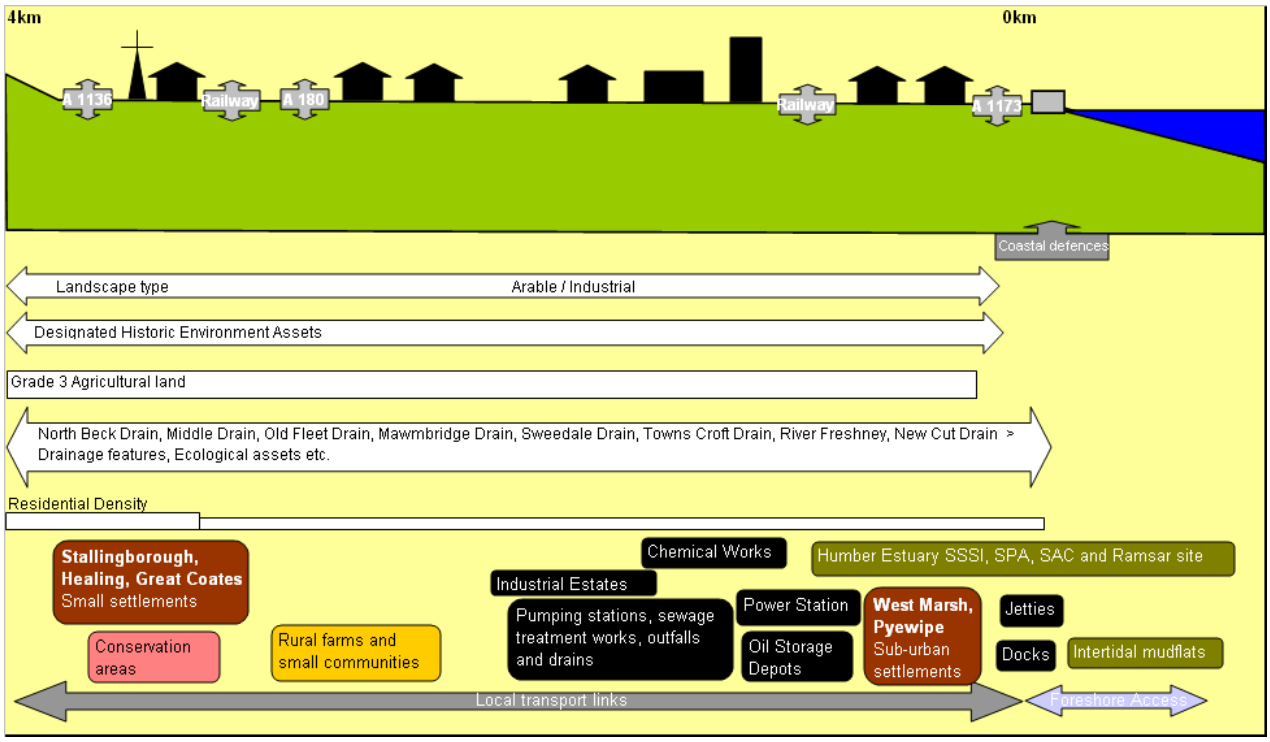
Character Area 10: Kilnsea to Spurn Point



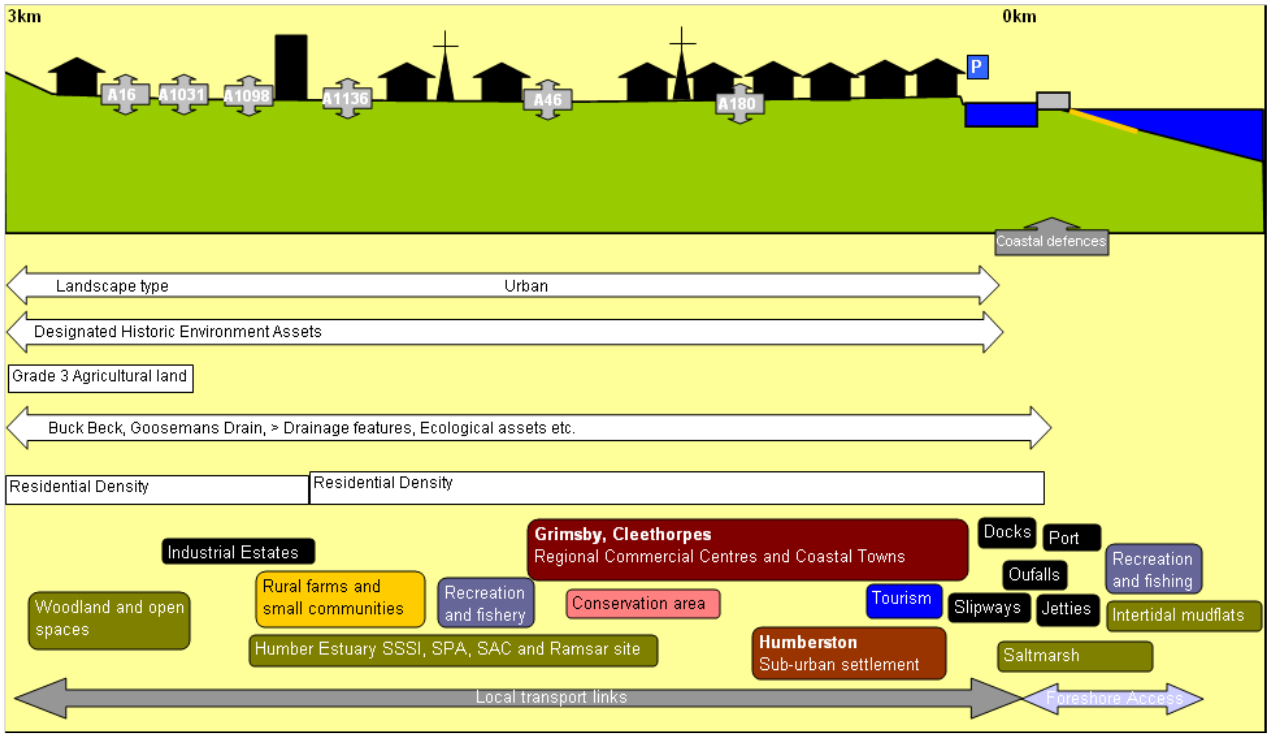
Character Area 11: Easington Road to Stone Creek



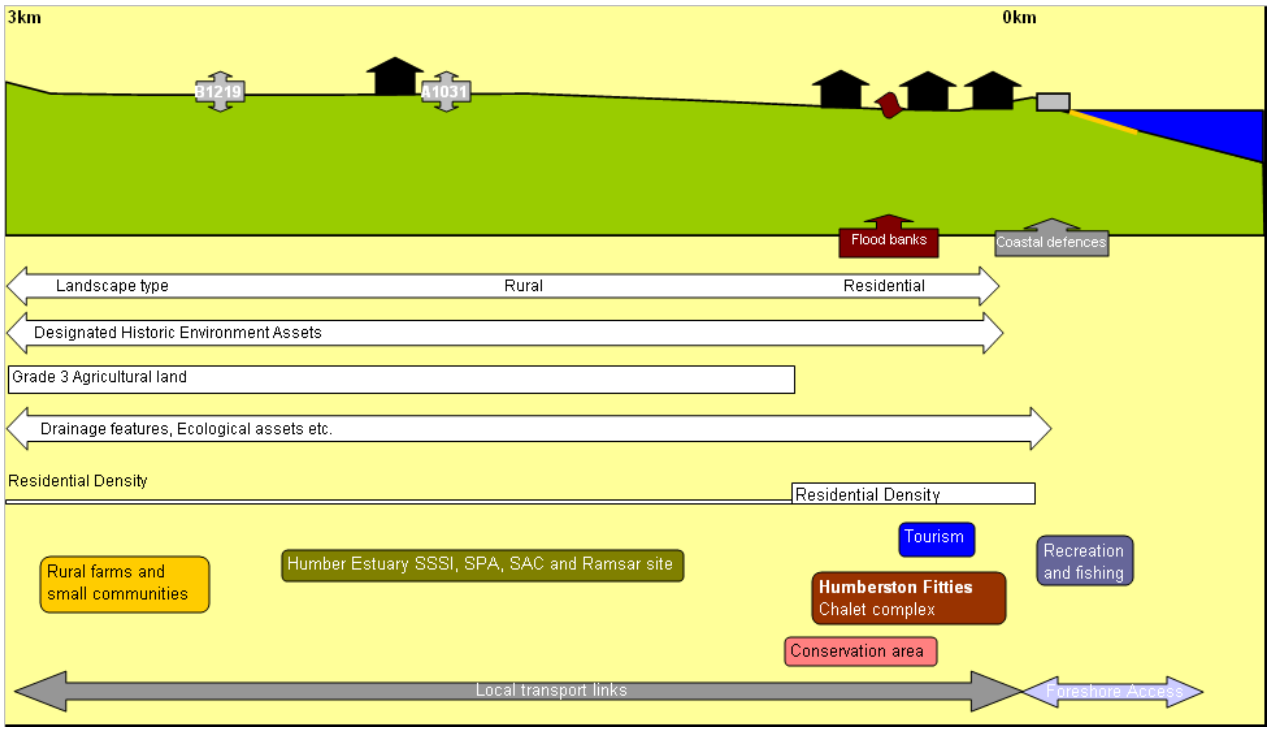
Character Area 12: East Immingham to Grimsby Docks



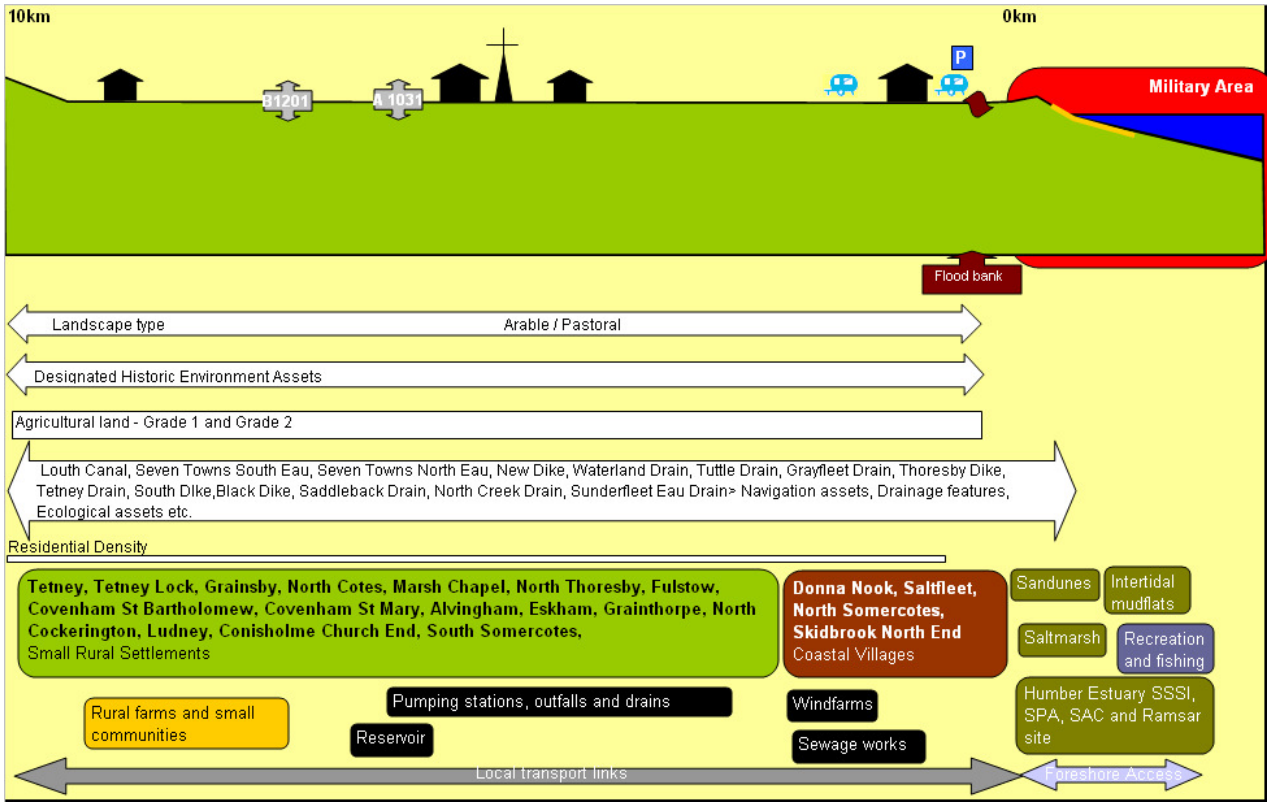
Character Area 13a: Grimsby and Cleethorpes



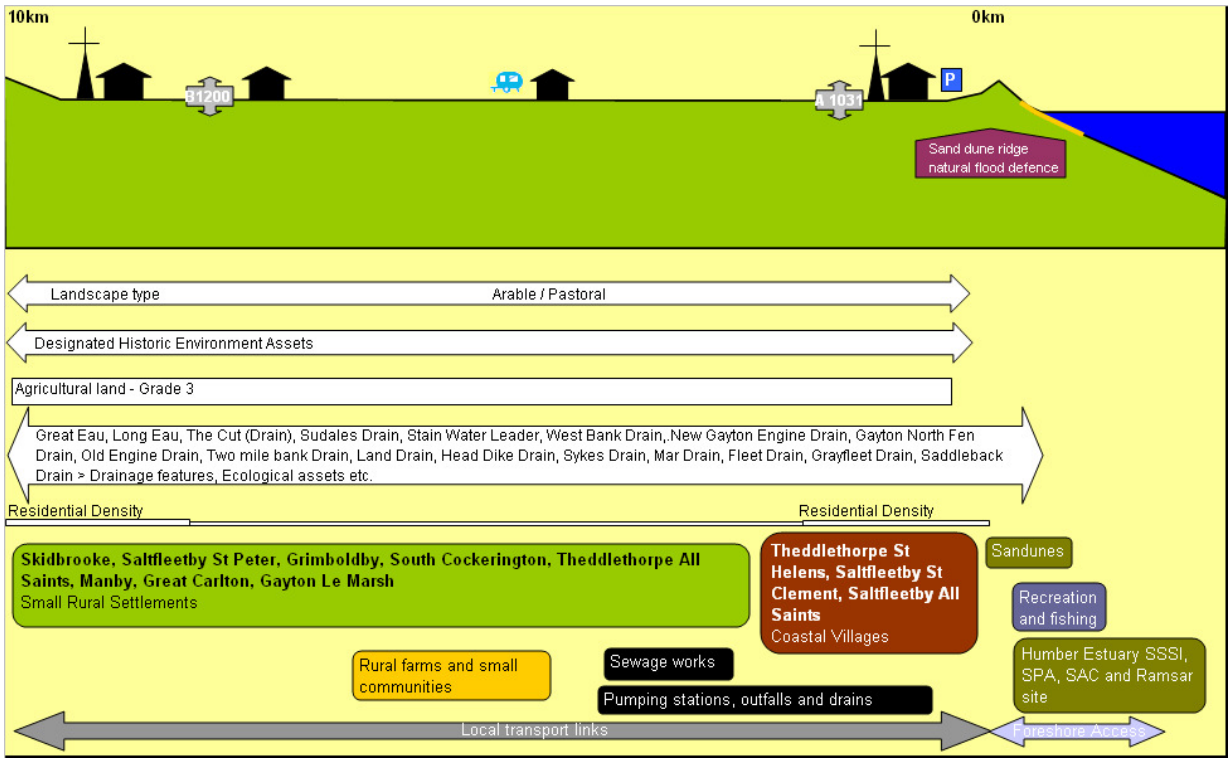
Character Area 13b: Humberston Fitties



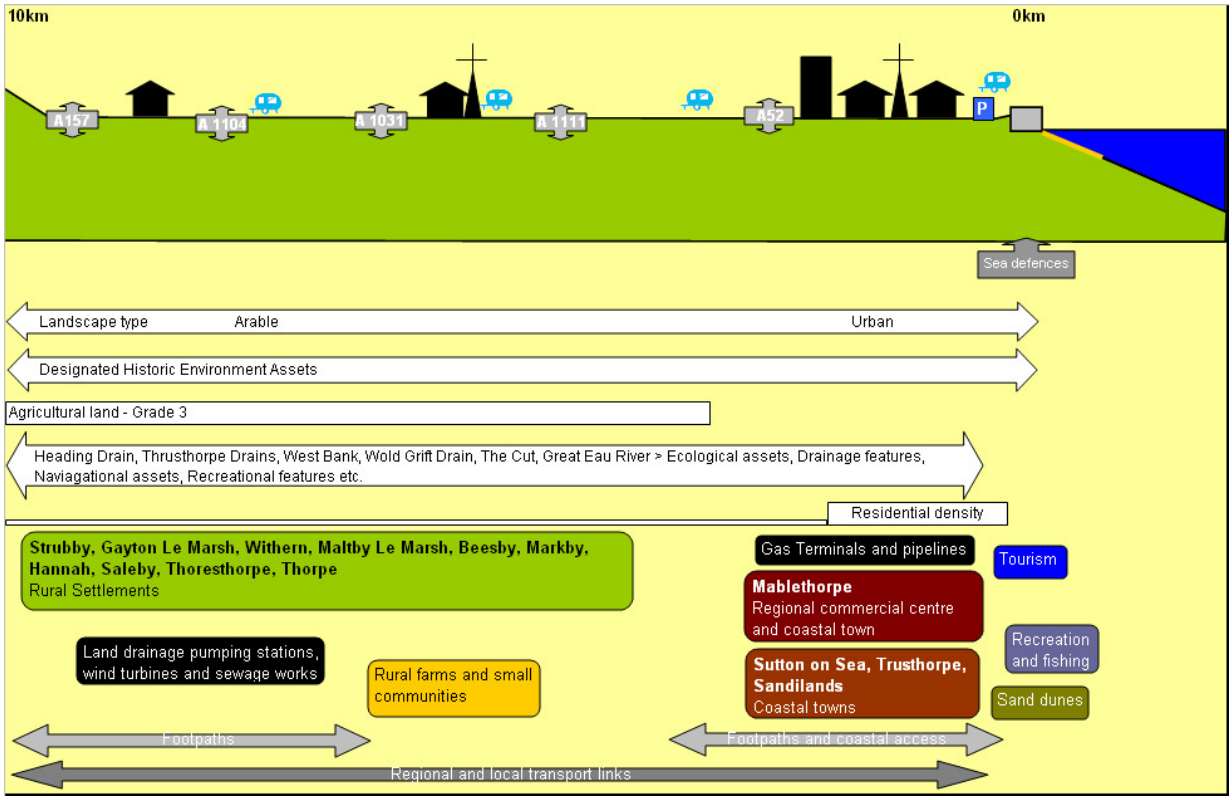
Character Area 14: South of Humberston Fitties to Saltfleet



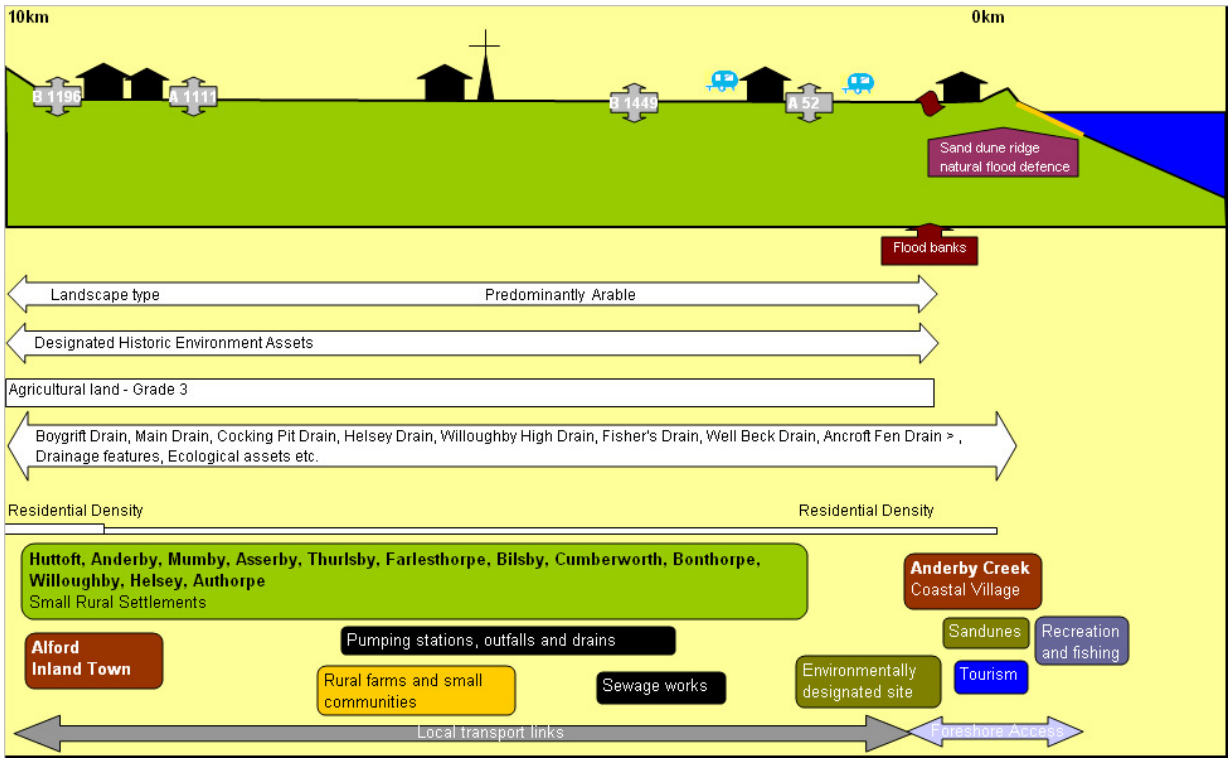
Character Area 15: Saltfleet Haven to Theddlethorpe St Helen



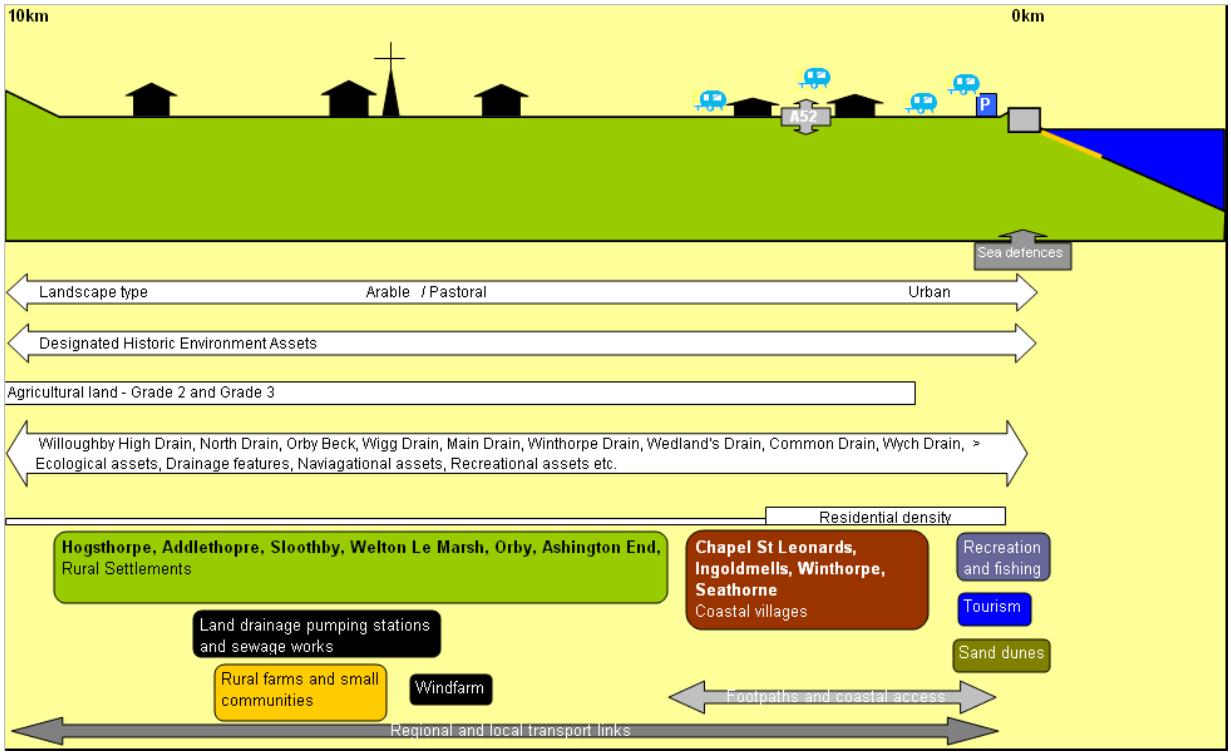
Character Area 16: Viking Gas Terminal to Sandilands (Mablethorpe)



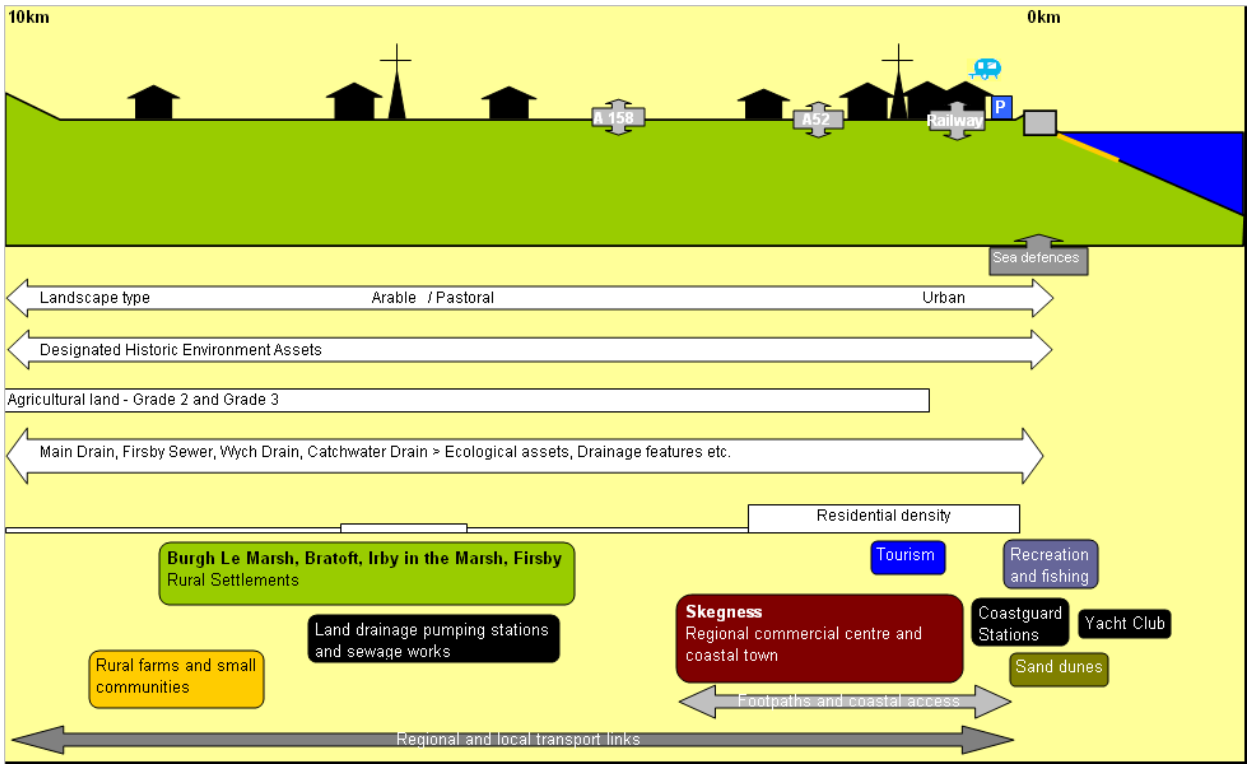
Character Area 17: Sandilands to Chapel Point



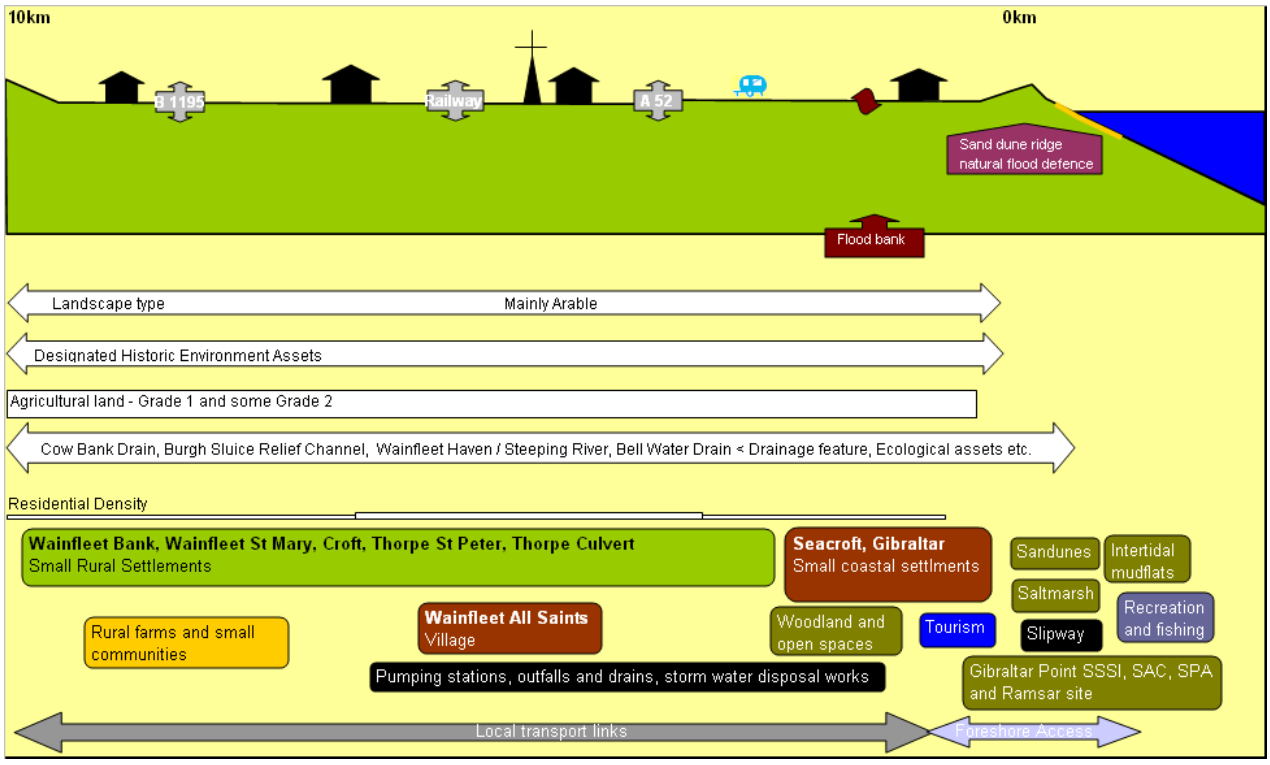
Character Area 18a: Chapel Point to Skegness



Character Area 18b: Skegness



Character Area 19: Seacroft to Gibraltar Point



Agriculture and industry

6.4 The coastline along much of the SMP frontage is predominantly rural with substantial areas of land used for agriculture. For this reason, agriculture is a key employer throughout the SMP area with many jobs dependent on the agricultural industry, particularly in East Lindsey where just under 7% of the population is employed within the industry (based on East Lindsey District Council's Economic Development Strategy: 2006 – 2020) compared to a figure of just under 2% nationally (based on National Farmers' Union figures: http://www.nfuonline.com/Media_centre/NFU_Quick_Stats/The_NFU_by_numbers/ accessed 19 March 2010.

6.5 In the UK, agricultural land is classified according to its quality using a consistent, country-wide system. This is known as the Agricultural Land Classification system and is the responsibility of Defra. Descriptions of land categories are given below:

- Grade 1 – excellent quality agricultural land: land with no or very minor limitations to agricultural use.
- Grade 2 – very good quality agricultural land: land with minor limitations which affect crop yield, cultivations or harvesting.
- Grade 3 - good to moderate quality agricultural land: land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.
- Grade 4 - poor quality agricultural land: land with severe limitations which significantly restrict the range of crops and/or level of yields.
- Grade 5 - very poor quality agricultural land: land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

6.6 In the East Riding of Yorkshire, the coastal strip between the settlements of Bridlington, Hornsea and Withernsea is rural with predominantly grade 3 agricultural land (there is also some grade 2 agricultural land) mostly used for arable farming. There is a large area of grade 2 agricultural land on the north bank of the Humber between Spurn Head and Stone Creek with a small area of grade 1 agricultural land towards the centre of Sunk Island. In East Lindsey, the rural areas are predominantly grade 3 agricultural land with small areas of grade 2 agricultural land. There are areas of grade 1 agricultural land at Donna Nook and Gibraltar Point.

6.7 There are significant areas of farmland being managed under agri-environment schemes; predominantly at entry level but with some areas at higher level, particularly around Flamborough Head, between Donna Nook and Mablethorpe, west of Skegness and at Gibraltar Point.

6.8 Future food security is an important issue for the nation as a whole and relevant to the SMP because of the significant areas of agricultural land with the potential to be affected by coastal management policy. Chatham House produced a report in 2009 investigating future food security within the UK and suggesting a range of measures to improve our future food security. The report highlights the UK's dependence on a small number of critical sources and inputs from the world market for food, feed and fertilizer, making the UK's food supply vulnerable to international events. The report recommends a number of measures to improve the UK's food supply resilience including investment in the agricultural industry to encourage productive and sustainable practices.

6.9 The area covered by the SMP includes some important industrial sites; the natural gas storage and processing facilities to the north of Atwick and to the east of Aldbrough, neither of which are predicted to be at risk from coastal erosion within the timescale of this Shoreline Management Plan. Dimlington and Easington gas terminals are located on the cliff top at Dimlington, just north of Easington. The south bank of the Humber to the west of Grimsby is heavily industrialised with infrastructure relating to the petrochemical industry; chemical works; oil storage; bulk and liquid storage; power generation; and other manufacturing, processing and storage infrastructure. Grimsby dock is a large commercial port and handles large volumes of foodstuffs, timber, steel, minerals, ores and grain. There are also fish processing facilities adjacent to the dock area. There is an oil storage tank farm at Tetney and the Viking gas terminal is located to the north of Mablethorpe, set back approximately 300 metres from the shoreline. There are also wind turbines at Mablethorpe.

Communities

6.10 Along the coastal strip of this SMP, there are several coastal towns, villages and individual dwellings. The coast is generally viewed as an attractive place to live and visit. However, many coastal communities experience a range of common challenges, as identified in a recent Government report (Communities and Local Government Committee, 2007):

- Physical and social isolation;
- High proportions of older people together with higher levels of outward migration among young people;
- Low-wage, low-skill economies and seasonality of employment;
- Frequent dependency on a single industry; and
- A high incidence of poor housing conditions and a high proportion of private rented homes.

6.11 The Indices of Multiple Deprivation 2007 are the Government's official measure of overall deprivation at the local level. The indices combine a number of indicators, chosen to cover a range of economic, social and housing issues into a single deprivation score for every locality in England.

6.12 The Indices of Multiple Deprivation 2007 indicate that within the East Riding, deprivation is concentrated along much of the coastline, although deprivation levels are not as high as in the other authorities. North East Lincolnshire has high levels of deprivation generally, but particularly concentrated in central Grimsby, adjacent to the dock area. In East Lindsey, there are small but significant pockets of social deprivation, particularly along the coast.

6.13 It is important that the SMP takes into consideration the spatial planning context and regeneration strategies that are currently in progress. In the Yorkshire and Humber Regional Spatial Strategy, Withernsea is identified as having particular needs for wide-ranging regeneration due to its declining economy and relatively high unemployment and deprivation levels. There are renaissance programmes underway in Grimsby and Cleethorpes, which link priorities for housing with community and regeneration objectives. Skegness and Mablethorpe have been identified as key areas for regeneration to address high levels of deprivation and seasonal unemployment.

Coastal flood and erosion risk

6.14 In the East Riding of Yorkshire, the towns of Bridlington, Hornsea and Withernsea as well as the village of Mappleton and the gas terminals at Easington are defended against coastal erosion. The current planning permission for the Easington defences expires on 31 January 2020 and requires that all coastal defence works at Easington shall be permanently removed within a year of that date.

6.15 Within the East Riding, the rural areas between the defended frontages are currently eroding at a rate of approximately 0.5 – 2.0 metres per year on average and if natural processes continue, there will be properties at risk from coastal erosion along these frontages within the timeframe of the SMP as well as agricultural land.

6.16 In response, the East Riding of Yorkshire Council used the recommendations stemming from their Integrated Coastal Zone Management Plan (adopted in 2002) to develop the concept of 'rollback' in relation to caravan parks and subsequently homes and farmsteads. The intention of the policy is to facilitate the relocation of residential properties and caravan parks inland, further away from the threat of erosion.

6.17 Within the East Riding, there are low-lying areas of land at risk from coastal and/or estuarine flooding, particularly the areas around Barmston drain, south Hornsea, Tunstall drain and the north bank of the Humber, including Sunk Island and parts of Easington.

6.18 Within North East Lincolnshire, virtually the entire frontage is protected by hard defences, however the hinterland (including large areas of Grimsby) is within the coastal flood plain (based on the extent of Flood Zone 3a).

6.19 Within East Lindsey, the majority of the frontage is defended by a combination of embankments or hard defences fronted by a beach. There are extensive areas of low-lying land behind the defences, potentially at risk of flooding through tidal inundation. This area includes towns, villages and significant areas of agricultural land. The back of the floodplain is marked by a ridge of higher ground with a gradual increase in gradient as the land rises towards the Lincolnshire Wolds. As sea levels rise are predicted to rise in the future, the drainage of fluvial water into the sea may become increasingly impinged; this could increase the threat of flooding from fresh water backing up (it becomes tide locked) and would increase the requirement for pumping to prevent flooding.

Historic environment

6.20 English Heritage is undertaking a Rapid Coastal Zone Assessment Survey to provide increased knowledge of the historic coastal environment. Stage 1 of the project, consisting of desk based assessment, has been completed for the Yorkshire and Lincolnshire areas and this information has informed the SMP. Stage 2 is currently underway and consists of field survey and an assessment of significance. Stage 1 of the Rapid Coastal Zone for Yorkshire and Lincolnshire can be downloaded from: http://www.english-heritage.org.uk/server/show/nav.18389

6.21 There are a considerable number of historic environment assets along the coastal strip including Scheduled Monuments, Listed Buildings, Parks and Gardens and Conservation Areas. There are no World Heritage Sites or Registered Battlefields within the area covered by the SMP. The historic environment designations are listed below:

- Scheduled monument: Scheduled monuments are designated and added to a 'Schedule' by the Secretary of State under powers contained in the Ancient Monuments and

Archaeological Areas Act, 1979. Scheduling refers to the legal system for protecting nationally important archaeological sites in England. There are approximately 19,500 scheduled monuments in England.

- Listed building: A building or other structure that is officially designated by English Heritage as being of special architectural and historic interest. Listed building status brings the structure under the consideration of the planning system. There are approximately 372,900 listed buildings in England.
- Registered parks and gardens: Since the 1980s there has been a national record of historic parks and gardens which make such a rich and varied contribution to our landscape, maintained by English Heritage. There are approximately 1,500 registered parks and gardens.
- Registered historic battlefield: There are nearly 50 important English battlefields identified on the Register of Historic Battlefields maintained by English Heritage.
- World Heritage Site: There are nearly 900 World Heritage sites across the world, including just under 30 in the UK. World Heritage sites are places of outstanding universal value to all humanity and are of importance for the conservation of mankind's cultural and natural heritage.
- Conservation area: Conservation areas are designated by local authorities as any area of special architectural or historic interest whose character or appearance is worth protecting or enhancing. There are over 8,000 conservation areas in England.

6.22 A number of these sites are potentially at risk from coastal erosion within the East Riding. A considerable number of these sites are potentially at risk from coastal flooding within North East Lincolnshire and East Lindsey due to the size of the flood plain as well as sites within East Riding on the north bank of the Humber which are vulnerable to flooding.

6.23 Historic environment assets are summarised on an area by area basis in Appendix D.

Infrastructure

6.24 There is a considerable quantity of infrastructure associated with towns and villages along the entire SMP frontage including: water and sewerage infrastructure; outfalls; RNLI stations; coastguard stations; coastal access points; wind farm infrastructure; piers; slipways; reservoir; and visitor centres at Spurn Head and Gibraltar Point. In each of the main towns, there are many local and regional services as well as community facilities such as schools, places of worship, public houses, shops, police stations, hospitals, doctors, museums, leisure centres etc.

6.25 The harbour area at Bridlington provides facilities for the local fishing community and is a focus for tourists and water sports enthusiasts.

6.26 There are three Ministry of Defence sites along the frontage; a bombing range in the vicinity of Cowden Parva and an RAF bombing range at Donna Nook. There is also an RAF underground bunker to the south of Hollym.

6.27 Throughout North East Lincolnshire, East Lindsey and along the north bank of the Humber, there is drainage infrastructure such as land drainage pumping stations, outfalls, drainage channels, dykes and streams to facilitate the drainage of the low-lying land in these areas.

6.28 The road and rail network within this area provides important transport links between towns and villages. The B1242 within the East Riding runs parallel to the coast, approaching close to the coastline in places and provides a key connection between the towns and villages of Skipsea, Atwick, Hornsea, Mappleton, Aldbrough, Roos and Withernsea. The A1031 and A52 within East Lindsey run parallel to the coast and provide a key connection between the towns and villages of Humberston, Saltfleet, Mablethorpe, Trusthorpe, Sutton on Sea, Ingoldmells and Skegness as well as smaller villages. The train station in Bridlington provides a rail connection between Hull and Scarborough. Several train stations within Grimsby and Cleethorpes provide rail access to the west. The train station in Skegness provides a rail connection between Skegness and Grantham.

Landscape

6.29 Flamborough Head and Spurn Head are both defined as Heritage Coasts in recognition of the value of their landscape character.

6.30 The East Riding coastal strip is predominantly exposed open landscape with limited tree cover and scattered small scale hamlets and villages contrasting with the surrounding large scale agricultural landscape. Coastal caravan parks are prominent in the coastal strip. The undefended eroding boulder clay cliffs and narrow beaches are a feature of much of this coastline.

6.31 North East Lincolnshire's coastal strip within the SMP area is heavily industrialised between Immingham and Grimsby due to activities associated with the docks. Grimsby and Cleethorpes are predominantly urban landscapes with an industrial area around the port of Grimsby. Landward of the residential and urban areas, is open, agricultural landscape.

6.32 East Lindsey's coastal strip is a low-lying drained coastal plain which is mostly flat with some areas of gentle undulations. Predominantly mixed agricultural land use with both arable and pasture and there are extensive networks of drainage ditches and dykes around field boundaries. There are sparsely scattered rural settlements throughout the area and a stretch of coastal resorts from Mablethorpe to Skegness with associated static caravan parks on their outskirts.

Natural environment

6.33 The coastline includes a number of nationally and internationally designated sites located on the coast as well as sites located in the vicinity of the coast line. Table 6 provides a summary of the nationally and internationally designated sites that are located on or in the vicinity of the coastline. It also sets out some of the key vulnerabilities at the sites that are of relevance to the SMP.

6.34 The environmental designations are listed below:

- Special Area of Conservation (SAC): SACs are areas which have been given special protection under the European Union's Habitats Directive (Council Directive 92/43/EEC of 21 May 1992). They provide increased protection to a variety of wild animals, plants and habitats and are a vital part of global efforts to conserve the world's biodiversity.
- Special Protection Area (SPA): SPAs are areas which have been identified as being of national and international importance for the breeding, feeding, wintering or the migration of rare and vulnerable species of birds found within European Union countries. They are

European designated sites, classified under the European Union's Birds Directive (79/409/EEC).

- Ramsar sites: Ramsar sites are wetlands of international importance, designated under the Ramsar Convention (signed in Ramsar, Iran in 1971). Wetlands are defined as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.
- European Marine Site: The term 'European Marine Site' (EMS) (as defined by the Habitats Regulations) refers to those marine areas of both Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), which are protected under the EC Habitats and Birds Directives. These are a non statutory designation and are essentially management units for those parts of Natura 2000 sites.
- Site of Special Scientific Interest (SSSI): SSSIs are the best sites for the country's wildlife and geology. There are over 4,000 SSSIs in England, covering around 7% of the country's land area.
- National Nature Reserve (NNR): Many of the finest sites in England for wildlife and geology are National Nature Reserves. As well as managing some of our most pristine habitats, our rarest species and our most significant geology, most Reserves now offer great opportunities to the public as well as schools and specialist audiences to experience England's natural heritage.
- Local Geological Sites: Local Sites (previously Regionally Important Geological/geological Site (RIGS)) are non-statutory areas of local importance for nature conservation that complement nationally and internationally designated geological and wildlife sites.

6.35 An important site for nature conservation can have more than one environmental designation; in particular, sites of European importance are usually also designated as SSSIs.

6.36 The internationally and nationally designated sites within the SMP area are listed in Table 6.1 as well as a summary of their interest features.

6.37 Just south of the SMP area is the extensive area of the Wash SPA and Ramsar site and the Wash & North Norfolk Coast SAC. In addition, in the area adjacent to the southern portion of the SMP area there are three draft Special Areas of Conservation: Inner Dowsing, Race Bank, and North Ridge. Although these designated and proposed designated areas are outside the boundary of the SMP, they have the potential to be affected by this SMP's policies.

6.38 In addition to the internationally and nationally designated sites, there are locally designated wildlife sites such as Biodiversity Action Plan (BAP) species and local wildlife sites within the SMP area; their importance has also been considered throughout the Plan's development.

Table 6.1: Internationally and nationally designated sites within the SMP area

Name	Features of interest	Area (hectares)
Flamborough Head SAC	• Reefs • Vegetated sea cliffs of the Atlantic and Baltic coasts • Submerged or partially submerged sea caves	6,312
Flamborough Head SSSI	The site comprises the coastal cliffs of Flamborough Head between Reighton and Sewerby, composed of chalk and softer sedimentary rocks. The cliff line exposes a variety of geological features. These rock exposures are also of interest in supporting important breeding bird colonies, whilst the cliff tops support interesting plant communities.	315
Flamborough Head and Bempton Cliffs SPA	This site qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: During the breeding season; • Kittiwake *Rissa tridactyla* Assemblage qualification: A seabird assemblage of international importance The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds: During the breeding season, the area regularly supports 305,784 individual seabirds	212
Skipsea Bail Mere SSSI	Skipsea Bail Mere consists of an area of agricultural land lying immediately north west of the village of Skipsea. The interest lies in the lake deposits underlying below the fields and can be accessed by auger or borehole. Skipsea Bail Mere is important for the interpretation of the vegetational history of the northern part of the Holderness coastal plain. The organic deposits which have infilled the basin contain a pollen and macrofaunal record that extends from the Devensian Late Glacial (around 13 Ka BP) through to historic times.	44
Withow Gap, Skipsea SSSI	Withow Gap, Skipsea is an important site for the interpretation of Late Devensian (glacial) and Flandrian (post-glacial) environmental history in Holderness. The unique feature of the site is the exposure in a coastal section of a sequence of mere deposits which occupies a hollow in the Late Devensian (Skipsea) till. This provides an unusual opportunity to see the complete stratigraphy, its lateral variations and the complexity of the geomorphological processes that operated at the former lake margin. Both the coastal section and the subsurface aspects of the hollow inland are invaluable for research and education, and the site has yielded a considerable volume of palaeoenvironmental data from studies of pollen, plant macrofossils, molluscs and lithostratigraphy.	8
Hornsea Mere SPA	This site qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: Over winter; • Gadwall *Anas strepera*, 300 individuals representing at least 1.0% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)	231

Name	Features of interest	Area (hectares)
Hornsea Mere SSSI	Hornsea Mere is a site of national ornithological importance. It consists of a large shallow eutrophic lake of about 120 hectares (300 acres), together with its associated habitats of reedswamp, fen and carr woodland, representing a relic of the once-extensive marshes and lakes of Holderness.	230
Dimlington Cliffs SSSI	Dimlington is a key site for Quaternary stratigraphy. Organic remains in the Dimlington Silts provide not only a good record of palaeoenvironmental conditions but also a limiting date for the maximum expansion of Late Devensian ice. Dimlington also provides valuable exposures in the Basement Till which includes Scottish and Scandinavian erratics and masses of fossiliferous Bridlington Crag transported from the floor of the North Sea. The site also provides sedimentary evidence for the superimposition of two till units associated with a single ice sheet.	55
The Lagoons SSSI	The site known as the Lagoons is situated on the Holderness coast some 2 kilometres north of Spurn peninsula and south-west of Easington village. It comprises a variety of coastal habitats including saltmarsh, shingle, sand dune, swamp and most significantly, saline lagoons and pools which represent the only extant example in North Humberside of this nationally rare habitat.	68
Spurn NNR	Spurn NNR has sandy beaches and the North Sea on its eastern side, and areas of saltmarsh and extensive mudflats on its western side, the latter attracting thousands of birds. Spurn NNR is owned and managed by the Yorkshire Wildlife Trust.	296
Humber Estuary SAC	• Estuaries • Mudflats and sandflats not covered by seawater at low tide • Sandbanks which are slightly covered by sea water all the time • Coastal lagoons * Priority feature • *Salicornia* and other annuals colonising mud and sand • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Embryonic shifting dunes • Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`) • Fixed dunes with herbaceous vegetation (`grey dunes`) * Priority feature • Dunes with *Hippophae rhamnoides* • Sea lamprey *Petromyzon marinus* • River lamprey *Lampetra fluviatilis* • Grey seal *Halichoerus grypus*	36,657

Name	Features of interest	Area (hectares)
Humber Estuary SPA	This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: During the breeding season; • Little Tern *Sterna albifrons* • Marsh Harrier *Circus aeruginosus* • Bittern *Botaurus stellaris* • Avocet *Recurvirostra avosetta* Over winter; • Bar-tailed Godwit *Limosa lapponica* • Bittern *Botaurus stellaris* • Golden Plover *Pluvialis apricaria* • Hen Harrier *Circus cyaneus* • Avocet *Recurvirostra avosetta* • Ruff *Philomachus pugnax* This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: On passage; • Redshank *Tringa totanus* • Dunlin *Calidris alpina alpina* • Red knot *Calidris canutus* • Black-tailed Godwit *Limosa limosa islandica* Over winter; • Dunlin *Calidris alpina alpina* • Knot *Calidris canutus* • Redshank *Tringa totanus* • Shelduck *Tadorna tadorna* • Black-tailed Godwit *Limosa limosa islandica* Assemblage qualification: A wetland of international importance. The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl: Over winter, the area regularly supports 187,617 individual waterfowl (5 year peak mean 1991/2 - 1995/6)	37,630

Name	Features of interest	Area (hectares)
Humber Estuary Ramsar	• Assemblages of international importance and species/populations occurring at levels of international importance In addition to the birds: • The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons. • The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad *Bufo calamita*. • The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	37,988
Humber Estuary SSSI	The Humber Estuary is a nationally important site with a series of nationally important habitats. These are the estuary itself (with its component habitats of intertidal mudflats and sandflats and coastal saltmarsh) and the associated saline lagoons, sand dunes and standing waters. The site is also of national importance for the geological interest at South Ferriby Cliff (Late Pleistocene sediments) and for the coastal geomorphology of Spurn. The estuary supports nationally important numbers of 22 wintering waterfowl and nine passage waders, and a nationally important assemblage of breeding birds of lowland open waters and their margins. It is also nationally important for a breeding colony of grey seals *Halichoerus grypus*, river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*, a vascular plant assemblage and an invertebrate assemblage.	37,000
Donna Nook NNR	Donna Nook NNR is made up of dunes, slacks, saltmarsh and inter-tidal areas. The area is rich in bird life. In summer, breeding dune birds include red-legged partridge, dunnock, whitethroat, linnet, skylark, yellowhammer and tree sparrow; while the mudflats provide a winter home for substantial numbers of brent geese, shelduck, twite, lapland bunting, shore lark, knot and dunlin, and a wide variety of other wading birds. In addition, Donna Nook has one of the largest and most accessible breeding colonies of grey seals in the UK. Donna Nook NNR is owned by the Ministry of Defence and managed by the Lincolnshire Wildlife Trust.	341
Saltfleetby – Theddlethorpe Dunes and Gibraltar Point SAC	• Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`) • Fixed dunes with herbaceous vegetation (`grey dunes`) * Priority feature • Dunes with *Hippophae rhamnoides* • Humid dune slacks • Embryonic shifting dunes	960

Name	Features of interest	Area (hectares)
Saltfleetby – Theddlethorpe Dunes SSSI	This nationally important site includes flats, dunes, salt and freshwater marsh which together support an exceptionally rich flora and fauna. There are outstanding assemblages of vascular plants, invertebrates and breeding birds and it is the most north-easterly breeding site in Britain for the Natterjack Toad. The rapid accretion of dunes and saltmarsh make this an important site for research into the processes of coastal development.	952
Saltfleetby – Theddlethorpe NNR	The dunes began forming in the 13th century, and the same processes of wind and tidal action continues dune formation on the site today. The dunes support a variety of flowers and grasses while saltmarsh and freshwater marsh areas are home to a wide variety of insects, amphibians, birds and mammals.	952
Chapel Point – Wolla Bank SSSI	Chapel Point-Wolla Bank is a nationally important geological site for its inter-tidal sediments, which record the evidence of early Holocene sea level change.	40
Sea Bank Clay Pits SSSI	The Sea Bank Clay Pits comprise a series of isolated flooded clay workings of varying size, depth and topography which now support uncommon aquatic plant communities characteristic of the slightly brackish, eutrophic (nutrient-rich) water in addition to extensive reedbeds and a rich marginal wetland flora. The pits were excavated in 1953 to provide material for the repair of the sea wall between Mablethorpe and Chapel St. Leonards on the Lincolnshire Coast. The pits are also important for breeding, wintering and passage birds. They are known to support a rich aquatic invertebrate fauna, notably beetles, including several nationally scarce species and others new to the County.	17
Gibraltar Point SPA	This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: During the breeding season; • Little Tern *Sterna albifrons* Over winter; • Bar-tailed Godwit *Limosa lapponica* This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: Over winter; • Grey Plover *Pluvialis squatarola* • Knot *Calidris canutus* Assemblage qualification: A wetland of international importance. The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl: Over winter, the area regularly supports 22,137 individual waterfowl (5 year peak mean 1991/2 - 1995/6)	414

Name	Features of interest	Area (hectares)
Gibraltar Point Ramsar	The area consists of a sand dunes system, freshwater and saltmarsh, extensive intertidal flats, and open water. The vegetation includes sedges (*Carex spp*), rushes, ferns, crowfoot, reed, sea holly, and sea campion. It supports *Pluvialis squatarola* (1.2% of the population), *Limosa lapponica* (0.6% of the population), and *Branta bernicla bernicla* (0.3% of the population). The site is used for recreation and grazing.	414
Gibraltar Point SSSI	This is a nationally important site due to its sand dunes and other coastal habitats and associated fauna, notably invertebrates and passage and breeding birds. Gibraltar Point is also of great importance for its coastal geomorphology.	581
Gibraltar Point NNR	The NNR forms the north-eastern extremity and entrance to the Wash estuary and has been built by complex tidal and geomorphological processes. Most of the reserve is intertidal flats and saltmarsh. There are areas of freshwater marsh and man-made fresh and salty water meres. Large numbers of migrant and overwintering birds visit the NNR. Gibraltar Point NNR is managed and part owned by the Lincolnshire Wildlife Trust.	429

Tourism

6.39 Tourism is a key industry along much of the SMP frontage. In the East Riding, Bridlington, Hornsea and Withernsea have developed as seaside resorts and Bridlington continues to be the East Riding's premier holiday resort serving a catchment covering West and South Yorkshire and North Nottinghamshire. Tourism is an important contributor to the local economy with numerous EC-designated bathing beaches along the Holderness coast and tourist-related development along the coast, including caravan parks. The scenic beauty and wildlife of Flamborough Head and Spurn Head also attract visitors and there are interpretation boards and facilities for visitors.

6.40 Tourism is a key economic driver in Cleethorpes (North East Lincolnshire) and this area has many recreation and tourism developments close to the EC-designated bathing beach that fronts the town.

6.41 Tourism is a vital input to the local economy within East Lindsey, with tourism and agriculture the main sources of employment. The 'Fun Coast' stretches between Mablethorpe and Skegness and includes traditional seaside resorts with Blue Flag beaches at Mablethorpe, Sutton on Sea and Skegness. There are many tourist-related developments along this part of the coast, including the legendary Butlins at Ingoldmells. There are approximately 28,000 caravans within East Lindsey, with over 300 licensed sites; the highest concentration in Europe. Beyond the popular beaches, visitors are drawn to the wild stretches of coast at Gibraltar Point and north of Mablethorpe. There is a visitor centre at Gibraltar Point to cater for tourists.

Offshore activity

Windfarms

6.42 There are currently two offshore windfarms under construction along the SMP coastline; Inner Dowsing and Lynn, offshore of Skegness. The Inner Dowsing and Lynn windfarms will each

have 27 turbines with an output of 90MW. The windfarm cables extend to the mainland where they come onshore near Skegness. There are also a number of planned and/or proposed offshore windfarms (including the Westermost Rough, Humber Gateway and Lincs windfarms as well as a number of windfarms further offshore), which may require on-shore facilities along the coastline. Existing power generation infrastructure on the south bank of the Humber is a particular attraction for further wind turbine development. However, care needs to be taken to protect this area from over-development of wind turbines to the detriment of the area's character and amenity.

Offshore dredging of marine aggregates

6.43 Currently 20-25 million tonnes of marine aggregates are dredged from the seabed around the coast of England and Wales, contributing about 20% to the total sand and gravel used by the UK construction industry each year. Areas of the seabed licensed for commercial dredging are also the source for most of the material used in beach nourishment works. Beach nourishment is regarded internationally as an effective and environmentally acceptable method of coastal defence, when used in suitable locations and in accordance with best practice. Dredged material is put onto beaches and shingle ridges to return them to a set height. One of the largest beach nourishment programs currently running in the UK is the 'Lincshore Project' between Mablethorpe and Skegness which helps protect vast swathes of Lincolnshire against coastal flooding.

6.44 Marine dredging operations for sand and gravel in the UK are regulated by the Secretary of State and closely controlled and monitored by The Crown Estate (which owns the UK's seabed) and Defra's Marine and Fisheries Agency. Since May 2007, The Marine Minerals Dredging Regulations have provided a statutory framework to control dredging from the seabed in British marine waters. Prior to this it was controlled by an informal 'Government View' procedure.

Offshore dredging in the HECAG SMP area

6.45 There are eight areas licensed for marine sand and aggregate extraction; the most northerly area is offshore of Easington and the most southerly area offshore of Chapel St Leonards; typically these are in water depths of over 15 m (Figure 6.2).

6.46 The Crown Estate issues licences to developers who wish to exploit marine resources in these designated areas. Each dredging licence application is subject to a rigorous Environmental Impact Assessment and Coastal Impact Study, which assess the impact that operations may have upon the shoreline. They look at beach drawdown, modification of wave and tidal forces, and sediment supply to shoreline. Also, all dredging vessels are equipped with an Electronic Monitoring System, which automatically records the time and position of all dredging activities.

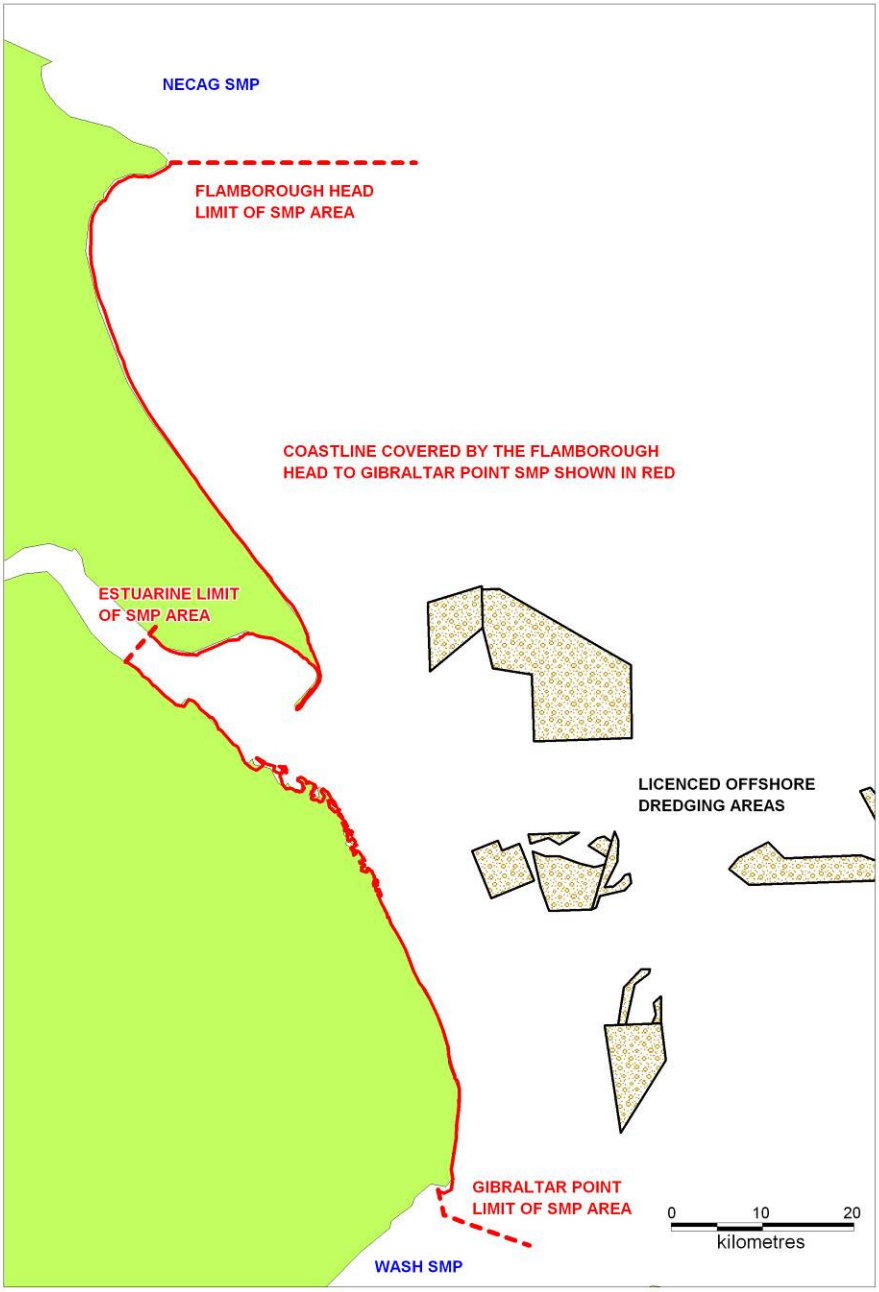


Figure 6.2 Map showing the location of the licensed offshore aggregate extraction areas

Concerns

6.47 The Yorkshire and Humber Plan: Regional Spatial Strategy highlights that it is important to consider offshore sand and gravel extraction, which may have adverse marine environmental impacts.

6.48 It is important to acknowledge that any dredging operation (whether for aggregates or harbour maintenance/ capital works) has the potential to result in changes to the physical processes which interact with the coastline if it is permitted to take place in an inappropriate location (shallow water, too close to the shoreline). This could result from changes to the wave climate

or interactions with sediment transport processes. Despite the rigorous checks in place to regulate and manage marine aggregate dredging in UK waters, there remain concerns that the activity is responsible for changes taking place at the coast.

6.49 The commonly expressed concerns emerge from the perception that dredging 'holes' off shore will steepen the nearshore profile, and therefore lead to beach draw-down and coastal erosion. The analogy of a hole being dug on a beach being rapidly filled is often used to support this concern. A historical example commonly quoted is Hallsands in Devon where dredging took place between low and high water marks next to the fishing village in the late 1800's. This occurred 100 years ago when there were no effective controls over, or environmental assessments of, extraction. The village was tragically destroyed due to the gradual loss of the protective beach but this was clearly inevitable as it was essentially the beach that was being removed.

Research findings

6.50 Such concerns have provoked research into this topic. An independent study commissioned by local authorities (the Southern North Sea Sediment Transport Study (HR Wallingford 2002)) studied the modern day physical processes in the Humber region. This research showed that the licensed areas off the Humber are subject to a tidally-dominant transport regime on account of their distance offshore and the water depths involved. Tidal flows are orientated coast parallel (north-south), and transport of sand may occur in both flood and ebb directions although the dominance of the flood tide tends to result in a net southerly movement of mobile sediment. The shore parallel orientation of the tidal currents and the largely rectilinear nature of the flood and ebb phases of the tide mean there is no significant mechanism for onshore-offshore sediment exchange between the coast and licensed areas or vice-versa. This study therefore concluded that there was no noticeable impact on the coast from offshore dredging.

6.51 A similar conclusion was drawn the BMAPA briefing paper (July 2009). It stated that it is "impossible for dredging in the licensed areas offshore to steepen the shore profile and that the coast is effectively 'unaware' of the dredging taking place." It stated that depths of extraction in permitted licence areas off the Humber range commonly from 1 metre to about 4 metres, depending on the thickness of the deposit. The seabed between the dredging sites and the coast consists of exposed glacial boulder clay, which effectively separates the extraction areas from the shore. There is no continuous sediment layer dipping down from the coast to the dredging areas. This understanding of transport processes is reinforced by survey data of sediment movements across current licence areas.

6.52 The Marine Aggregate Extraction summary report produced by the Marine Aggregate Levy Sustainability Fund (www.alsf-mepf.org.uk/downloads.aspx) contributes extensively to the body of evidence built up as a result of recent research, modelling and field studies. Most significantly it also concludes that both individual offshore dredging licences and the cumulative impacts of such licences have not contributed to coastal erosion.

Control measures and monitoring

6.53 There are continual measures in place to ensure dredging does not impact on the adjacent shoreline. Seabed modelling is used in an Environmental Impact Assessment to predict possible environmental impacts of dredging. This modelling considers numerous factors including water depths and wave heights, tides and currents sediment type and movement. The modelling is undertaken to ensure that there is no impact to the beach sediment system (the transport of beach material along the coast). Dredging operators are required to undertake compulsory monitoring of the extraction site, both during and following operations. This most commonly will take the form of depth surveys of the seabed being dredged and surrounding

area. This data shows whether there has been newly settled sediment where the seabed has been lowered. In the event of significant new sediment being detected, action would be taken. So far, the results of such monitoring have indicated no new sediment forming in dredged areas

Future work

6.54 The Crown Estate and the dredging industry have commissioned Marine Aggregate Regional Environmental Assessments (MAREA) which will provide additional assessment information. The HECAG SMP recognises the requirement for further detailed research into this important and controversial matter, and an in-depth study has been put forward in the Action Plan to collect vital data and further improve the knowledge base of the complex linkages and processes involved.

7 Summary of Policy Appraisal Process

7.1 Based on the baseline information presented in Chapters 3 to 6 which highlights features and issues of importance along the coastline, combined with the understanding of how the shoreline will develop under different policies, a series of policies for the frontage were developed, appraised and compared. This section summarises the steps and processes undertaken to appraise the different SMP policies for the frontage in order to develop the preferred policies. The following sections describe the general approach to carrying out the assessment of policies as part of stage 3 of the SMP. Further detail on the policy appraisal process can be found in Appendix E.

7.2 As described in paragraph 6.1, the coastline was divided into areas of broadly similar character; these were termed Character Areas (Figure 7.2). An assessment of the features and issues of importance within each Character Area was undertaken. Specific objectives were then set for each Character Area; these objectives were based on the general SMP principles (listed in paragraph 1.37) and the features and issues of importance for each Character Area. The objectives were then used as policy appraisal criteria to appraise SMP policy options identified for each Character Area.

7.3 The first step of policy appraisal involved identifying SMP policies for appraisal for each Character Area. In relevant areas, CFMP-defined flood risk management policies were also considered (see section 1.17). The policies were put forward if they were deemed sufficiently relevant and realistic to be worthy of full appraisal, but did not necessarily need to be viable. In some instances there were recognised benefits of appraising policies that were anticipated to be unviable; for example, in some cases it was be considered to be in the public interest to fully assess a policy anticipated to be unviable, and by doing so, add weight to the preferred policy chosen.

7.4 Following the identification of policy options for appraisal, policy packages were developed. Policy packages comprised coherent 'strings' of policies representing a particular intent of management and were used as intermediary mechanisms to assist and rationalise the appraisal process. By combining policy options into logical assemblages, an efficient comparison of various policy options could be undertaken. Without this rationalisation process, assessment of the enormous number of different policy combinations over the whole frontage would have been an extremely lengthy and inefficient process. Policy Packages were formed for stretches of the coastline covering multiple Character Areas (known as Policy Development Zones) where issues and processes are largely similar and/or strongly linked (see Figure 7.2).

7.5 Policy packages were then assessed against the appraisal criteria (based on the specific objectives previously identified) for each Character Area. This process was undertaken systematically using an agreed 'traffic light' approach based on how well a policy package fulfilled the individual criteria. A narrative was also provided to explain the attributed colour and assessment. An integral part of the appraisal process included the assessment of shoreline responses to the different policy packages. To ensure a consistent and objective assessment was undertaken, a number of guidelines were devised to aid the appraisal processes.

7.6 Through the policy development processes, it became apparent that there were some stretches of the coast where the same policy would apply, sometimes comprising several adjacent Character Areas. The definition of these areas was deemed useful to deliver the Shoreline Management Plan so the frontage can be classified by areas where the same management approach is to be adopted; these sections were defined as Policy Units. The location of the policy units is shown in Figure 7.3.

7.7 The appraisal process indicated the preferred management intent for each area of the frontage. A process of fine tuning and policy refinement was then undertaken in close communication with the Client Steering Group and the Elected Members Forum to ensure a coherent, sustainable and optimised Plan. Further steps in this fine tuning included a check of economic viability of the policies, compliance with relevant environmental legislation, and a high level check on the wider sediment transport impacts of the preferred Plan.

7.8 Stakeholder consultation also formed an important and integral part of the policy development process. The Client Steering Group and Elected Members Forum were closely involved in the entire process, agreeing the general approach, policy options for testing, appraisal methodology and developing the preferred policies.

7.9 Following the procedures discussed above, the draft Plan was confirmed. In some cases flexibility was built into the preferred policies to account for the recognised uncertainties in some areas, especially in epoch 3. Conditional policies were agreed for some Units as a mechanism to deliver this flexibility. An overview of the appraisal and policy development process is provided in Figure 7.1.

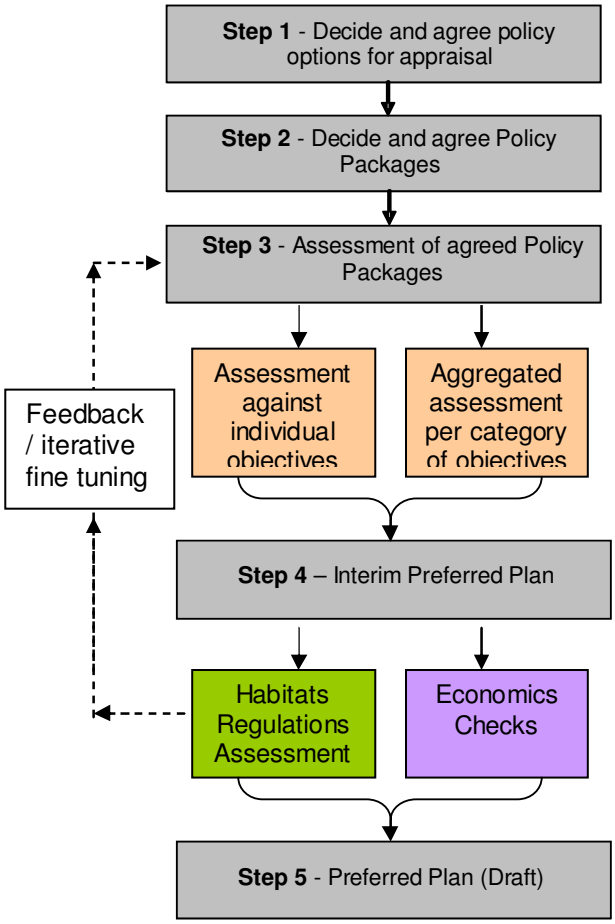


Figure 7.1.Overview of policy appraisal process and development of the draft preferred policies

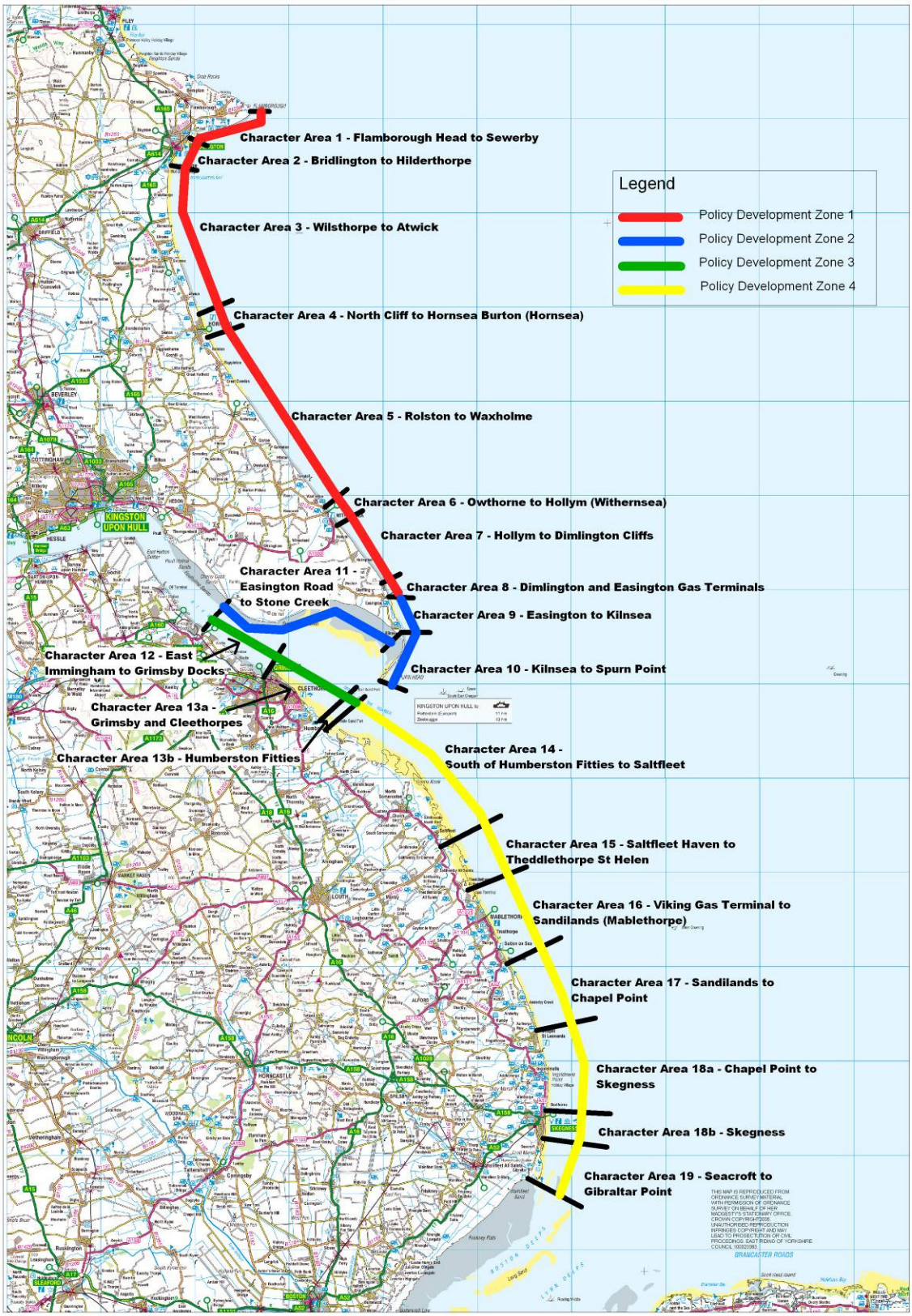


Figure 7.2. Map showing Character Areas and Policy Development Zones

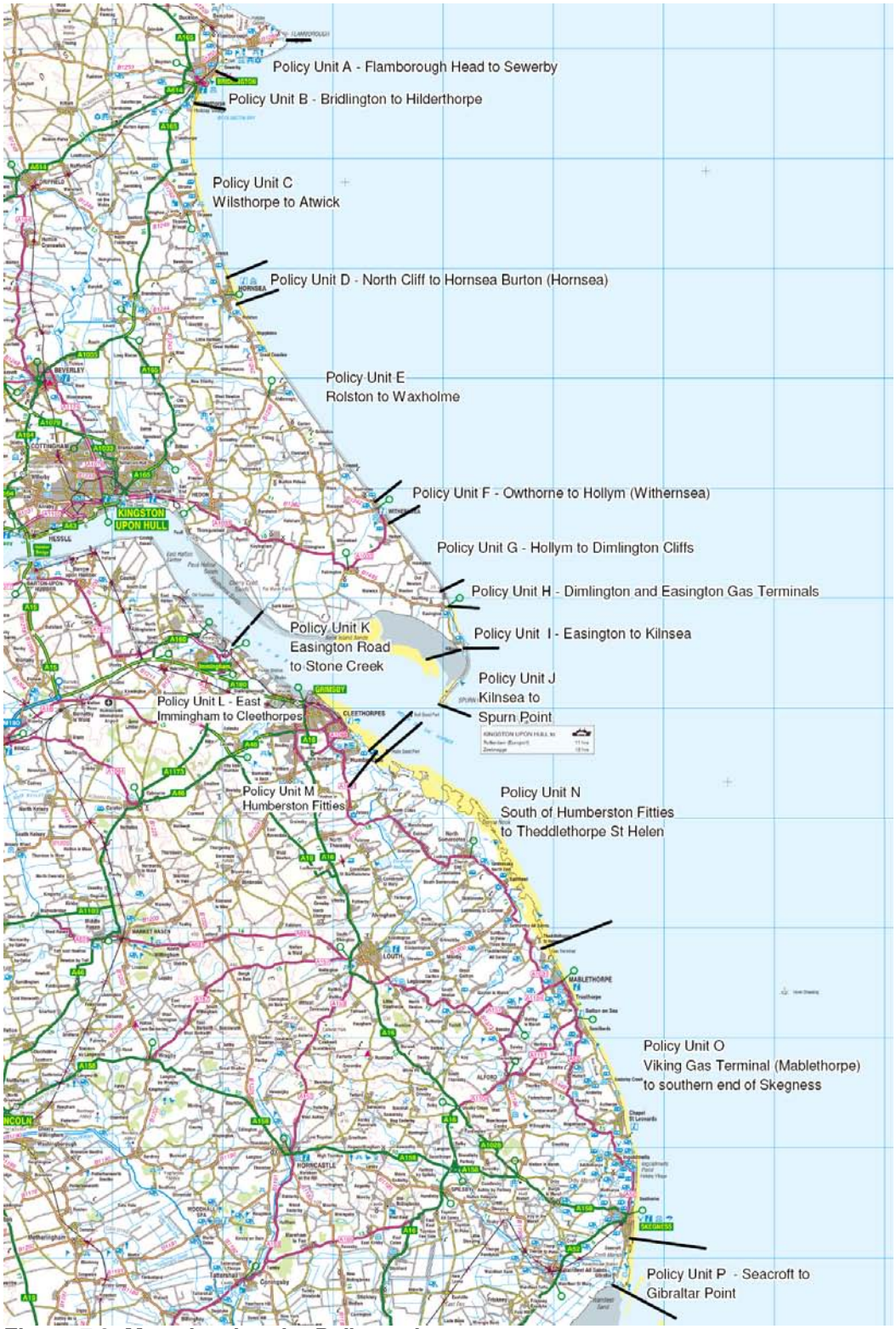


Figure 7.3. Map showing the Policy units

8 The Plan

8.1 Following the completion of procedures outlined in Chapter 7, the draft Plan was developed.

8.2 The draft Shoreline Management Plan was issued for public consultation from Monday 2 November 2009 to Friday 5 February 2010. Consultation was undertaken through ten specific public exhibitions to present the draft Plan. In addition the draft Plan was also available on the project website and comments and feedback was encouraged by providing electronic and paper feedback sheets.

8.3 This consultation phase provided vital feedback on the draft Plan and its policies. Nearly 800 comments were received from a variety of stakeholders and organisations during this period. This information was collated using an electronic database and then each comment was individually evaluated and a response provided by the SMP Team as to the action that would be taken as a result. Key feedback was discussed with the CSG and EMF and amendments and updates to the document agreed to finalise the Plan. This feedback provided useful pointers and opinions as to how to improve the Plan and ensured that the final Plan addresses and balances the needs of the coast most effectively.

8.4 Following the consultation period, the draft SMP was revised to take account of the feedback received. This chapter provides an overview of the final Shoreline Management Plan and discusses its implications, both in terms of impacts on communities, the natural and historic environment as well as considering the economics.

Overview of the Plan

8.5 The intention of the SMP is to develop a set of policies that provides an acceptable balance between the competing interests on the coast whilst moving towards more sustainable ways of managing the shoreline. Each stretch of coastline within this SMP is very different, presenting different challenges and so the policies are different in each area. The intent of management within each area is summarised below:

Chalk cliffs (Flamborough Head to Sewerby)

8.6 The intent of management for this area is to allow natural processes to continue.

Holderness cliffs (Sewerby to Kilnsea coast)

8.7 The intent of management for this area is to allow natural processes to continue along the frontage whilst sustaining Bridlington, Hornsea and Withernsea as viable towns and seaside resorts. The policies intend to sustain the viability of the village of Mappleton and a strategic north-south transport link. The policies intend to sustain the Dimlington and Easington gas terminals while there is a strategic need for the site. The continued functionality of Barmston Drain and flood protection at Tunstall may be maintained.

Spurn Head

8.8 The intent of management for this area is to allow the Spurn barrier to evolve largely naturally with as limited intervention as is required to maintain the integrity of the Spurn barrier. The intention is to maintain access to the key facilities and assets at Spurn Point whilst causing minimal interruption to the natural environment, coastal processes and the geomorphological functioning of Spurn Head and the Humber Estuary.

Outer Humber Estuary

8.9 The intent of management for this area is to continue to provide sustainable flood protection to assets in the floodplain, whilst balancing the needs of the human, natural and historic environments, including the requirements of applicable legislation.

Lincolnshire coast

8.10 The intent of management for the area from south of Humberston Fitties to Theddlethorpe St Helen is to continue to provide sustainable flood protection to assets in the floodplain, whilst balancing the needs of the human, natural and historic environments, including the requirements of applicable legislation. The intent of management from the Viking Gas Terminal to Gibraltar Point is to continue protecting against flooding at the same standard as the present day.

Summary of policies

8.11 The policies are summarised below for each policy unit in Table 8.1. The policy abbreviations are shown below

- HTL: Hold the existing defence line. This policy will cover those situations where work or operations are carried out on the existing defences (such as beach recharge, rebuilding the toe of a structure, building offshore breakwaters and so on). Included in this policy are 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.
- ATL: Advance the existing defence line by building new defences on the seaward side of the original defences. Using this policy should be limited to those policy units where significant land reclamation is considered.
- MR: Managed realignment by allowing the shoreline to move backwards, with management to control or limit movement (such as building new defences on the landward side of the original defences).
- NAI: A decision not to invest in providing or maintaining defences.
- HR: Hold the line on a realigned position.

8.12 In areas where flood risk is an issue, management policies which address flood risk have also been selected. Flood risk management policies defined in Catchment Flood Management Plans (CFMPs) have been considered in policy development and used in this SMP to indicate the aspirational intent regarding the future standard of protection against flooding for specific sections of coast (see section 1.17). The Catchment Flood Management Plan flood risk management policies (P1-P5) are defined below:

- P1: No Active Intervention
- P2 – Reduce existing flood risk management actions, accepting increase of risk over time.
- P3 – Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this base line.
- P4 – Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from climate change).

  P5 – Take further action to reduce flood risk

Table 8.1: Proposed policies

Policy Unit	Epoch 1 (present day to 2025)	Epoch 2 (2025 – 2055)	Epoch 3 (2055 – 2105)	Comments
Policy Unit A – Flamborough Head to Sewerby	NAI	NAI	NAI	The current policy of No Active Intervention will continue through all epochs. Works may be necessary to maintain the viability of the RNLI Station at South Landing; these will be permitted subject to necessary approvals.
Policy Unit B – Bridlington to Hilderthorpe	HTL with P4	HTL with P4	HTL with P4	The current defence line will be held throughout all epochs, however if the marina development goes ahead, the defence line may be locally realigned seawards of its current position. If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Bridlington.
Policy Unit C – Wilsthorpe to Atwick	NAI	NAI	NAI	No Active Intervention will occur through all epochs. However, works may be necessary to maintain the functionality of Barmston Drain. In keeping with existing permissions, the privately owned defences at Ulrome currently protecting caravan parks would not be maintained under this policy and erosion of the shoreline would occur as a result of natural processes.
Policy Unit D – North Cliff to Hornsea Burton (Hornsea)	HTL with P4	HTL with P4	HTL with P4	If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Hornsea. It is uncertain in which epoch this may be required.
Policy Unit E – Rolston to Waxholme	NAI with HTL at Mappleton	NAI with HTL at Mappleton	NAI. HTL at Mappleton, but with other options considered subject to monitoring.	The policy of No Active Intervention would continue for the currently undefended sections through all epochs. However, works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain. At Mappleton, the current defence line will be held for epochs 1 and 2 with monitoring of coastal processes undertaken. In the medium-term, assessment of options for maintaining a strategic north-south transport link is likely to be necessary. Monitoring will be undertaken to determine whether continuing to hold the line at Mappleton is still sustainable in epoch 3 and options may be considered.

Policy Unit	Epoch 1 (present day to 2025)	Epoch 2 (2025 – 2055)	Epoch 3 (2055 – 2105)	Comments
Policy Unit F – Owthorne to Hollym (Withernsea)	HTL with P4	HTL with P4	HTL with P4	If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Withernsea. It is uncertain in which epoch this may be required.
Policy Unit G – Hollym to Dimlington Cliffs	NAI	NAI	NAI	The current policy of No Active Intervention will continue through all epochs. In the medium-term, assessment of options for maintaining a strategic north-south transport link is likely to be necessary.
Policy Unit H – Dimlington and Easington Gas Terminals	HTL for current defences. NAI elsewhere	NAI or HTL for currently defended areas. NAI elsewhere	NAI or HTL for currently defended areas. NAI elsewhere	Management policy will be to continue to protect the Gas Terminals in line with the existing planning permission for the Gas Terminals and as long as the planning status allows defences. No Active Intervention for currently undefended areas, however management of outflanking may be permitted, subject to necessary approvals to protect the nationally important gas supplies and while there is a strategic need for the site.
Policy Unit I – Easington to Kilnsea	HTL (P3) for current defences. NAI elsewhere	HTL (P3) for current defences. NAI elsewhere	HTL (P3) for current defences. NAI elsewhere	The Policy of No Active Intervention will continue for the currently undefended sections through all epochs. At Easington Lagoons and the Kilnsea flood defence, the line will be held in epoch 1 and the intent of management will be to hold the line in epochs 2 and 3 but other options may be considered subject to monitoring of coastal processes, future studies and dependent on third party decisions. To ensure sustainable flood defences, and meet the requirements of environmental legislation, limited Managed Realignment of defences may occur. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets. This process will be informed by the Humber Flood Risk Management Strategy.
Policy Unit J – Kilnsea to Spurn Point	MR	MR or NAI	MR or NAI	The intention is to intervene only when necessary to maintain access to the facilities and Spurn Point. The integrity of the barrier will be maintained until it becomes unsustainable to do so.

Policy Unit	Epoch 1 (present day to 2025)	Epoch 2 (2025 – 2055)	Epoch 3 (2055 – 2105)	Comments
Policy Unit K – Easington Road to Stone Creek	HTL with P4	HTL with P4	HTL with P4	The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defences, and meet the requirements of environmental legislation, limited Managed Realignment of defences may occur. Detailed studies will identify sites which will be in the order of 100 hectares in epochs 1 and 2 combined. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets. This process will be informed by the Humber Flood Risk Management Strategy.
Policy Unit L – East Immingham to Cleethorpes	HTL with P4	HTL with P4	HTL with P4	The defences will be held in their current position and their function will be maintained.
Policy Unit M – Humberston Fitties	HTL with P3 for the front line and P4 for the second line.	HTL with P3 for the front line and P4 for the second line.*	HTL P4 for the second line of defence	*The Policy for the Chalet Park will be subject to further policy evaluation.
Policy Unit N – South of Humberston Fitties to Theddlethorpe St Helen	HTL with P4	HTL with P4	HTL with P4	The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defences, and meet the requirements of current environmental legislation, limited Managed Realignment of defences may occur. Detailed studies will identify sites which will be in the order of 100 hectares of habitat on the south bank of the outer estuary in epochs 1 and 2 combined. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets and will be informed by the Humber Flood Risk Management Strategy.
Policy Unit O – Viking Gas Terminal (Mablethorpe) to southern end of Skegness	HTL with P4	HTL with P4	HTL P4 with localised MR considered where appropriate	The management intent will be to hold the line for all epochs continuing the present day standard of protection against flooding. In epoch 3, localised managed realignment could be considered in appropriate areas to increase defence sustainability. Specific sites have not been identified, but further detailed studies in the future should investigate potential sites.

Policy Unit	Epoch 1 (present day to 2025)	Epoch 2 (2025 – 2055)	Epoch 3 (2055 – 2105)	Comments
Policy Unit P – Seacroft to Gibraltar Point	HTL with P4	HTL with P4	HTL or MR (P4)	The policies for the long term are conditional. They depend on the results of monitoring and research into climate change, shoreline response and the role of defences.

Managed realignment for sustainable flood protection

8.13 The schematics and text below explains why managed realignment may be considered in some appropriate areas to ensure sustainable flood protection in the future as sea levels rise.

1. Present day situation for many parts of Lincolnshire

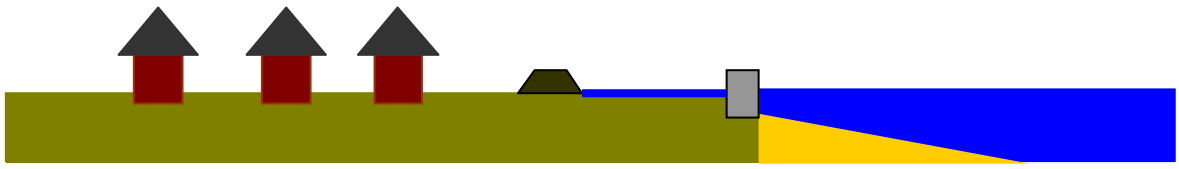
8.14 There is a beach in front of hard defences. The combination of these two features protects the assets in the floodplain from flooding during storms.

2. Future situation holding the current defence line and maintaining standard of flood protection as sea levels rise

8.15 If defences continued to be held in position, beaches would tend to erode and lower, and the hard defences would need to be significantly upgraded (both in height and width) to maintain the current standard of protection against flooding as sea levels rise.

8.16 This situation would have increasing negative impacts on landscape (large defences and obscuring of coastal views), tourism (lack of beaches), the environment (loss of habitats for wildlife) and the cost of trying to maintain defences would get increasingly large and difficult to sustain.

3. Future situation to maintain sustainable flood protection using secondary line of defence as sea levels rise



8.17 In appropriate areas, this option may offer a sustainable option to continue protecting people and assets against flooding. In the future, in some areas where there is no property, no significant or designated historic environment assets, and no critical infrastructure, a secondary defence line could be built behind the current defences. The existing defences would remain for a while and would continue to provide some protection against flooding. However as sea levels rise, some water would come over the top of the front line of defences during storms, but

this water would be prevented from flooding assets in the floodplain by the new second defence line. This combination of defences would maintain the current standard of protection against flooding, without the need for such frequent and expensive works, and the increasingly large structures that are required with a single line of defence. This approach would not be suitable in all areas, and investigations and consultation would be required before implementation.

Implications of the Plan

8.18 This section summarises the impacts resulting from the Plan. The implications of the Shoreline Management Plan have been assessed as part of the policy development process; the impacts of the policies are shown graphically for each policy unit within the policy statements in Chapter 9.

8.19 The policies have been developed following a Strategic Environmental Assessment (SEA) process which takes into consideration environmental, social and economic impacts in their widest sense. The SEA Environmental Report evaluates the impacts on an established set of receptors and is included in Appendix J.

8.20 The main implications of the policies are summarised below, by area.

Chalk cliffs (Policy Unit A)

8.21 Within Policy Unit A, natural processes will be allowed to continue, meaning that Flamborough Head will continue to erode. Due to the slow erosion rate within this area, there are no settlements or individual properties at threat from coastal erosion over the lifetime of the SMP. This policy ensures that natural coastal processes will continue uninterrupted in this area, meaning that sediment will continue to be supplied to other coastlines from this area. The policy has benefits for the natural environment, landscape and tourism, since the character of Flamborough Head will not be adversely affected by the policy. There may be some impacts due to erosion on historic environment assets, such as the Scheduled Monument at Danes Dyke.

Holderness cliffs (Policy Units B – I)

8.22 Within this area, the policies will ensure the continued protection from coastal erosion and coastal flooding of the towns of Bridlington, Hornsea and Withernsea. These policies will also ensure that infrastructure associated with these towns, historic environment assets behind the defended area and agricultural land at the rear of the towns continue to be protected from coastal erosion and flooding. The decision to continue to hold the line means that erosion of each of these frontages is prevented and there may be some interruption to the sediment supplied to downdrift coastlines by the end of the SMP timeframe, as the defended areas increasingly become promontories as the undefended areas either side of the defences continue to erode. The interruption of natural processes may result in narrowing of the beaches, which has the potential to adversely affect the landscape and tourism value of these coastal towns. The defended frontages are likely to require increasingly sizeable defences as they become more exposed to wave attack (due to loss of beach as well as sea level rise).

8.23 The policy for Mappleton will ensure continued protection from coastal erosion for the village in the short and medium term at least. This policy will also ensure that infrastructure associated with the village, historic environment assets behind the defended area and agricultural land at the rear of Mappleton continue to be protected from coastal erosion and flooding. The decision to continue to hold the line means that erosion of this frontage is prevented and there may be some interruption to the sediment supplied to downdrift coastlines by the end of the SMP timeframe, as the defended area increasingly becomes a promontory as the undefended areas either side of the defences continue to erode. The interruption of natural processes may result in narrowing of the beach, which has the potential to adversely affect the landscape value of Mappleton. Increasingly sizeable defences are likely to be required as they become more exposed to wave attack (due to loss of beach as well as sea level rise). The SMP has identified the need to continue monitoring of coastal processes in this area to determine

whether continuing to hold the line at Mappleton is still sustainable in epoch 3 and options may be considered.

8.24 The policy at the Dimlington and Easington gas terminals will ensure continued protection from coastal erosion of the gas terminals while there is a strategic need for the sites. This policy will also ensure that historic environment assets behind the defended area and agricultural land at the rear of the gas terminals continue to be protected from coastal erosion. The decision to continue to hold the line means that erosion of this frontage is prevented and there may be some interruption to the sediment supplied to downdrift coastlines by the end of the SMP timeframe, as the defended area increasingly becomes a promontory as the undefended areas either side of the defences continue to erode. The interruption of natural processes may result in narrowing of the beach, which has the potential to adversely affect the landscape value in this area. Increasingly sizeable defences are likely to be required as they become more exposed to wave attack (due to loss of beach as well as sea level rise).

8.25 The policies recognise that works may be necessary to maintain the functionality of Barmston Drain.

8.26 The policies recognise that works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain.

8.27 The policy south of Easington ensures sustainable coastal flood and erosion protection to assets in the floodplain. The policy recognises that the replacement of Easington Lagoons habitat is likely to be required in epoch 2. The SMP has identified the need to continue monitoring coastal processes in this area, with sustainability of the Kilnsea defences likely to be needed in epoch 2 or 3.

8.28 Between the defended areas of Bridlington, Hornsea, Mappleton, Withernsea and Easington, the policy of 'no active intervention' means that the cliffs of Holderness will continue to erode (with the exception of the intervention mentioned in paragraph 8.25 at Barmston Drain). This policy ensures that natural coastal processes will continue uninterrupted in this area, meaning that sediment will continue to be supplied to other coastlines from this area. The policy has benefits for the natural environment, landscape and tourism, since the character of the undefended sections of coast will not be adversely affected by the policy. There will be some impacts to historic environment assets due to continued erosion.

8.29 Although the majority of the coastal villages[2] (and associated infrastructure and services) will not be at risk of erosion over the lifetime of the SMP, there are a number of individual properties at risk of erosion over the timescale of the SMP. Based on the mapping showing erosion lines accompanying the policy statements in Chapter 9, it is estimated that over the length of undefended frontage, approximately 37 residential properties are at risk of erosion by 2025, approximately 73 properties between 2025 and 2055, with further property at risk of erosion by the end of the Plan period in 2105. In addition to the residential properties, there will be loss of or damage to a number of buildings associated with campsites and holiday parks along the cliff top, as well as farm outbuildings, a number of boat compounds and part of an industrial estate. The mapping in Chapter 9 gives an indication of the likely position of the shoreline in the years 2025, 2055 and 2105, however there is considerable uncertainty in the actual future position of the shoreline so the actual number of properties that will be lost in each epoch may be less than or greater than the predicted figures. In addition to properties, the decision not to protect the currently undefended areas means that agricultural land will continue being lost to erosion. Based on the mapping showing erosion lines accompanying the policy

[2] Including Wilsthorpe, Fraisthorpe, Barmston, Ulrome, Skipsea, Atwick, Rolston, Cowden, Aldbrough, Grimston, Hilston, Tunstall, Hollym, Holmpton, Out Newton.

statements in Chapter 9, it is estimated that over the length of undefended frontage, almost no grade 2 agricultural land will be lost to erosion by 2025, approximately 10 hectares between 2025 and 2055, with further grade 2 agricultural land lost by the end of the Plan period in 2105. It is estimated that over the length of undefended frontage, approximately 160 hectares of grade 3 and 4 agricultural land will be lost to erosion by 2025, approximately 280 hectares between 2025 and 2055 with further losses of grade 3 and 4 agricultural land by the end of the Plan period in 2105. The preferred policies will have an adverse impact on some of the infrastructure within this area, particularly the B1242 to the north of Mappleton, Holmpton Road to the south of Withernsea and the Hollym wastewater treatment works which are all at risk of erosion within the lifetime of the SMP. There is also the potential for some loss of or damage to historic environment assets in this area, including the Scheduled Monument at Grimston Garth comprising two moated sites and associated features.

Spurn Head (Policy Unit J)

8.30 Within Policy Unit J, Spurn Head will be allowed to evolve largely naturally with as limited intervention as is required to maintain the integrity of the barrier, as long as this is sustainable. This policy ensures continued access to the key facilities and assets at Spurn Point whilst causing minimal interruption to the natural environment, coastal processes and the geomorphological functioning of Spurn and the Humber Estuary. As a result of the great degree of uncertainty over how Spurn will evolve, particularly in the longer term as the climate changes, there is some uncertainty over how much intervention will be required to maintain access and what the consequent impact will be on the landscape value of Spurn. In the longer term, there is also the potential for significant damage to historic environment assets along Spurn, including the World War I and World War II features and Spurn lighthouse; this is likely to be caused by natural evolution of the barrier but historic environment features could also be affected by intervention.

Outer Humber Estuary (Policy Units K – M)

8.31 The policy for the north bank of the Humber will ensure continued protection from coastal erosion and coastal flooding for assets in the floodplain. All property, all known designated and significant historic environment assets and the majority of agricultural land will continue to be protected. However, in order to ensure sustainable defences and meet the requirements of environmental legislation, limited managed realignment of defences may be required. Detailed studies will identify sites which will be in the order of 100 hectares for epochs 1 and 2 combined. Property and known designated and significant historic environment assets will not be affected by any realignment schemes, however some grade 2 agricultural land is likely to be lost as part of the realignment. The process will be informed by the Humber Flood Risk Management Strategy. In addition to managing the risks of tidal inundation, increased drainage pumping may also be required to provide flood protection to the low lying areas as sea levels rise.

8.32 The policy for the south bank of the Humber will ensure continued protection from coastal erosion and coastal flooding for assets in the floodplain, including the significant industry, port and residential areas between Immingham and Cleethorpes. This policy will also ensure that infrastructure associated with Grimsby, Cleethorpes and the villages within the area, historic environment assets and agricultural land at the rear of the towns continue to be protected from coastal erosion and flooding. The decision to continue to hold the line means that erosion of this frontage is prevented resulting in a reduction in supply of sediment to intertidal and subtidal habitats. The interruption of natural processes as well as coastal squeeze caused by sea level rise is likely to result in loss of intertidal habitat within the Humber Estuary, which has the potential to adversely affect the landscape as well as the designated environmental sites of the

Humber Estuary. The defended frontages are likely to require increasingly sizeable defences as they become more exposed to wave attack (due to removal of material at the toe of the defence structures as well as sea level rise).

8.33 At Humberston Fitties, further studies will investigate the overall feasibility of maintaining into the long term the current standards of defence for the chalet park, and this will inform the policy for this area. There may need to be planning, and sufficient time, for adaptation and/or relocation of the Chalet Park.

Lincolnshire coast (Policy Units N – P)

8.34 The policy for the area to the south of Humberston Fitties to Theddlethorpe St Helen is to ensure continued protection from coastal erosion and coastal flooding for assets in the floodplain. All property, all known designated and significant historic environment assets and the majority of agricultural land will continue to be protected. However, in order to ensure sustainable defences and meet the requirements of applicable environmental legislation, limited managed realignment of defences may be required. Detailed studies will identify sites which will be in the order of 100 hectares for epochs 1 and 2 combined. Property and known designated and significant historic environment assets will not be affected by any realignment schemes, however some high grade agricultural land is likely to be lost as part of such a realignment. The process will be informed by the Humber Flood Risk Management Strategy.

8.35 The policy for Mablethorpe to the southern end of Skegness will ensure continued protection against coastal flooding and coastal erosion at the same standard as the present day. This policy will ensure all people and property, including the two principal towns of Mablethorpe and Skegness and their associated infrastructure and services, as well as historic environment assets and agricultural land at the rear of the towns continue to be protected from coastal erosion and flooding. The interruption of natural processes may result in narrowing of the beaches, which has the potential to adversely affect the landscape and tourism value of these coastal towns. Increasingly sizeable defences are likely to be required as they become more exposed to wave attack (due to loss of beach as well as sea level rise). In the longer term (epoch 3), accelerating sea level rise could begin to cause problems for defence sustainability as sea levels rise. Managed Realignment could be considered locally, in areas where appropriate, to ensure sustainable flood risk management for the future. The landward extent of any new defence line would be the minimum required to ensure sustainable defences; minimising the impacts on agricultural land, people, property and the historic environment. In addition to protecting against tidal inundation, increased drainage pumping may also be required to provide flood protection as sea levels rise. There will need to be sufficient planning and time allocated for adaptation if this is undertaken.

8.36 The policy for the area to the south of Skegness to Gibraltar Point will ensure continued protection against coastal flooding and coastal erosion at the same standard as the present day This policy will ensure all people and property as well as historic environment assets and agricultural land continue to be protected from coastal erosion and flooding. Except for an area of erosion south of lagoon walk, the majority of this area is currently accreting, partly dependent on material from the Holderness cliffs and this trend is likely to continue in the short and medium term at least. In the longer term (epoch 3), increased management activity may be required to carry out this policy as the accretion trend is expected to slow and potentially change to an erosional trend. Currently, there is not enough evidence to be able to firmly predict if and when this may happen. As a result, the policy for the long term (epoch 3) is conditional. It depends on the results of monitoring and research into climate change, shoreline response and the role of defences. In the future, a landward realignment of defences may need to be considered as an alternative to holding the line. A realignment would come at

the expense of agricultural land directly behind the defences, but it would provide more sustainable flood defence for both the people and the high quality agricultural land further inland. It would also support intertidal habitats with associated benefits, such as for fisheries, and provide compensation for intertidal habitat loss caused by coastal squeeze, as required under applicable legislation.

Economic Assessments

8.37 An SMP is an aspirational, broad scale plan for the future, and consequently the SMP guidance (Defra, 2006b) recognises that the justification of a particular policy does not depend purely on whether or not benefits outweigh costs; non-quantifiable criteria such as environmental issues, sediment continuity and the policies of adjacent areas must also be evaluated. However high level economic assessments have been an integral part of the Plan development to ensure that the preferred policies are not economically nonsensical.

8.38 The high-level economic assessment was undertaken based on the best available information for each Policy Unit (Appendix H). The appraisal used two approaches depending on the availability of suitably detailed information:

1. In many areas existing strategies have undertaken an economic analysis using FCDPAG3 for sections of the coastline. In such cases, the information was reviewed and details of the outcomes in relation to the preferred policies presented. The coastal strategies used to inform the economic assessments included:
    - Bridlington Coastal Strategy (Posford Haskoning, 2005)
    - Withernsea coastal Strategy (Posford Duvivier, 2001)
    - Humber Flood Risk Management Strategy (RPA, 2003)
    - Lincshore Performance Review, 2008
2. Where no previous economic analysis had been performed, a strategic economic assessment was undertaken using FCDPAG3. Defence costs were estimated and assessed against the potential benefits of readily identifiable assets, such as residential properties. This method was used to determine only if the benefits generated by the policy are greater, similar to, or less than the costs.

8.39 For the preferred policy of each Policy Unit the economic assessment identified whether:

- The benefits clearly outweigh the costs;
- The benefits marginally outweigh the costs; or
- The costs clearly outweigh the benefits.

8.40 Details of the economic appraisal are provided in Appendix H and the findings are summarised below:

Holderness cliffs

8.41 Along the currently undefended areas of Holderness, the policy of ‘no active intervention’ has no costs associated with its implementation. However, it should be noted that some asset losses will occur over the lifetime of the SMP due to erosion.

8.42 The benefits clearly outweigh the costs of continuing to protect the towns of Bridlington, Hornsea and Withernsea. For the village of Mappleton, the economic case of continuing to hold the line is marginal based purely on tangible benefits.

8.43 Due to the strategic nature of the Dimlington and Easington gas terminals and substantial assets behind the defences, the benefits of the policy were shown to clearly outweigh the costs.

8.44 For the area south of Easington, the benefits are similar to the costs for the preferred policy.

Outer Humber Estuary including Spurn

8.45 There are minimal costs associated with the policy of allowing Spurn to evolve with as limited intervention as possible.

8.46 Within the Humber Estuary, the analysis shows that the benefits of the policies outweigh the costs because of the size of the flood plain and the significant number of assets within the floodplain.

Lincolnshire coast

8.47 Along the Lincolnshire coast, the analysis shows that the benefits clearly outweigh the costs because of the size of the floodplain and the significant number of assets within the floodplain.

Funding

8.48 The main aim of the SMP is to develop a management approach for the shoreline that achieves the best possible balance of all the features and interests that occur along the shoreline over the next 100 years. This needs to recognise that it has a strong relationship with social, economic and environmental activities around the shoreline. SMP policies therefore have to be realistic. Implementing SMP policies will require funding, which may be national, local and / or third-party.

8.49 Funding has not been a key driver of policy development as it is not the scope of an SMP to account for the current funding system as it is a forward looking aspirational Plan. Neither is it the role of an SMP to prescribe precisely how policies should be funded in the future; however, the economic assessments undertaken provide a broad indication of the potential funding that maybe needed to implement the preferred policy. This SMP acknowledges that funding issues will provide a major hurdle in the implementation of some aspirational policies. It is prudent to recognise that in some instances Government funding may not always be available (especially where benefits only marginally outweigh, or are similar to, the costs), and funding maybe required from other sources, otherwise policy delivery may be at risk.

8.50 It is the role of coastal strategies to provide the policy delivery mechanisms and consider the economics and funding issues in greater detail. In 2009 the Environment Agency issued a long term investment strategy which sets out the best available evidence on the choices the people of England face about how much should be invested in managing the increasing risk of flooding and coastal erosion, and how the Environment Agency should deliver a long-term programme of investment. This document provides a useful insight into potential funding sources, and how much funding is likely to be required in the future; this document can be viewed at: http://publications.environment-agency.gov.uk/pdf/GEHO0609BQDF-E-E.pdf

9 Policy Statements

9.1 This chapter provides the detailed policy statements for each policy unit. Each policy statement consists of:

- Description of the policies to implement the Plan over all three epochs;
- Justification for recommendations and appraisal of the impacts of the Plan;
- Summary of the changes from the way the shoreline is presently managed;
- Key features (including agriculture and industry, communities, historic environment, infrastructure, landscape, natural environment and tourism) summarised schematically;
- Graphical representation of the policy impacts on the key features within the policy unit; and
- Summary of the findings of the Appropriate Assessment, Water Framework Directive Assessment and economic assessment relevant to each policy unit.

Introduction

9.2 The policy units below are sections of frontage where the same approach to managing the coast is generally applied in the future. However, localised variations may be required to meet regulatory and funding constraints, not yet identified at this stage.

9.3 The mapping for each policy unit gives an indication of the predicted position of the shoreline under the preferred policy in the years 2025, 2055 and 2105. It should be noted that there is considerable uncertainty about how the shoreline will respond to future changes including climate change and sea level rise so in reality, the actual shoreline position may be several tens of metres landward or seaward of the predicted position by epoch 3. Where shoreline predictions are mapped for an eroding area, the distances have been based on East Riding of Yorkshire Council monitoring which calculates erosion distances and erosion rates at discrete points. As a result, the shoreline predictions should be used to get a feel for general erosion trends across an area rather than giving a highly accurate assessment at local points.

Policy Unit A: Flamborough Head to Sewerby

Policy Development Zone:	**PDZ1**
Policy Unit:	**A**
Character Area:	**1**
Location reference:	**Flamborough Head to Sewerby**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
A	Flamborough Head to Sewerby	NAI	NAI	NAI	The current policy of No Active Intervention will continue through all epochs. Works may be necessary to maintain the viability of the RNLI Station at South Landing; these will be permitted subject to necessary approvals.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Summary of Preferred Plan: Recommendations

9.4 The intent of management for Policy Unit A is to allow natural processes to continue.

Justification for Recommendations

9.5 This will maintain the geological exposure of the cliffs and allow the internationally designated site and Heritage Coast to evolve under natural processes.

Appraisal of Impacts

9.6 This will be achieved through a No Active Intervention policy which will allow the chalk cliffs to continue to erode slowly. However, works to maintain the continued viability of the RNLI Station at South Landing will be permitted, subject to necessary approvals.

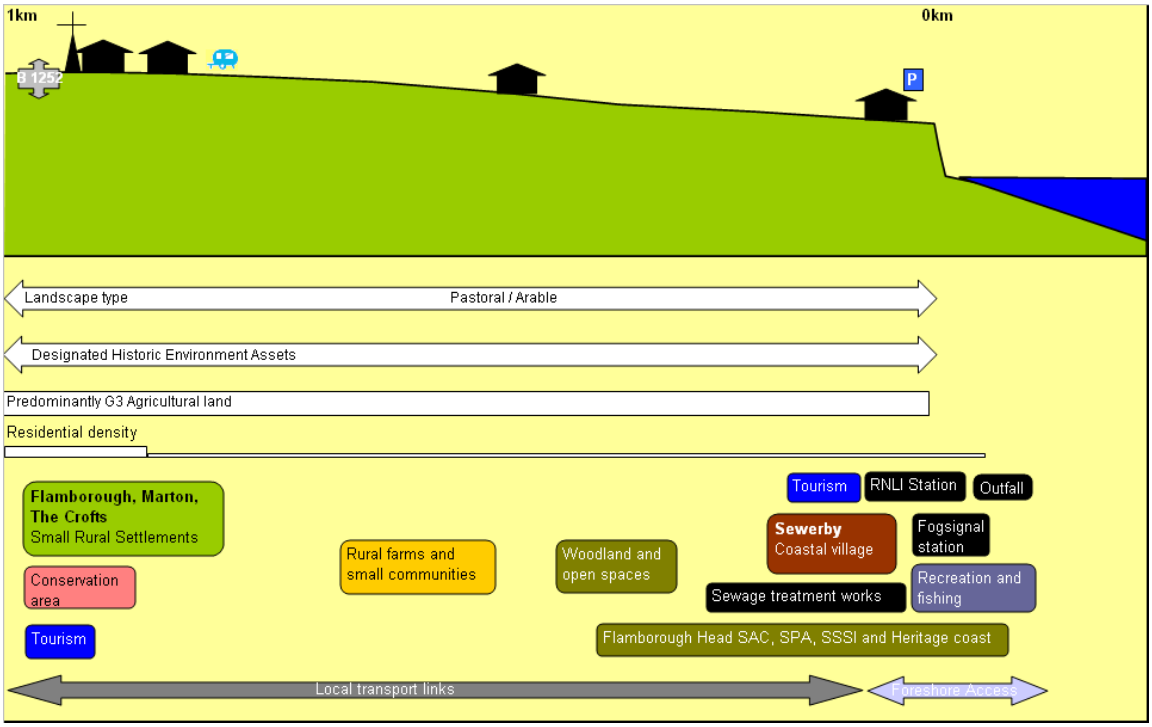
Preferred policy to implement Plan	
From present day to 2025	There will be no management intervention or defences constructed. If works are necessary to maintain the viability of the RNLI station these will be permitted, subject to necessary approvals.
Medium term 2025 - 2055	There will be no management intervention or defences constructed. If works are necessary to maintain the viability of the RNLI station these will be permitted, subject to necessary approvals.
Long term 2055 - 2105	There will be no management intervention or defences constructed. If works are necessary to maintain the viability of the RNLI station these will be permitted, subject to necessary approvals.

Changes from Present Management

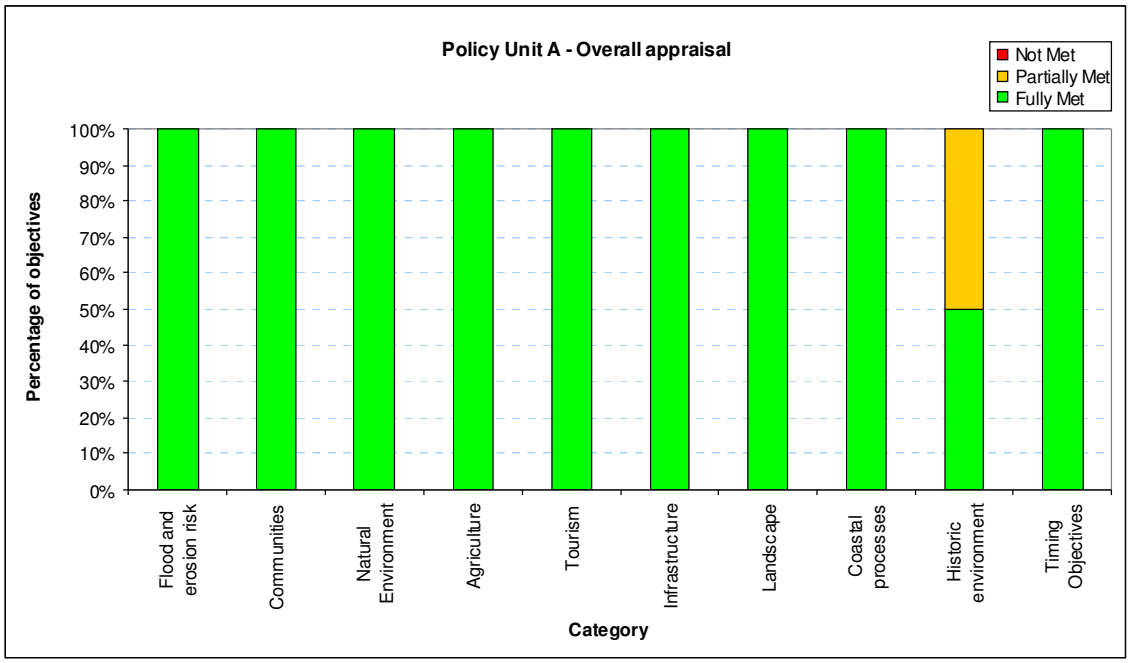
9.7 For all three epochs there is no change from the existing policy.

Key Features

9.8 The key features within this policy unit are provided below (Character Area 1 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.9 The Flamborough Head Special Area of Conservation and Flamborough to Bempton Cliffs Special Protection Area are within this Policy Unit, however the Habitat Regulations Assessment has identified that significant effects on these sites resulting from SMP policies are unlikely.

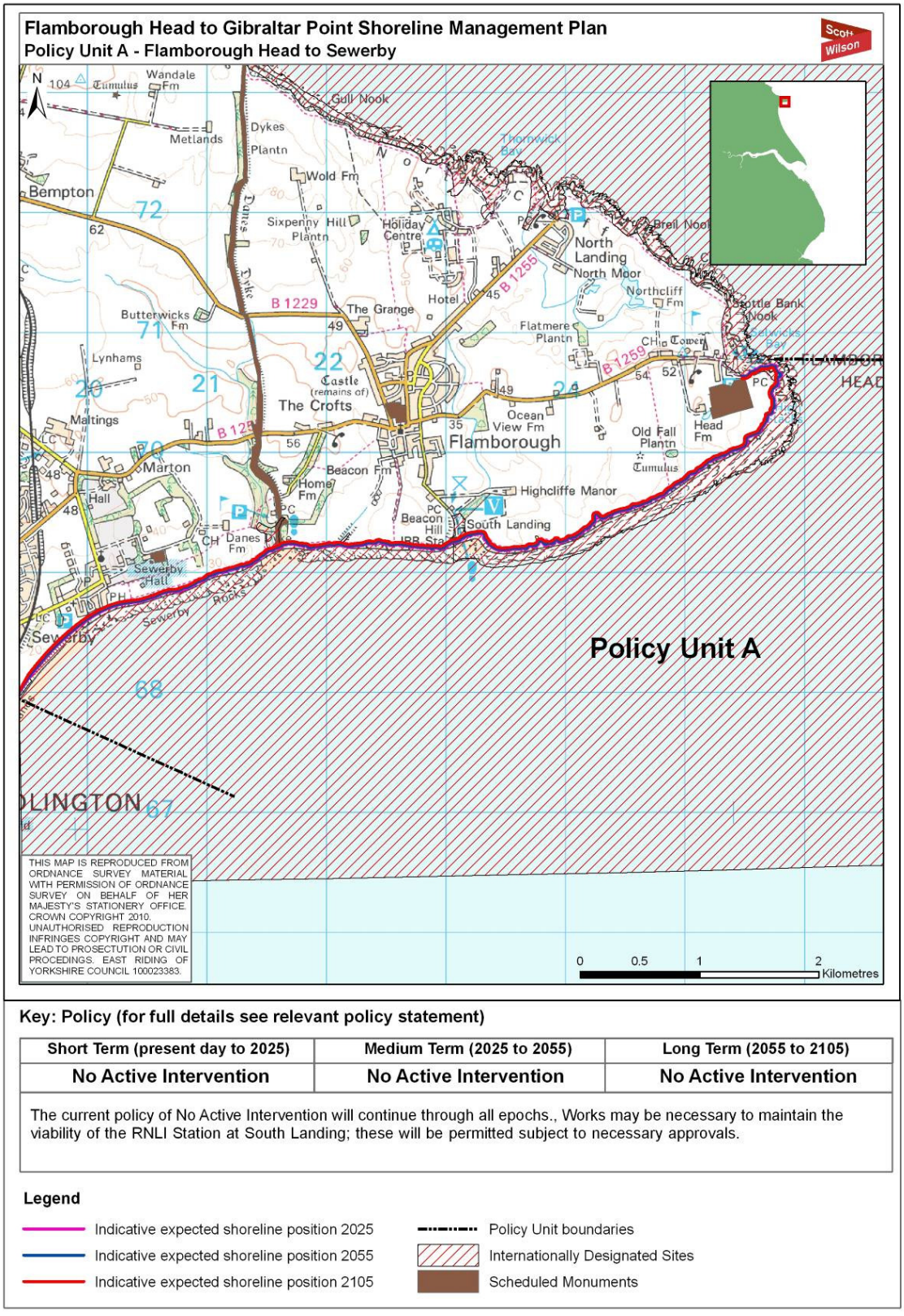
Summary of Water Framework Directive Assessment findings for this policy unit

9.10 The Water Framework Directive Assessment found that no deterioration in the Ecological Potential of the Hull and East Riding inland water bodies, coastal water body or Hull and East Riding groundwater body is anticipated resulting from policies within this policy unit.

Summary of Economics Appraisal findings for this policy unit

9.11 Implementation of an NAI policy has no direct economic cost, however it should be noted that losses to assets may occur during the lifetime of the SMP.

Policy Mapping



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
No Active Intervention	**No Active Intervention**	**No Active Intervention**
The current policy of No Active Intervention will continue through all epochs., Works may be necessary to maintain the viability of the RNLI Station at South Landing; these will be permitted subject to necessary approvals.		

Legend

- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Internationally Designated Sites
- Scheduled Monuments

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit B: Bridlington to Hilderthorpe

Policy Development Zone:	**PDZ1**
Policy Unit:	**B**
Character Area:	**2**
Location reference:	**Bridlington to Hilderthorpe**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
B	Bridlington to Hilderthorpe	HTL (P4)	HTL (P4)	HTL (P4)	The current defence line will be held throughout all epochs, however if the marina development goes ahead, the defence line may be locally realigned seawards of its current position. If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Bridlington.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Codes in brackets refer to the future intent of flood risk management

- P2 – Reduce existing flood risk management actions, accepting increase of risk over time.
- P3 – Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this baseline.
- P4 – Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from climate change).
- P5 – Take further action to reduce flood risk.

Summary of Preferred Plan: Recommendations

9.12 The intent of management for Policy Unit B is to sustain the viability of Bridlington town as a regional commercial centre and seaside resort.

Justification for Recommendations

9.13 The preferred policy has been recommended in order to maintain the coastal flood and erosion defence function of defences to sustain the viability of Bridlington.

Appraisal of Impacts

9.14 This intent will be achieved by holding the shoreline defences in their current alignment. In addition, there may be the requirement to locally advance the alignment of defences if the proposed new marina for the town goes ahead.

9.15 The town will be protected against flooding to the same standard as the present day. This means the level of management activity will increase to account for future changes such as sea level rise.

9.16 The SMP has identified the need to continue monitoring of coastal processes in this unit.

9.17 If monitoring shows that erosion is leading to outflanking of defences, engineering works may be necessary to maintain protection to the settlement of Bridlington.

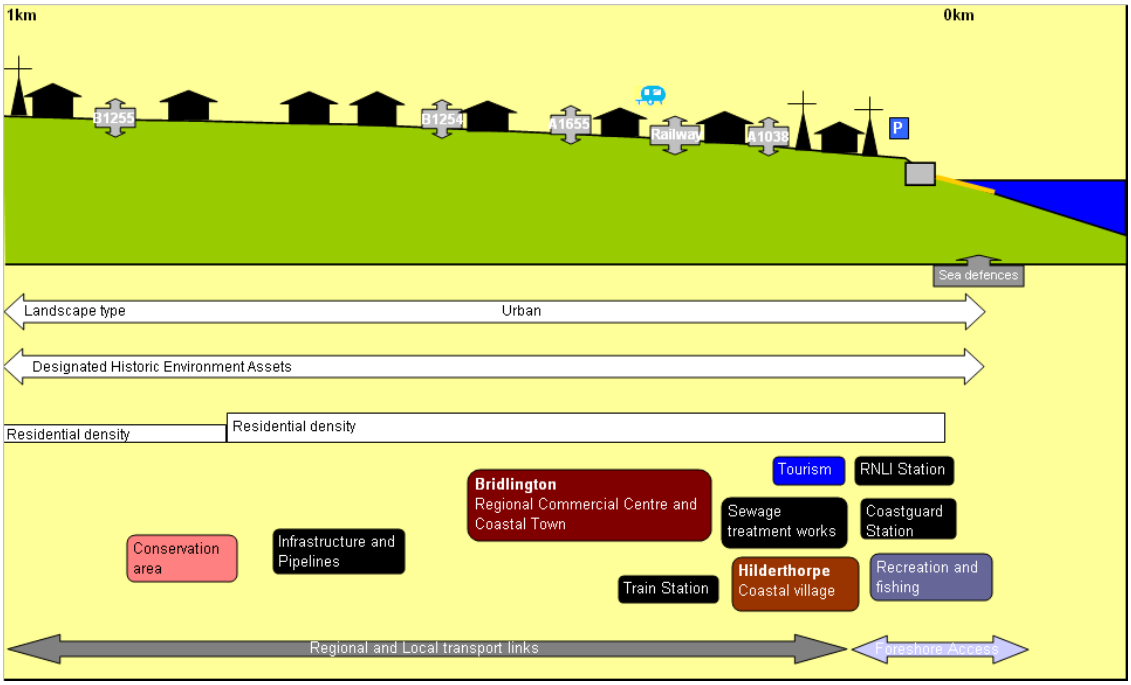
Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their function will be maintained.
Medium term 2025 - 2055	The defences will be held in their current position and their function will be maintained. If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Bridlington.
Long term 2055 - 2105	The defences will be held in their current position and their function will be maintained. If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Bridlington.

Changes from Present Management

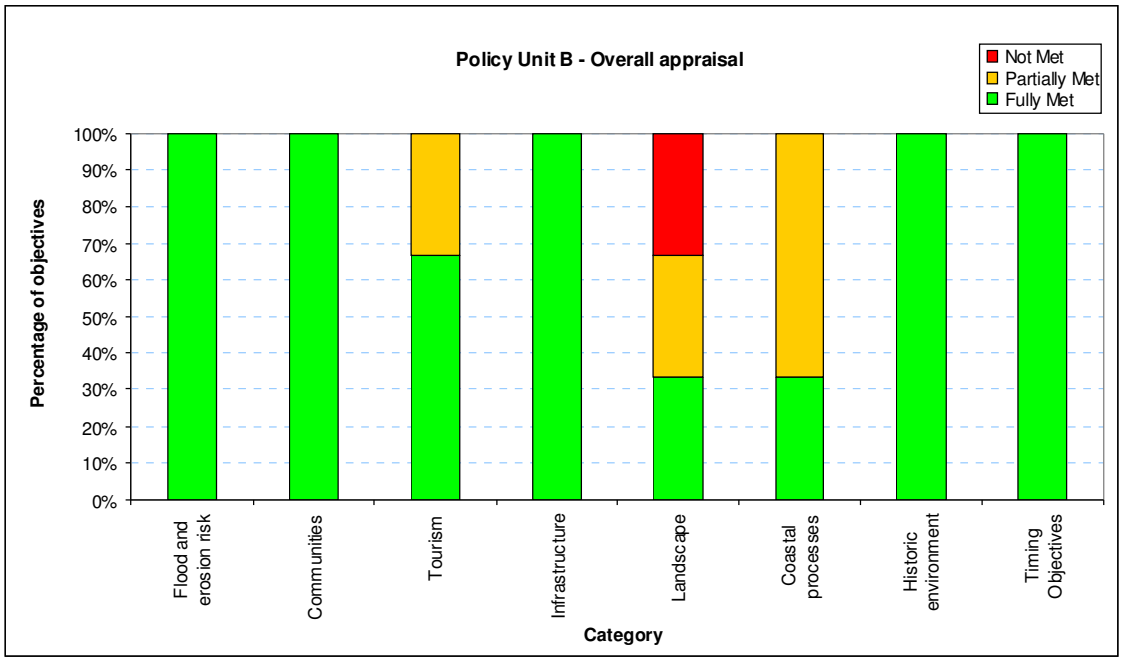
9.18 For all three epochs there is no change from the existing policy. A new defence line could be locally constructed seawards of it present position if the marina development goes ahead. This is most likely to occur in the short term if consent is granted.

Key Features

9.19 The key features within this policy unit are provided below (Character Area 2 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.20 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. There are no internationally designated sites within this policy unit, however the Habitat Regulations Assessment has identified the potential for management actions undertaken within this policy unit to have an impact on internationally designated sites in other policy units due to impacts on sediment transport.

9.21 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

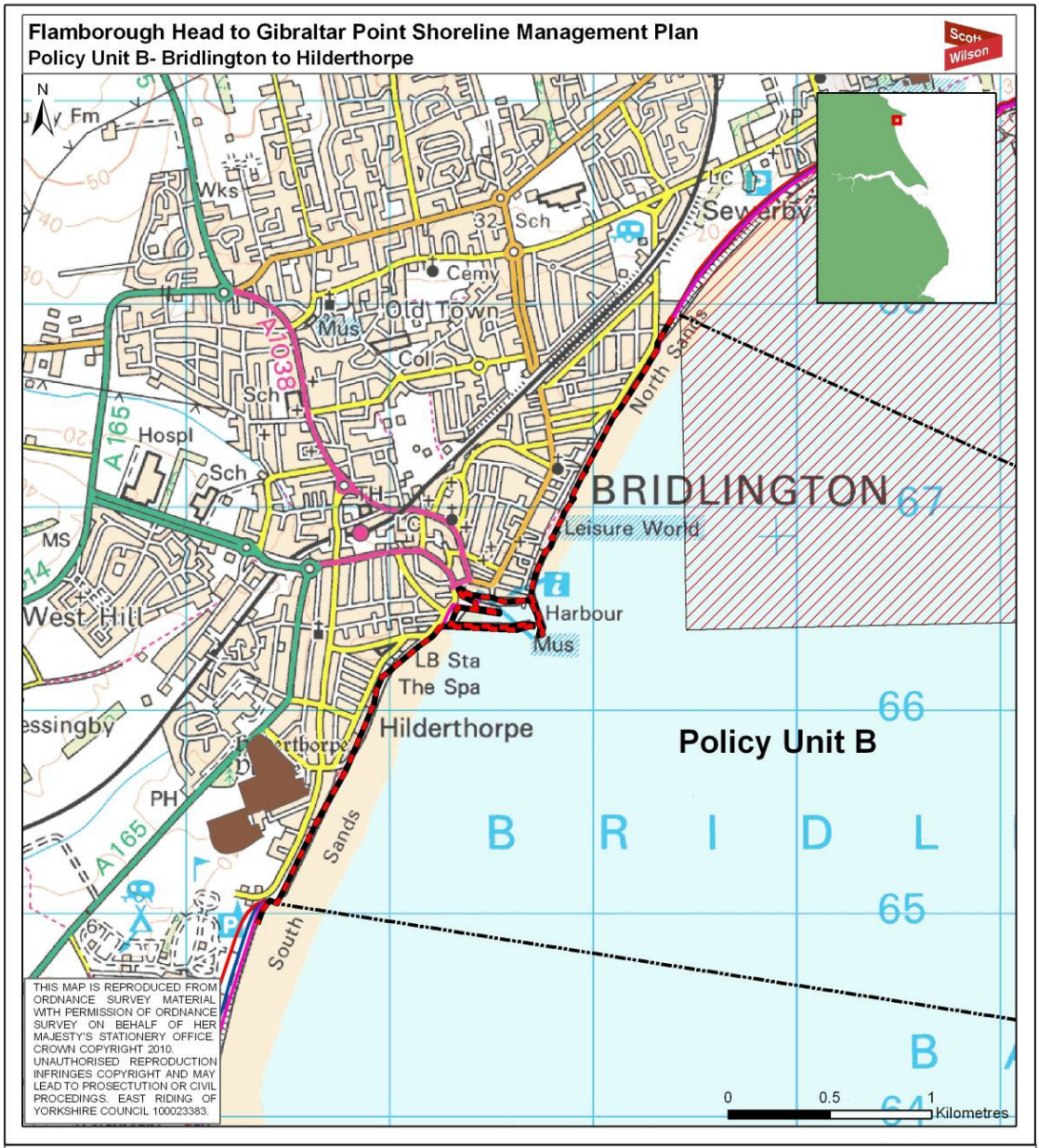
Summary of Water Framework Directive Assessment findings for this policy unit

9.22 The Water Framework Directive Assessment found that no deterioration in the Ecological Potential of the Hull and East Riding inland water bodies or Hull and East Riding groundwater body is anticipated resulting from policies within this policy unit. However, the hold the line policy may result in adverse impacts on the coastal water body, through beach narrowing and steepening, with a consequent impact on seabed habitats of the coastal water body. Monitoring of cliff recession and beach profiles along the Holderness coast should continue. At the stage when coastal strategies and defence schemes consider design of defences in detail, it should be ensured that impacts on the coastal water body are considered to ensure no negative impact on the coastal water body.

Summary of Economics Appraisal findings for this policy unit

9.23 The economic appraisal found that the policy will generate benefits which clearly outweigh the costs.

Policy Mapping



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold The Line (P4)	**Hold The Line (P4)**	**Hold The Line (P4)**
The current defence line will be held throughout all epochs, however if the marina development goes ahead, the defence line may be locally realigned seawards of its current position. If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Bridlington.		

Legend

- Current defences(ERYC/Harbour Authority maintained)
- Internationally Designated Sites
- Scheduled Monuments
- Policy Unit boundaries
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit C: Wilsthorpe to Atwick

Policy Development Zone:	**PDZ1**
Policy Unit:	**C**
Character Area:	**3**
Location reference:	**Wilsthorpe to Atwick**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
C	Wilsthorpe to Atwick	NAI	NAI	NAI	No Active Intervention will occur through all epochs. However, works may be necessary to maintain the functionality of Barmston Drain. In keeping with existing permissions, the privately owned defences at Ulrome currently protecting caravan parks would not be maintained under this policy and erosion of the shoreline would occur as a result of natural processes.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Summary of Preferred Plan: Recommendations

9.24 The intent of management for Policy Unit C is to allow natural processes to continue, however works may be necessary to maintain the functionality of Barmston Drain.

Justification for Recommendations

9.25 The overall effects of the policy for the area as a whole are more beneficial than alternative policies assessed. A No Active Intervention policy will release sediment from the cliffs which helps to provide natural coastal protection for areas to the south, including more southerly

areas of the East Riding of Yorkshire coastline and Lincolnshire. A No Active Intervention policy also has significant advantages compared to defending the frontage in terms of: landscape (since the natural character of the policy unit will be maintained); tourism (due to landscape and beach benefits within the policy unit in comparison to alternative policies); and the natural environment (particularly the environmentally designated areas at Skipsea).

Appraisal of Impacts

9.26 The management intent will be achieved by a No Active Intervention policy, however the continued functionality of Barmston Drain may be maintained through management of the outfall.

9.27 In keeping with the existing situation, the privately owned defences currently protecting caravan parks at Ulrome would not be maintained under this policy, and the shoreline would erode as defences deteriorate. The defences may require removal if public safety becomes an issue as they erode.

9.28 Under this policy, the undefended cliffs will continue to erode and the rate of erosion will increase over time as a result of sea level rise. This policy will result in some adverse impacts for property, with approximately 27 houses potentially at threat from erosion by 2025; a further 46 houses are potentially at threat by 2055, with further property at risk of erosion by the end of the Plan period in 2105.

9.29 There will also be adverse impacts on agricultural land, with approximately 40 hectares of agricultural land potentially at threat from erosion by 2025; a further 80 hectares of agricultural land (including 1 hectare of grade 2 agricultural land) are potentially at threat by 2055, with further agricultural land (predominantly grade 3 and a small amount of grade 2 agricultural land) at risk of erosion by the end of the Plan period in 2105.

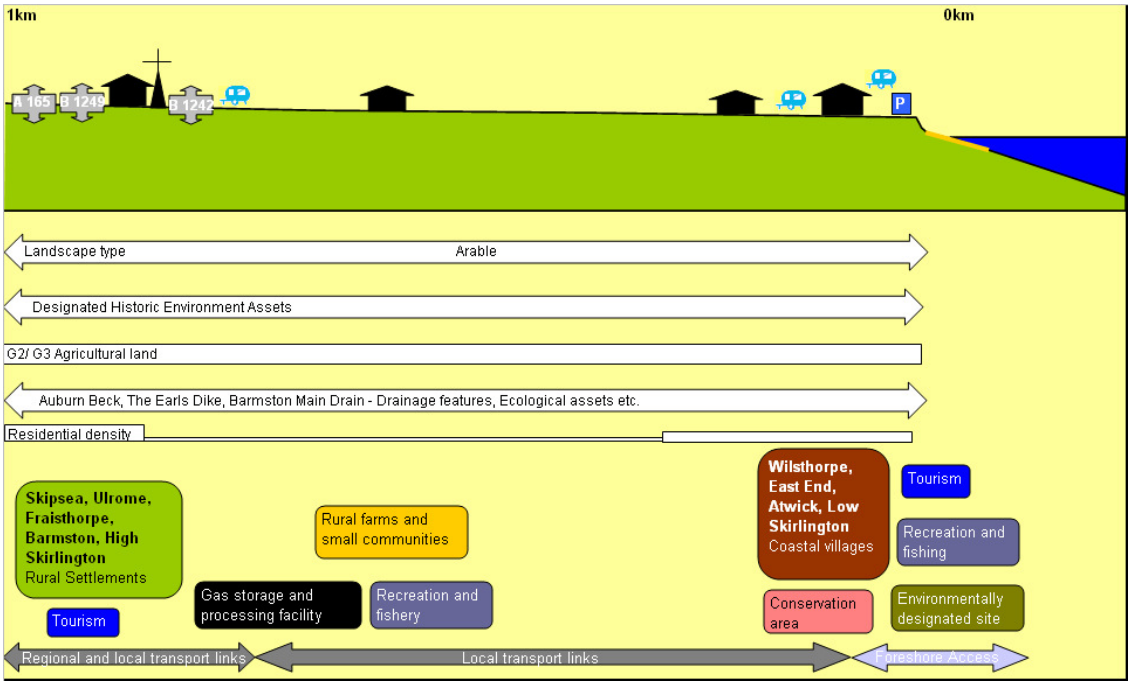
Preferred policy to implement Plan	
From present day to 2025	There will be no management intervention or defences constructed, except if required locally to maintain the functionality of Barmston Drain.
Medium term 2025 - 2055	There will be no management intervention or defences constructed, except if required locally to maintain the functionality of Barmston Drain.
Long term 2055 - 2105	There will be no management intervention or defences constructed, except if required locally to maintain the functionality of Barmston Drain.

Changes from Present Management

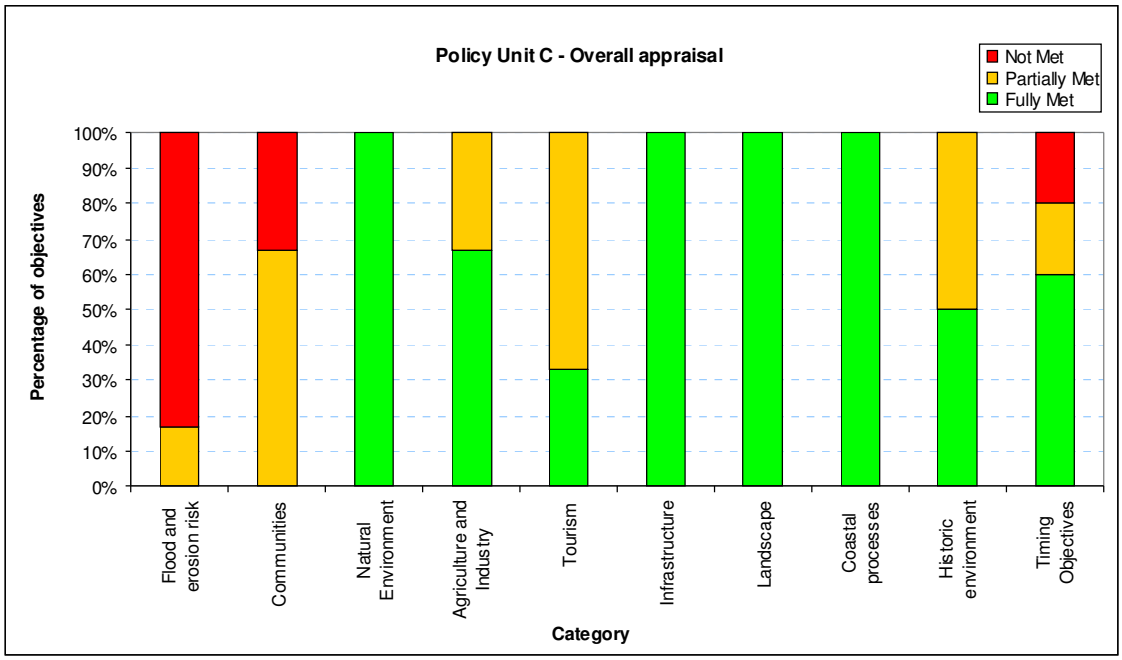
9.30 For all three epochs there is no change from the existing policy.

Key Features

9.31 The key features within this policy unit are provided below (Character Area 3 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.32 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. There are no internationally designated sites within this policy unit.

9.33 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

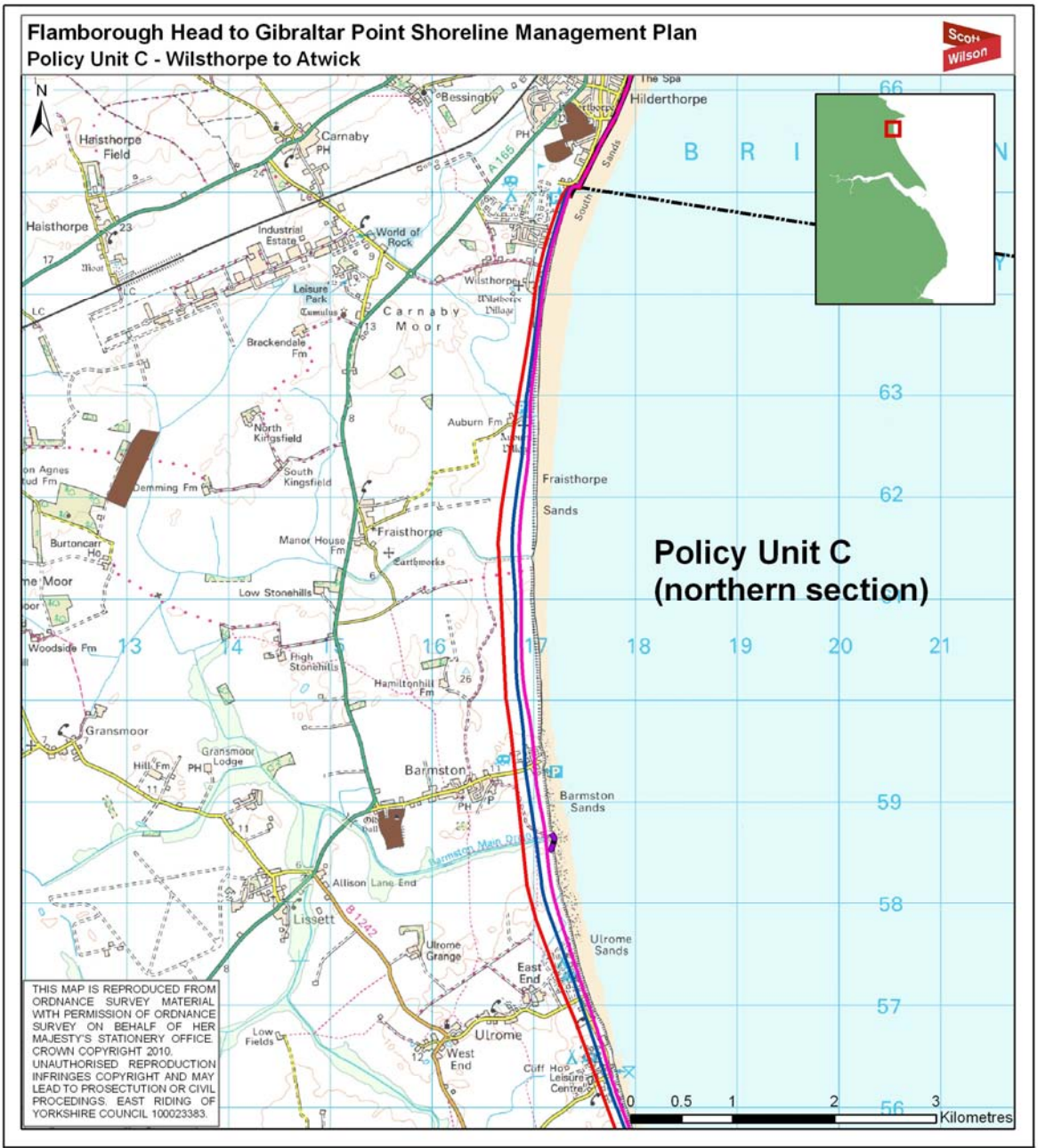
Summary of Water Framework Directive Assessment findings for this policy unit

9.34 The Water Framework Directive Assessment found that no deterioration in the Ecological Potential of the Hull and East Riding inland water bodies, coastal water body or Hull and East Riding groundwater body is anticipated resulting from policies within this policy unit.

Summary of Economics Appraisal findings for this policy unit

9.35 Implementation of an NAI policy has no direct economic cost, however it should be noted that losses to assets may occur during the lifetime of the SMP.

Policy Mapping

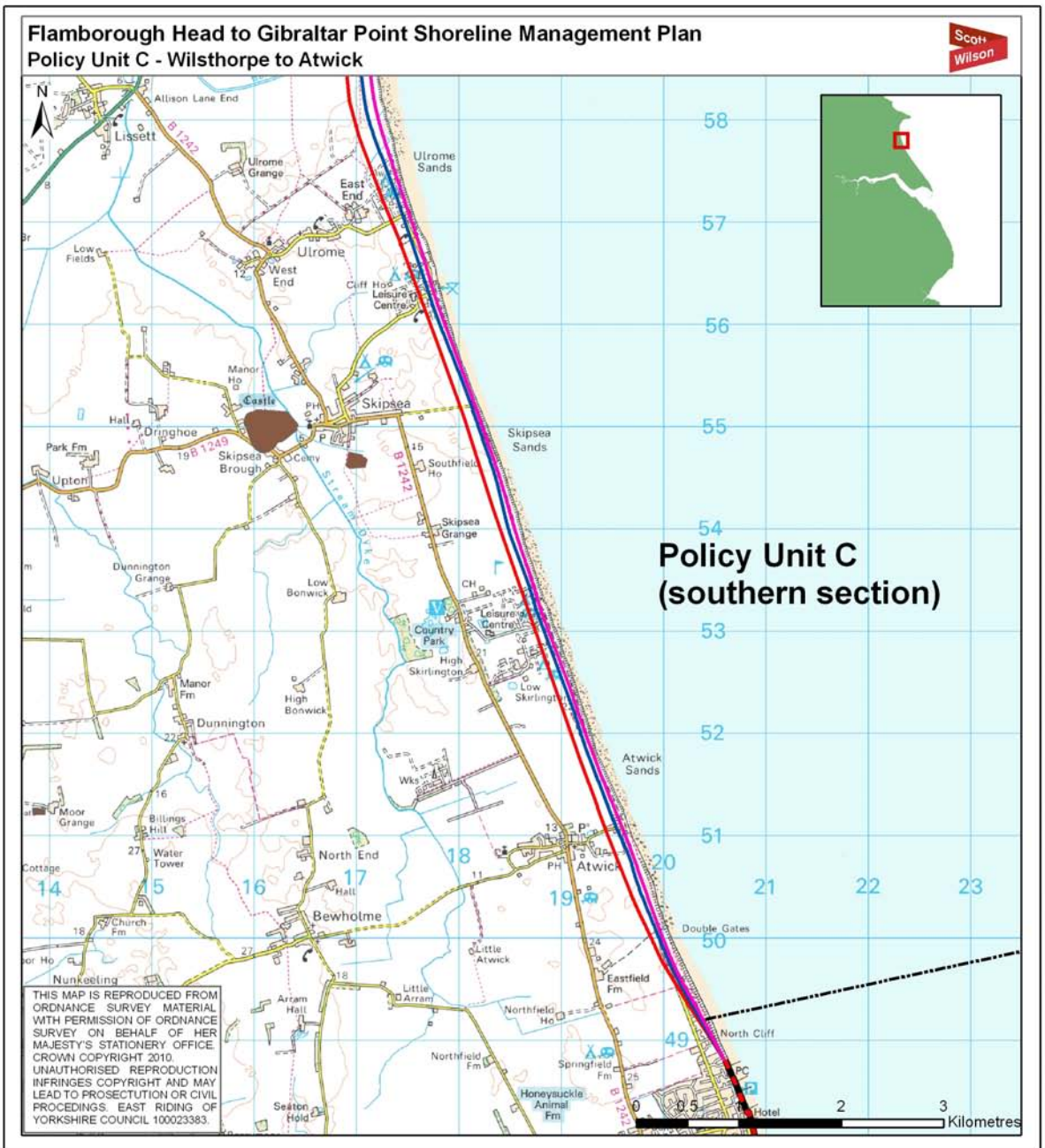


Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
No Active Intervention	**No Active Intervention**	**No Active Intervention**
No Active Intervention will occur through all epochs. However, works may be necessary to maintain the functionality of the Barmston Drain. In keeping with existing permissions, the privately owned defences at Ulrome currently protecting caravan parks would not be maintained under this policy and erosion of the shoreline would occur.		

Legend

- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
No Active Intervention	**No Active Intervention**	**No Active Intervention**
No Active Intervention will occur through all epochs. However, works may be necessary to maintain the functionality of the Barmston Drain. In keeping with existing permissions, the privately owned defences at Ulrome currently protecting caravan parks would not be maintained under this policy and erosion of the shoreline would occur.		

Legend

- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments
- Internationally Designated Sites

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit D: North Cliff to Hornsea Burton (Hornsea)

Policy Development Zone:	**PDZ1**
Policy Unit:	**D**
Character Area:	**4**
Location reference:	**North Cliff to Hornsea Burton (Hornsea)**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
D	North Cliff to Hornsea Burton (Hornsea)	HTL (P4)	HTL (P4)	HTL (P4)	If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Hornsea. It is uncertain in which epoch this may be required.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Codes in brackets refer to the future intent of flood risk management

- P2 – Reduce existing flood risk management actions, accepting increase of risk over time.
- P3 – Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this baseline.
- P4 – Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from climate change).
- P5 – Take further action to reduce flood risk.

Summary of Preferred Plan: Recommendations

9.36 The intent of management for Policy Unit D is to sustain Hornsea as a viable town and as a seaside resort.

Justification for Recommendations

9.37 The preferred policy has been recommended in order to maintain the coastal flood and erosion defences to sustain the viability of Hornsea.

Appraisal of Impacts

9.38 This intent will be achieved by holding the shoreline defences in their current alignment. Currently undefended areas will remain unprotected and will continue to erode.

9.39 The town will be protected against flooding to the same standard as the present day. This means the level of management activity will increase to account for future changes, such as sea level rise.

9.40 The SMP has identified the need to continue monitoring of coastal processes in this unit in relation to their impacts on Hornsea.

9.41 If monitoring shows that erosion is leading to outflanking of defences, engineering works may be necessary to maintain protection to the settlement of Hornsea.

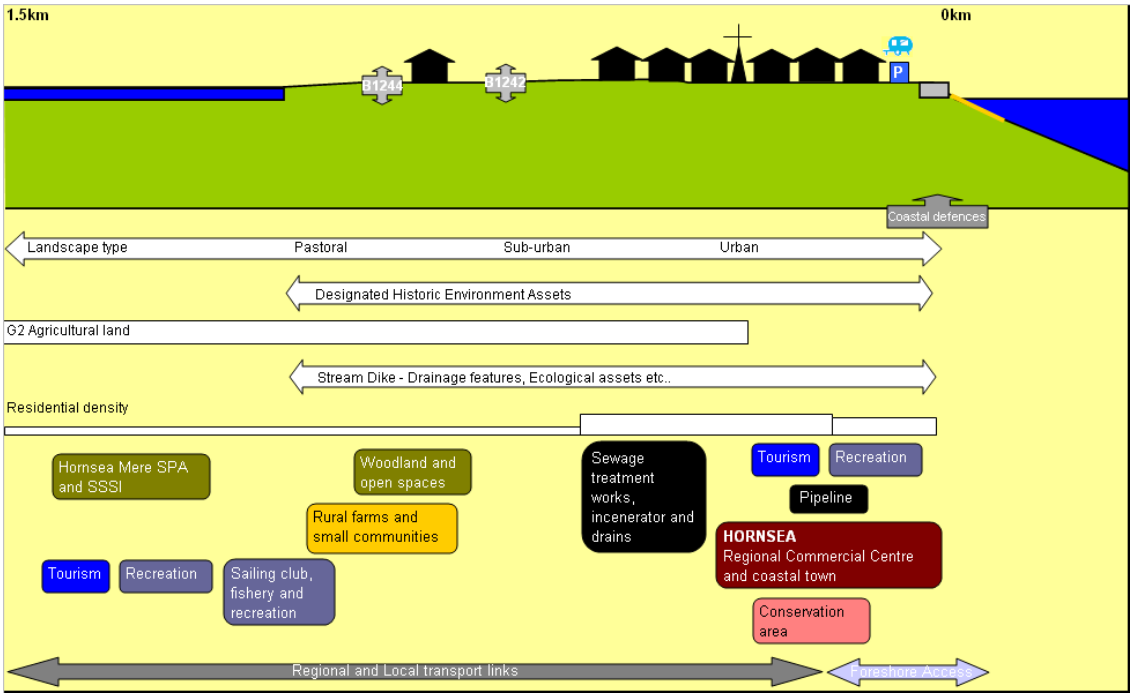
Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their function will be maintained at the current standard. Currently undefended areas will remain unprotected. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Hornsea.
Medium term 2025 - 2055	The defences will be held in their current position and their function will be maintained at the current standard. Currently undefended areas will remain unprotected. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Hornsea.
Long term 2055 - 2105	The defences will be held in their current position and their function will be maintained at the current standard. Currently undefended areas will remain unprotected. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Hornsea.

Changes from Present Management

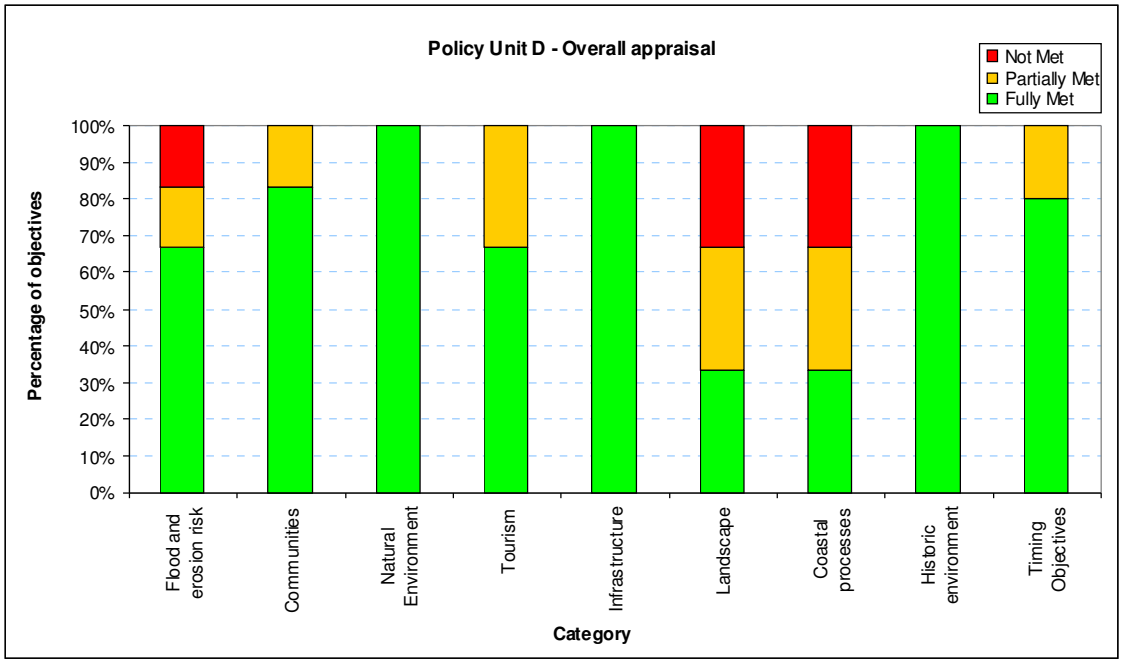
9.42 For all epochs, there is no change from the existing policy. However, there maybe the requirement, if monitoring identifies, to manage outflanking of the defences to maintain the protection to the settlement of Hornsea.

Key Features

9.43 The key features within this policy unit are provided below (Character Area 4 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.44 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. The Hornsea Mere Special Protection Area is within this policy unit, however, the Habitat Regulations Assessment has identified that significant effects on this site resulting from SMP policies are unlikely.

9.45 The Habitat Regulations Assessment has also identified the potential for management actions undertaken within this policy unit to have an impact on internationally designated sites in other policy units due to impacts on sediment transport.

9.46 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

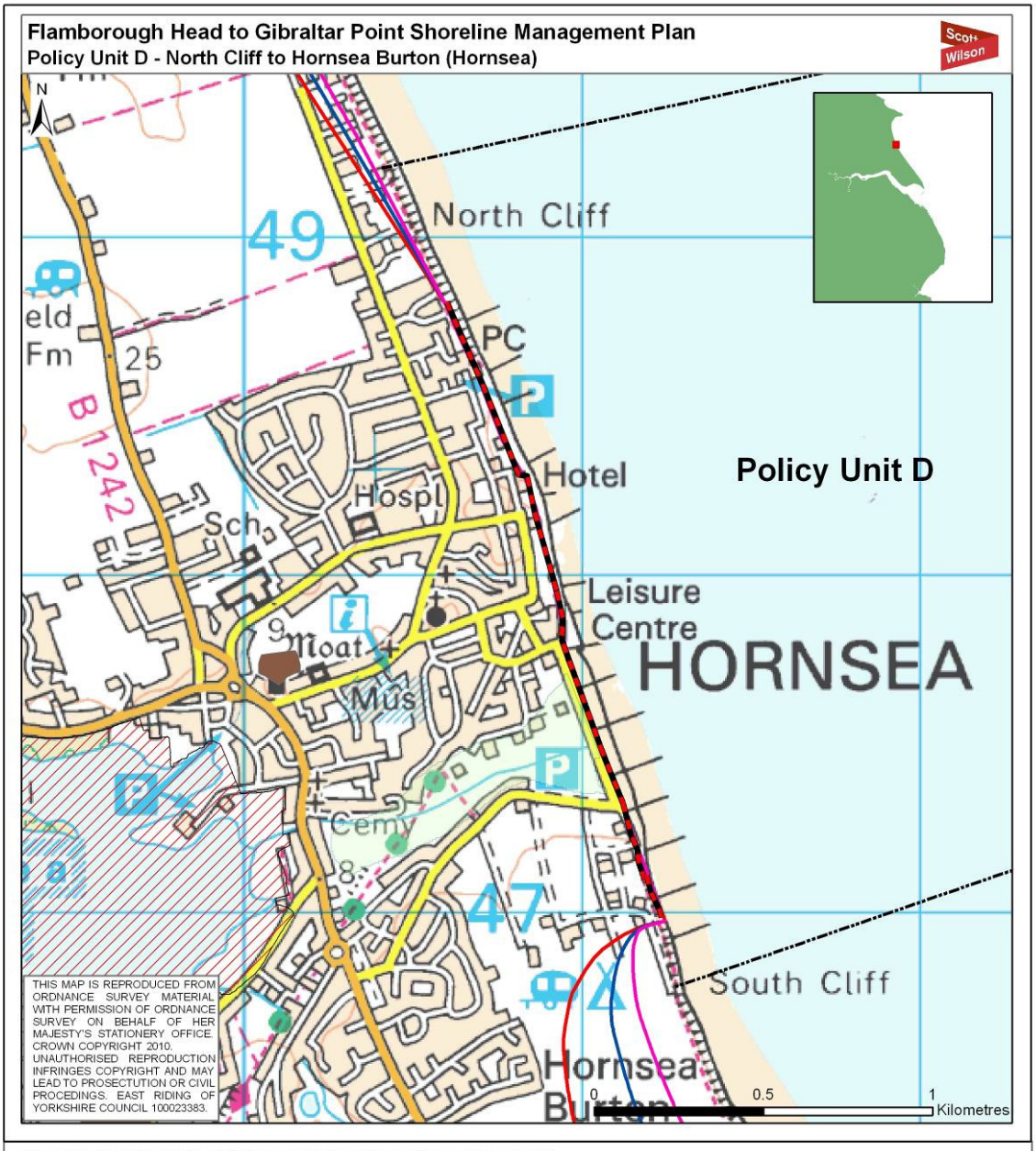
Summary of Water Framework Directive Assessment findings for this policy unit

9.47 The Water Framework Directive Assessment found that no deterioration in the Ecological Potential of the Hull and East Riding inland water bodies or Hull and East Riding groundwater body is anticipated resulting from policies within this policy unit. However, the hold the line policy may result in adverse impacts on the coastal water body, through beach narrowing and steepening, with a consequent impact on seabed habitats of the coastal water body, as well as potentially (in the long term) the partial interruption of longshore sediment transport processes which will impact on the evolution of the coastline downdrift. Monitoring of cliff recession and beach profiles along the Holderness coast should continue. At the stage when coastal strategies and defence schemes consider design of defences in detail, it should be ensured that impacts on the coastal water body are considered to ensure no negative impact on the coastal water body.

Summary of Economics Appraisal findings for this policy unit

9.48 The economic appraisal found that the policy will generate benefits which clearly outweigh the costs.

Policy Mapping



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Hornsea. It is uncertain in which epoch this may be required.		

Legend

- Current defences(ERYC maintained)
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit E: Rolston to Waxholme

Policy Development Zone:	**PDZ1**
Policy Unit:	**E**
Character Area:	**5**
Location reference:	**Rolston to Waxholme**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
E	Rolston to Waxholme	NAI with HTL at Mappleton	NAI with HTL at Mappleton	NAI. HTL at Mappleton, but with other options considered subject to monitoring.	The policy of No Active Intervention would continue for the currently undefended sections through all epochs. However, works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain. At Mappleton, the current defence line will be held for epochs 1 and 2 with monitoring of coastal processes undertaken. In the medium-term, assessment of options for maintaining a strategic north-south transport link is likely to be necessary. Monitoring will be undertaken to determine whether continuing to hold the line at Mappleton is still sustainable in epoch 3 and options may be considered.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Summary of Preferred Plan: Recommendations

9.49 The intent of management for Policy Unit E is to allow natural processes to continue along the currently undefended areas; however works may be necessary to a sustainable flood defence in the vicinity of Tunstall Drain. The intent of management at Mappleton is to continue to ensure the viability of the village and a strategic transport link between Hornsea to the north and Withernsea to the south.

Justification for Recommendations

9.50 The overall effects of the policy for the area as a whole are more beneficial than alternative policies assessed. A policy of No Active Intervention will release sediment from the cliffs which helps to provide natural coastal protection for areas to the south, including more southerly areas of the East Riding of Yorkshire coastline and Lincolnshire. A No Active Intervention policy also has significant advantages compared to defending the frontage in terms of: landscape (since the natural character of the policy unit will be maintained); tourism (due to landscape and beach benefits within the policy unit in comparison to alternative policies); and the natural and historic environment (particularly the submarine forest at Tunstall).

Appraisal of Impacts

9.51 The management intent will be achieved by a No Active Intervention policy for all areas except at Tunstall Drain and the currently defended area at Mappleton.

9.52 A sustainable flood defence in the vicinity of Tunstall Drain may be maintained through coastal flood defences.

9.53 At Mappleton, the current defence line will be held for the short and medium term at least, but the SMP has identified the need to continue monitoring of coastal processes in this unit. To the north of the defences, the strategic north-south transport link could be at threat from erosion before 2055. The SMP has also identified the need to continue monitoring of coastal processes in this unit, and the sustainability of defences may need to be considered in epoch 3.

9.54 Under this policy, the undefended cliffs will continue to erode and the rate of erosion will generally increase over time as a result of sea level rise. This policy will result in some adverse impacts for property, with approximately 10 houses potentially at threat from erosion by 2025; a further 22 houses are potentially at threat by 2055; with further property at risk of erosion by the end of the Plan period in 2105.

9.55 There will also be adverse impacts on agricultural land, with approximately 70 hectares of agricultural land potentially at threat from erosion by 2025; a further 130 hectares of agricultural land are potentially at threat by 2055; with further agricultural land (predominantly grade 3 agricultural land) at risk of erosion by the end of the Plan period in 2105.

Preferred policy to implement Plan	
From present day to 2025	There will be no management intervention or defences constructed on the currently undefended frontages. Works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain. At Mappleton the current defence line will be held.
Medium term 2025 - 2055	There will be no management intervention or defences constructed on the currently undefended frontages. Works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain. At Mappleton

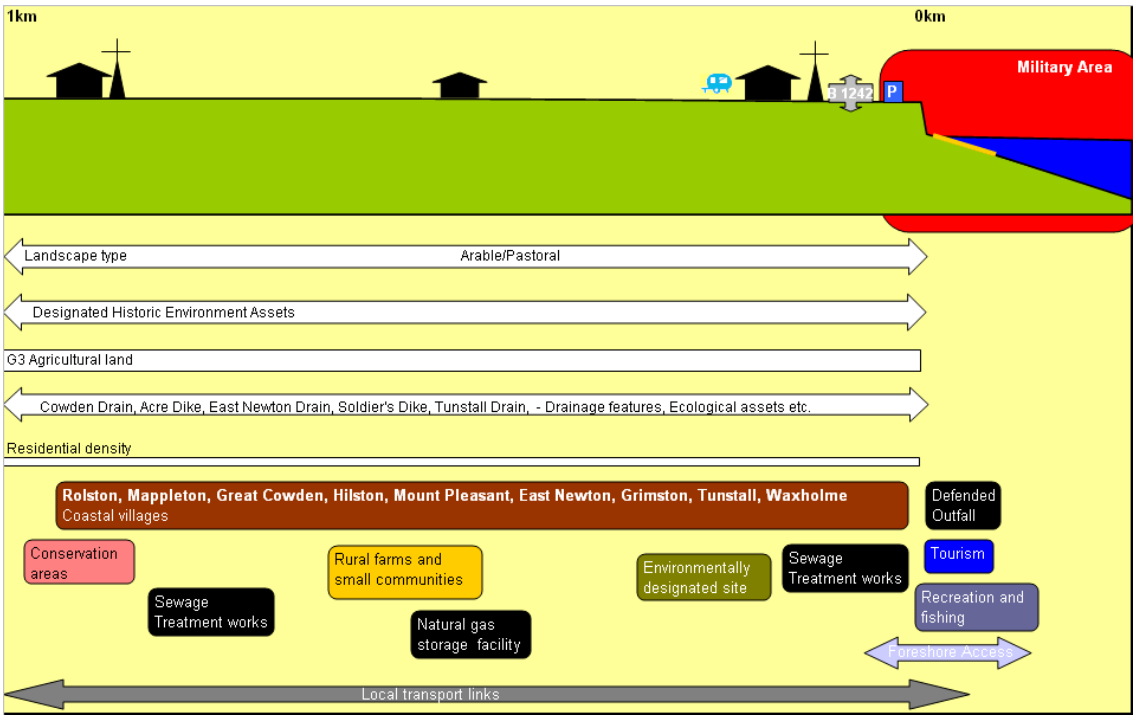
	the current defence line will be held. Assessment of options for maintaining a strategic north-south transport link is likely to be necessary.
Long term 2055 - 2105	There will be no management intervention or defences constructed on the currently undefended frontages. Works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain. At Mappleton, the current defence line will be held, subject to review in the intervening period.

Changes from Present Management

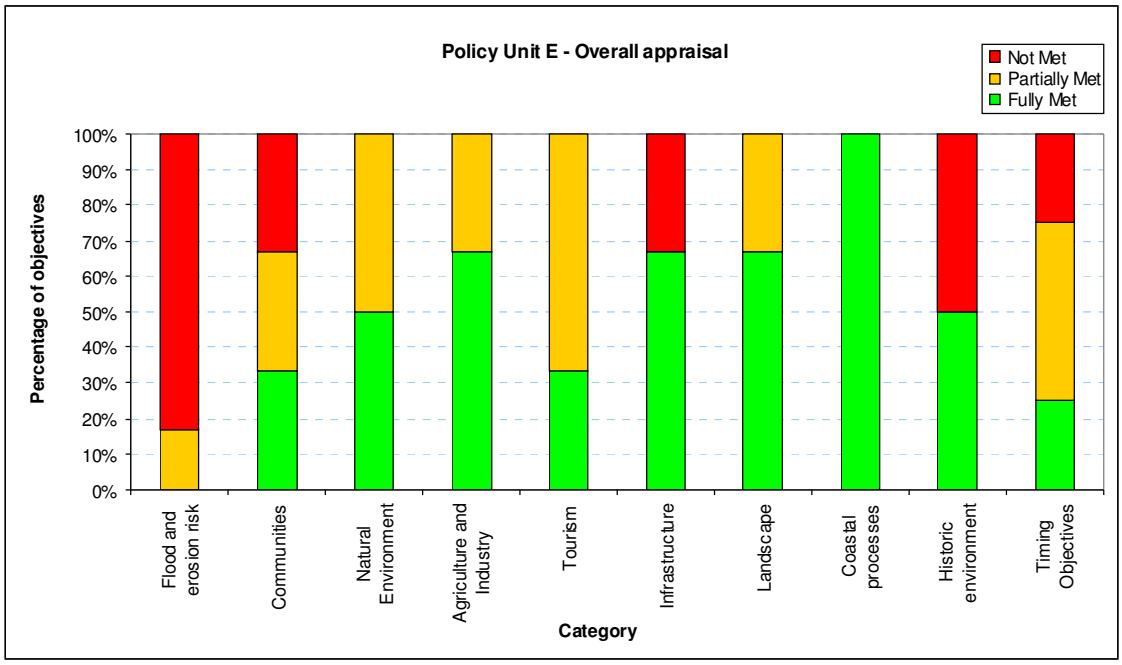
9.56 For all three epochs there is no change from the existing policy.

Key Features

9.57 The key features within this policy unit are provided below (Character Area 5 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.58 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. There are no internationally designated sites within this policy unit, however the Habitat Regulations Assessment has identified the potential for management actions undertaken within this policy unit to have an impact on internationally designated sites in other policy units due to impacts on sediment transport.

9.59 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

Summary of Water Framework Directive Assessment findings for this policy unit

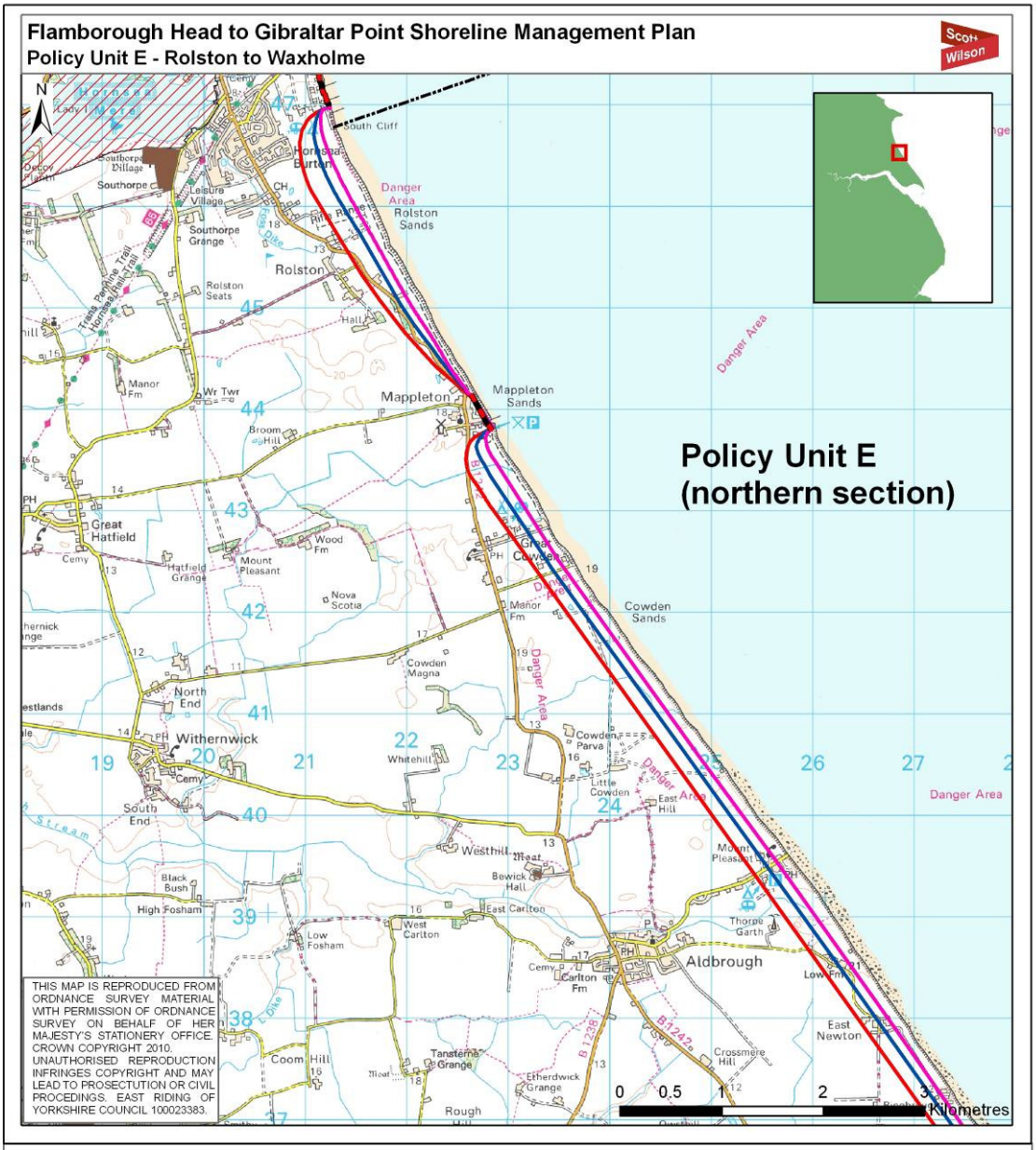
9.60 The Water Framework Directive Assessment found that no deterioration in the Ecological Potential of the Hull and East Riding inland water bodies, coastal water or Hull and East Riding groundwater body is anticipated resulting from the no active intervention policy within this policy unit. No deterioration in the Ecological Potential of the coastal water body is anticipated resulting from the no active intervention policy within this policy unit.

9.61 However, the hold the line policy at Mappleton may result in adverse impacts on the coastal water body, through beach narrowing and steepening, with a consequent impact on seabed habitats of the coastal water body, as well as potentially (in the long term) the partial interruption of longshore sediment transport processes which will impact on the evolution of the coastline downdrift. Monitoring of cliff recession and beach profiles along the Holderness coast should continue. At the stage when coastal strategies and defence schemes consider design of defences in detail, it should be ensured that impacts on the coastal water body are considered to ensure no negative impact on the coastal water body.

Summary of Economics Appraisal findings for this policy unit

9.62 Implementation of an NAI policy has no direct economic cost, however it should be noted that losses to assets may occur during the lifetime of the SMP. Marginal economic case for Hold the Line at Mappleton and requires further detailed Strategy level assessment.

Policy Mapping



Key: Policy (for full details see relevant policy statement)

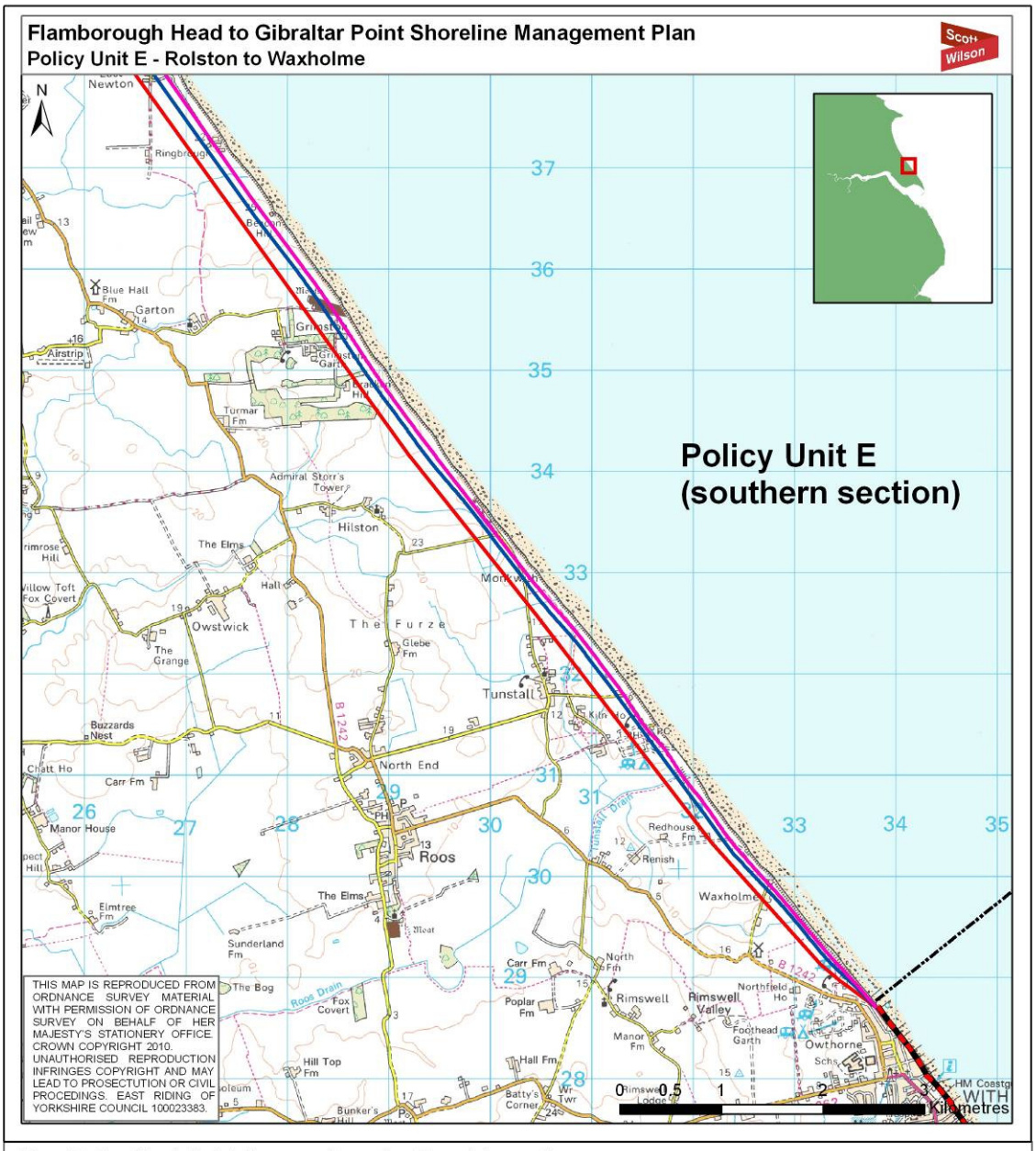
Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
No Active Intervention with Hold the Line at Mappleton	**No Active Intervention with Hold the Line at Mappleton**	**No Active Intervention. Hold the Line at Mappleton but with other options considered subject to monitoring.**

The policy of No Active Intervention would continue for the currently undefended sections through all epochs. However, works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain. At Mappleton, the current defence line will be held for epochs 1 and 2 with monitoring of coastal processes undertaken. In the medium-term, assessment of options for maintaining a strategic north-south transport link is likely to be necessary. Monitoring will be undertaken to determine whether continuing to hold the line at Mappleton is still sustainable in epoch 3 and options may be considered.

Legend

- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Current defences(ERYC maintained)
- Policy Unit boundaries
- Scheduled Monuments

N.B. Mapping shows a Hold the Line policy for Mappleton in all epochs.



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
No Active Intervention with Hold the Line at Mappleton	**No Active Intervention with Hold the Line at Mappleton**	**No Active Intervention. Hold the Line at Mappleton but with other options considered subject to monitoring.**

The policy of No Active Intervention would continue for the currently undefended sections through all epochs. However, works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain. At Mappleton, the current defence line will be held for epochs 1 and 2 with monitoring of coastal processes undertaken. In the medium-term, assessment of options for maintaining a strategic north-south transport link is likely to be necessary. Monitoring will be undertaken to determine whether continuing to hold the line at Mappleton is still sustainable in epoch 3 and options may be considered.

Legend

- Current defences(ERYC maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit F: Owthorne to Hollym (Withernsea)

Policy Development Zone:	**PDZ1**
Policy Unit:	**F**
Character Area:	**6**
Location reference:	**Owthorne to Hollym (Withernsea)**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
F	Owthorne to Hollym	HTL (P4)	HTL (P4)	HTL (P4)	If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Withernsea. It is uncertain in which epoch this may be required.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Codes in brackets refer to the future intent of flood risk management

- P2 – Reduce existing flood risk management actions, accepting increase of risk over time.
- P3 – Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this baseline.
- P4 – Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from climate change).
- P5 – Take further action to reduce flood risk.

Summary of Preferred Plan: Recommendations

9.63 The intent of management for Policy Unit F is to sustain Withernsea as a viable town and as a seaside resort.

Justification for Recommendations

9.64 The preferred policy has been recommended in order to maintain the coastal flood and erosion defences to sustain the viability of Withernsea.

Appraisal of Impacts

9.65 This intent will be achieved by holding the shoreline defences in their current alignment.

9.66 The town will be protected against flooding to the same standard as the present day. This means the level of management activity will increase to account for future changes such as sea level rise.

9.67 The SMP has identified the need to continue monitoring of coastal processes in this unit in relation to their impacts on Withernsea.

9.68 If monitoring shows that erosion is leading to outflanking of defences, engineering works may be necessary to maintain protection to the settlement of Withernsea.

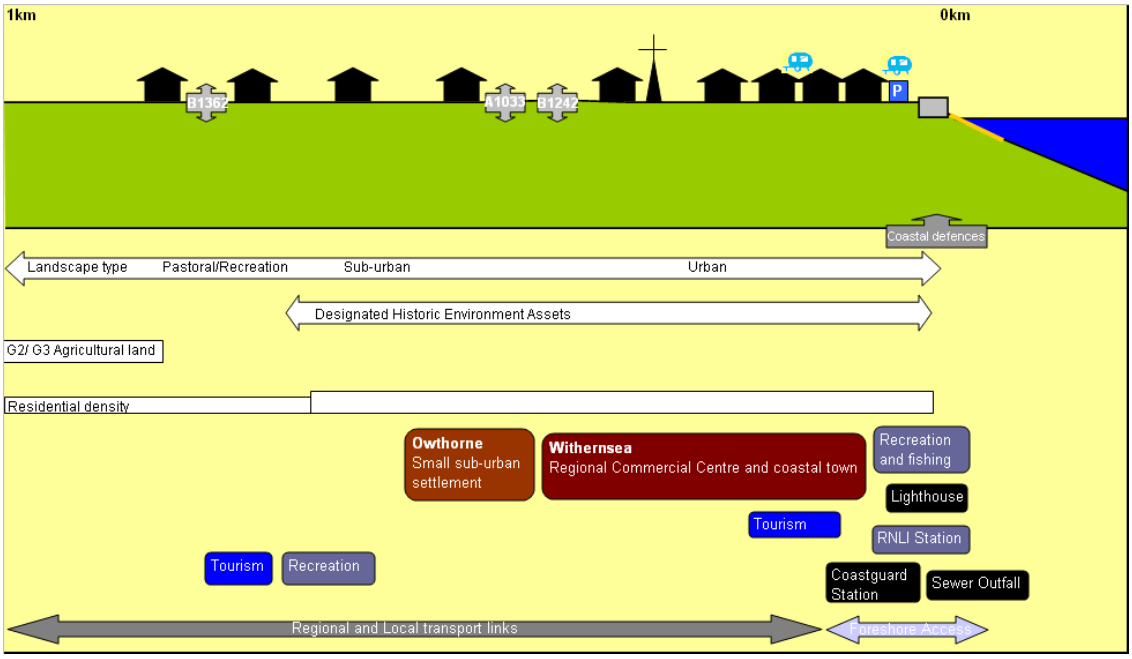
Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their flood defence function will be maintained. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Withernsea.
Medium term 2025 - 2055	The defences will be held in their current position and their flood defence function will be maintained. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Withernsea.
Long term 2055 - 2105	The defences will be held in their current position and their flood defence function will be maintained. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Withernsea.

Changes from Present Management

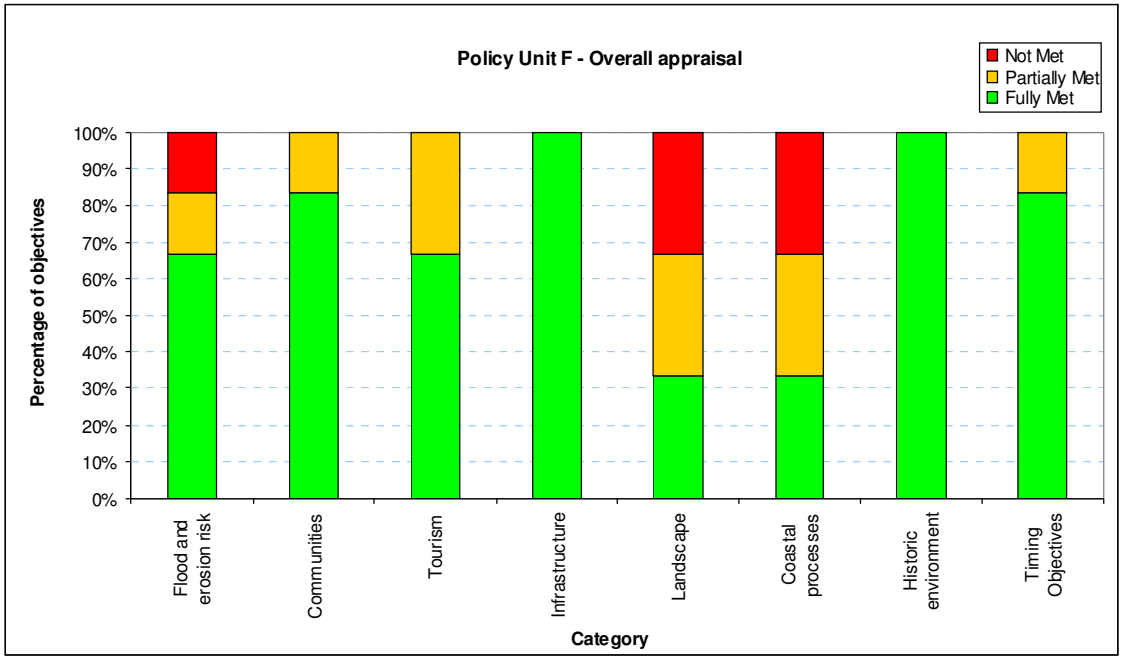
9.69 For the all epochs there is no change to the existing policy. However, there maybe the requirement, if monitoring identifies, to manage outflanking of the defences to maintain the protection to the settlement of Withernsea.

Key Features

9.70 The key features within this policy unit are provided below (Character Area 6 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.71 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. There are no internationally designated sites within this policy unit, however the Habitat Regulations Assessment has identified the potential for management actions undertaken within this policy unit to have an impact on internationally designated sites in other policy units due to impacts on sediment transport.

9.72 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

Summary of Water Framework Directive Assessment findings for this policy unit

9.73 The Water Framework Directive Assessment found that no change in the Ecological Potential of the Hull and East Riding inland water bodies or Hull and East Riding groundwater body is anticipated resulting from policies within this policy unit. However, the hold the line policy may result in adverse impacts on the coastal water body, through beach narrowing and steepening, with a consequent impact on seabed habitats of the coastal water body, as well as potentially (in the long term) the partial interruption of longshore sediment transport processes which will impact on the evolution of the coastline downdrift. Monitoring of cliff recession and beach profiles along the Holderness coast should continue. At the stage when coastal strategies and defence schemes consider design of defences in detail, it should be ensured that impacts on the coastal water body are considered to ensure no negative impact on the coastal water body.

Summary of Economics Appraisal findings for this policy unit

9.74 The economic appraisal found that the policy will generate benefits which clearly outweigh the costs.

Policy Mapping

Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Withernsea. It is uncertain in which epoch this may be required.		

Legend

- Current defences(ERYC maintained)
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments
- Internationally Designated Sites

There are listed buildings within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit G: Hollym to Dimlington Cliffs

Policy Development Zone:	**PDZ1**
Policy Unit:	**G**
Character Area:	**7**
Location reference:	**Hollym to Dimlington Cliffs**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
G	Hollym to Dimlington Cliffs	NAI	NAI	NAI	The current policy of No Active Intervention will continue through all epochs. In the medium-term, assessment of options for maintaining a strategic north-south transport link is likely to be necessary.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Summary of Preferred Plan: Recommendations

9.75 The intent of management for Policy Unit G is to allow natural processes to continue, however, provision will be made to maintain a strategic north-south transport link.

Justification for Recommendations

9.76 The overall effects of the policy for the area as a whole are more beneficial than alternative policies assessed. A No Active Intervention policy will release sediment from the cliffs which helps to provide natural coastal protection for areas to the south, including more southerly areas of the East Riding of Yorkshire coastline and Lincolnshire. A No Active Intervention policy also has significant benefits compared to defending the frontage in terms of: landscape (since the natural character of the policy unit will be maintained); tourism (due to landscape and beach benefits within the policy unit in comparison to alternative policies); and the natural environment (particularly the environmentally designated area at Dimlington).

Appraisal of Impacts

9.77 The management intent will be achieved by a No Active Intervention policy. Under this policy, the undefended cliffs will continue to erode and the rate of erosion will generally increase over time as a result of sea level rise. This will help maintain the supply of sediment to more southerly frontages.

9.78 At the northern end of this policy unit, the strategic north-south transport link could be at threat from erosion before 2055.

9.79 Due to the location of properties in relation to the current shoreline position, this policy will have no adverse impact for property in the short term despite continued erosion of the cliffs. In the medium and longer term there will be some adverse impacts for property, with approximately 5 houses potentially at threat from erosion by 2055; with further property at risk of erosion by the end of the Plan period in 2105.

9.80 There will also be adverse impacts on agricultural land, with approximately 30 hectares of agricultural land potentially at threat from erosion by 2025; a further 50 hectares of agricultural land (including 8 hectares of grade 2 agricultural land) are potentially at threat by 2055; with further agricultural land (including grade 2 and grade 3 agricultural land) at risk of erosion by the end of the Plan period in 2105.

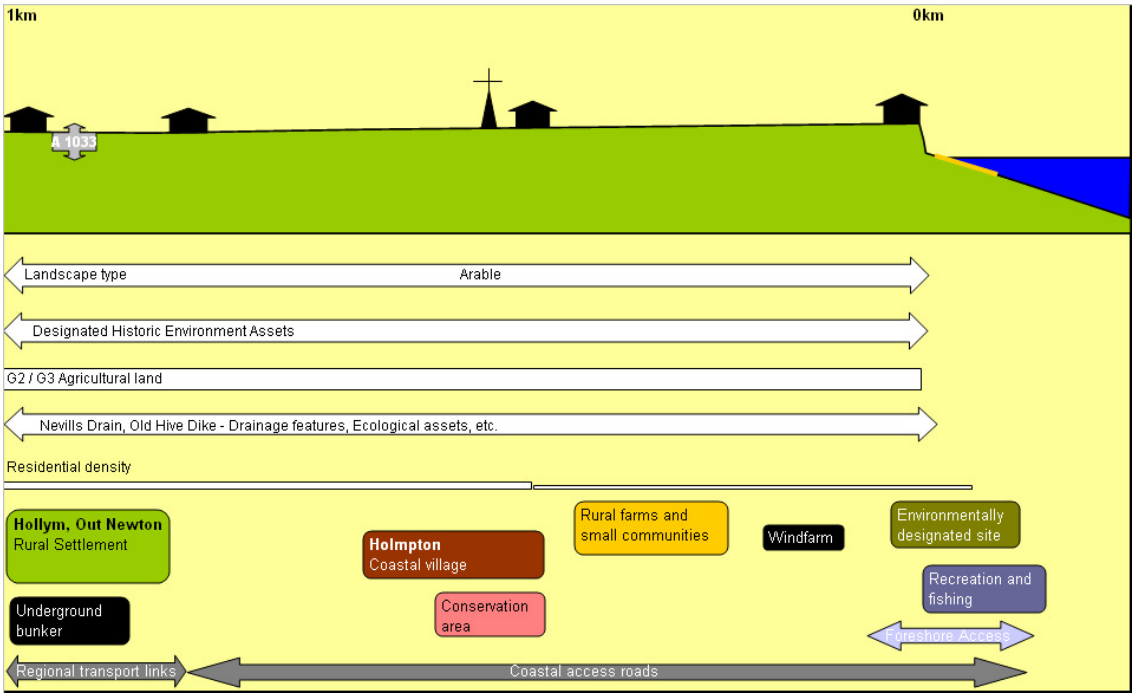
Preferred policy to implement Plan	
From present day to 2025	There will be no management intervention or defences constructed.
Medium term 2025 - 2055	There will be no management intervention or defences constructed. Assessment of options for maintaining a strategic north-south transport link is likely to be necessary.
Long term 2055 - 2105	There will be no management intervention or defences constructed.

Changes from Present Management

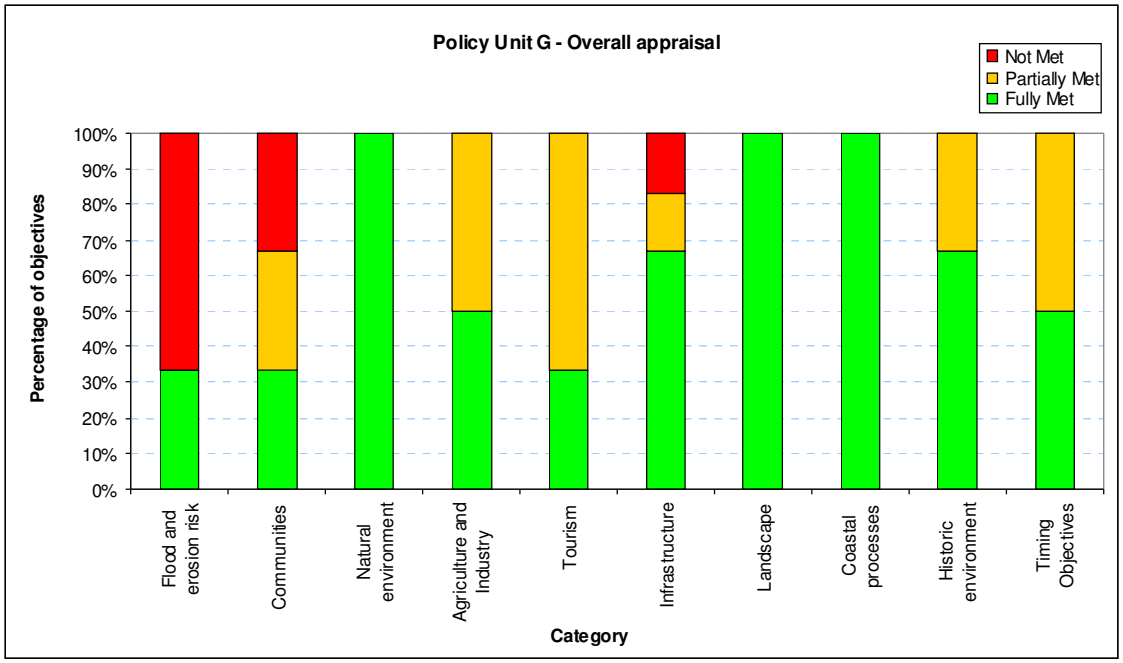
9.81 For all three epochs there is no change from the existing policy.

Key Features

9.82 The key features within this Policy Unit are provided below (Character Area 7 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.83 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. There are no internationally designated sites within this policy unit.

9.84 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

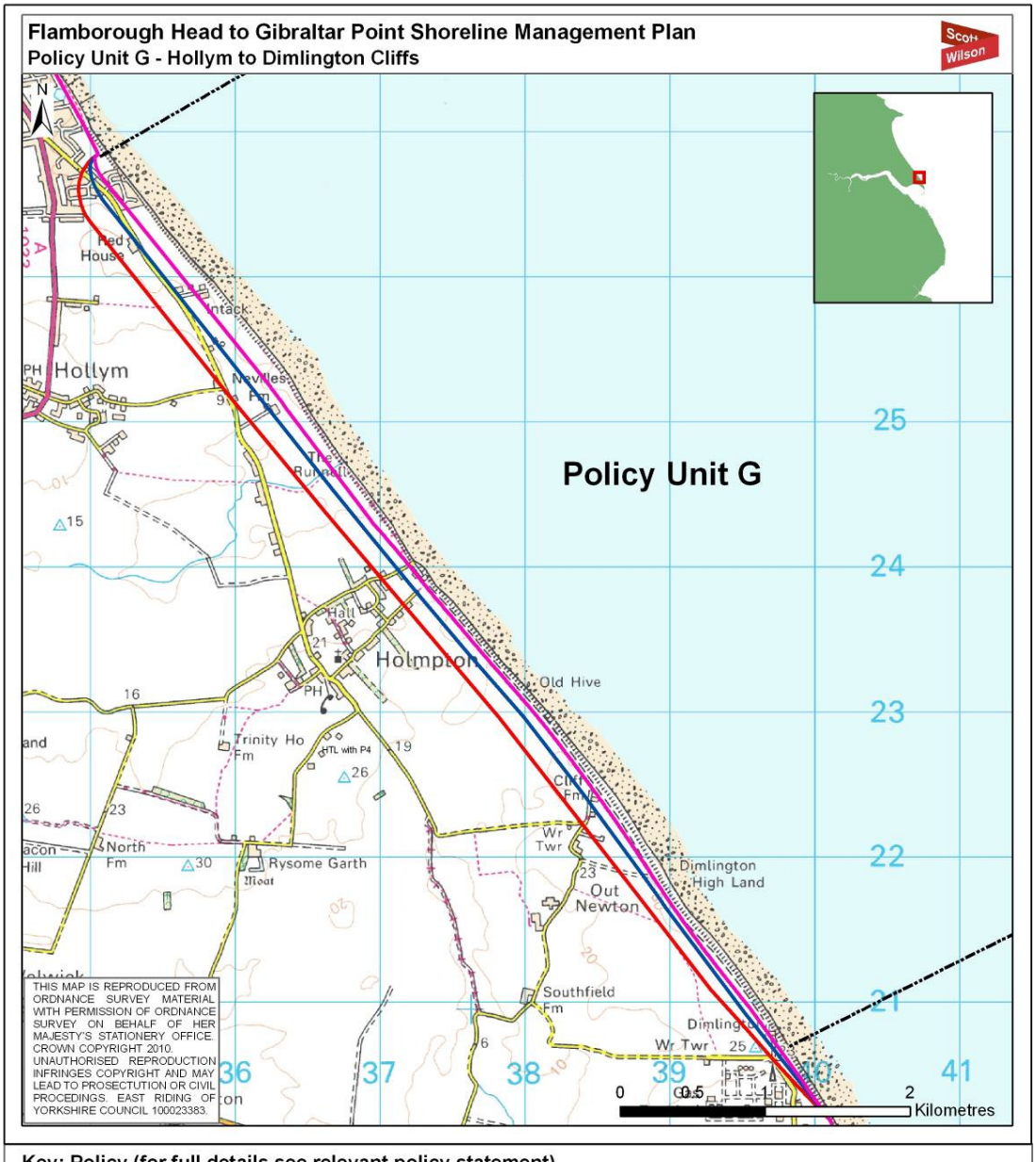
Summary of Water Framework Directive Assessment findings for this policy unit

9.85 The Water Framework Directive Assessment found that no deterioration in the Ecological Potential of the Hull and East Riding inland water bodies, coastal water body or Hull and East Riding groundwater body is anticipated resulting from policies within this policy unit.

Summary of Economics Appraisal findings for this policy unit

9.86 This policy has no costs associated with its implementation. However, it should be noted that losses to assets may occur during the lifetime of the SMP.

Policy Mapping



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
No Active Intervention	**No Active Intervention**	**No Active Intervention**
The current policy of No Active Intervention will continue through all epochs. In the medium-term, assessment of options for maintaining a strategic north-south transport link is likely to be neccesary.		

Legend

- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit H: Dimlington and Easington Gas Terminals

Policy Development Zone:	**PDZ1**
Policy Unit:	**H**
Character Area:	**8**
Location reference:	**Dimlington and Easington Gas Terminals**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
H	Dimlington and Easington Gas terminals	HTL for current defences. NAI elsewhere	NAI or HTL for currently defended areas. NAI elsewhere	NAI or HTL for currently defended areas. NAI elsewhere	Management policy will be to continue to protect the Gas Terminals in line with the existing planning permission for the Gas Terminal site and as long as the planning status allows defences. No Active Intervention for currently undefended areas, however management of outflanking may be permitted, subject to necessary approvals to protect the nationally important gas supplies and while there is a strategic need for the site.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Summary of Preferred Plan: Recommendations

9.87 The intent of management for Policy Unit H is to continue to maintain the viability of the Dimlington and Easington Gas Terminals while there is a strategic need for the sites.

Justification for Recommendations

9.88 The preferred policy has been recommended in order to protect the Dimlington and Easington Gas Terminals while there is a strategic need for the sites and to maintain nationally important gas supplies.

Appraisal of Impacts

9.89 This will be achieved by a Hold the Line policy for current defences with No Active intervention elsewhere; however management of outflanking would be permitted, subject to necessary approvals.

9.90 Future decisions will need to be made in regard to the protection of the site when the current planning permission expires in 2020.

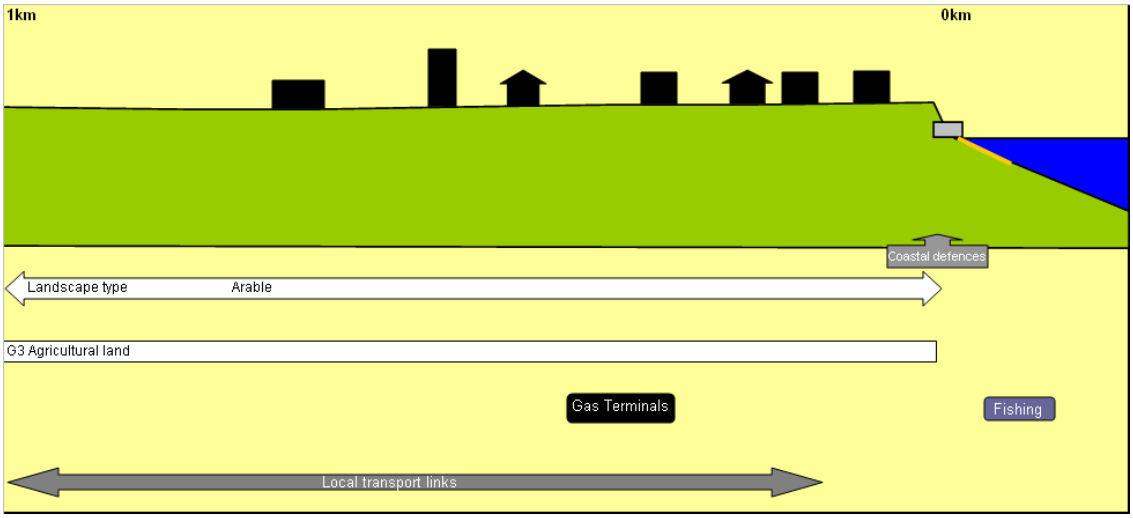
Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position, subject to a review of planning status for the Gas Terminals in 2020. No Active Intervention elsewhere, however management of outflanking may be permitted, subject to necessary approvals, in order to protect the nationally important gas supplies.
Medium term 2025 - 2055	Future decisions will need to be made in regard to the protection of the site. No Active Intervention for currently undefended areas, however management of outflanking may be permitted, subject to necessary approvals, in order to protect the nationally important gas supplies, while there is a strategic need for the site.
Long term 2055 - 2105	Future decisions will need to be made in regard to the protection of the site. No Active Intervention for currently undefended areas, however management of outflanking may be permitted, subject to necessary approvals, in order to protect the nationally important gas supplies while there is a strategic need for the site.

Changes from Present Management

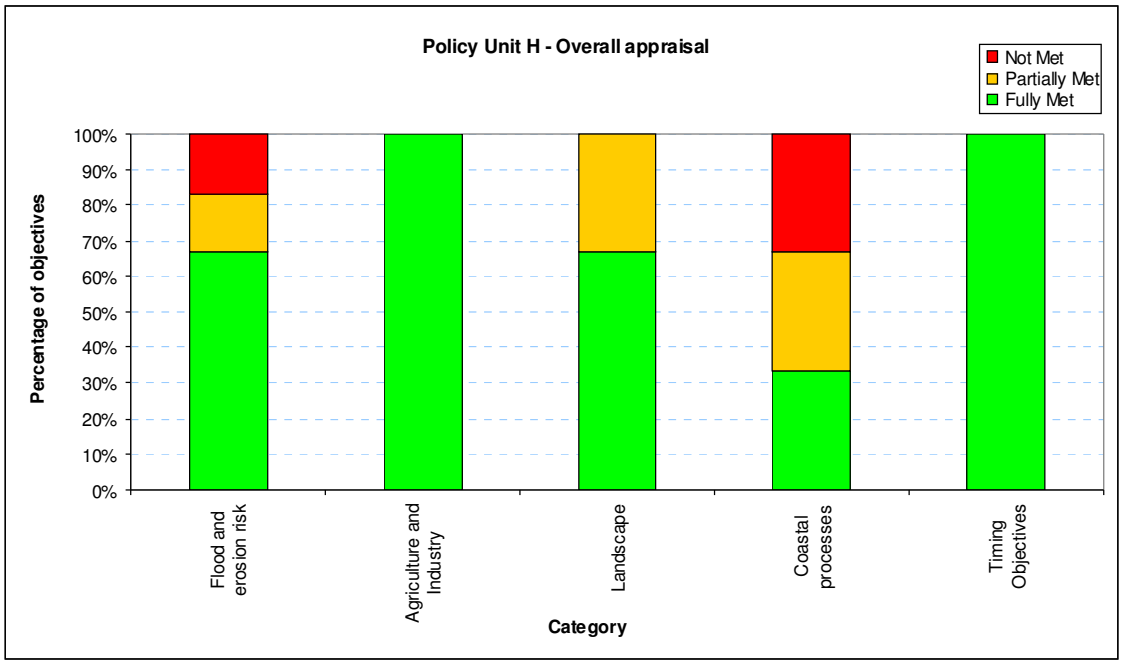
9.91 Present management is to protect the Gas Terminals through holding the existing defence line. This policy will continue as long as the planning status allows the defences to remain. The current planning permission for the Gas Terminals can be viewed on request from East Riding of Yorkshire Council. It may be necessary to consider management of outflanking in order to protect nationally important gas supplies, subject to necessary approvals. Future decisions will need to be made in regard to the protection of the site.

Key Features

9.92 The key features within this policy unit are provided below (Character Area 8 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.93 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. There are no internationally designated sites within this policy unit, however the Habitat Regulations Assessment has identified the potential for management actions undertaken within this policy unit to have an impact on internationally designated sites in other policy units due to impacts on sediment transport. Should a future policy of no active intervention be pursued for the current defences, the Habitat Regulations Assessment has identified that the Unit will contribute to sediment release.

9.94 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

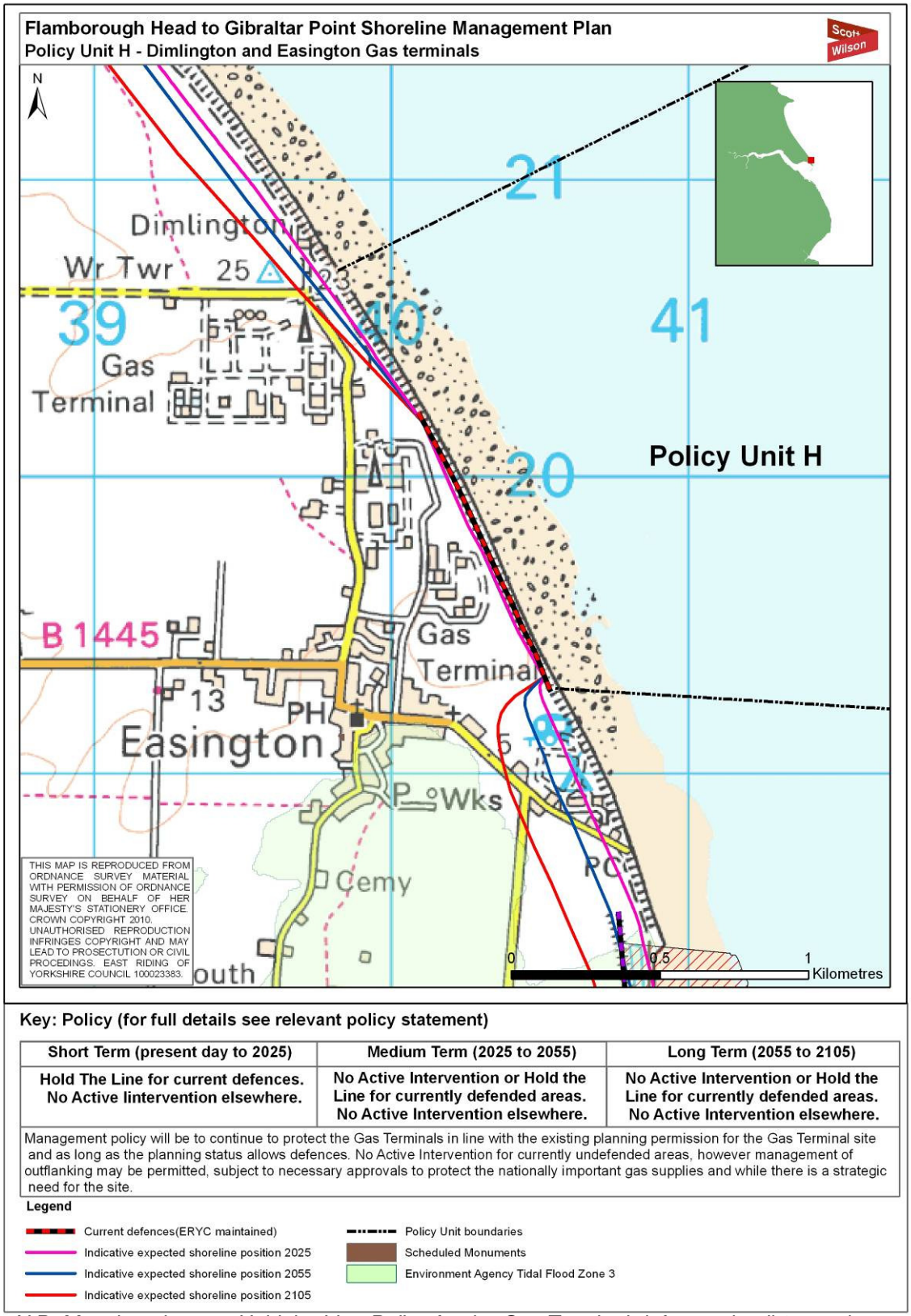
Summary of Water Framework Directive Assessment findings for this policy unit

9.95 The Water Framework Directive Assessment found that no change in the Ecological Potential of the Hull and East Riding inland water bodies or Hull and East Riding groundwater body is anticipated resulting from policies within this policy unit. However, the hold the line policy in epoch 1 may result in adverse impacts on the coastal water body, through beach narrowing and steepening, with a consequent impact on seabed habitats of the coastal water body, as well as potentially (in the long term) the partial interruption of longshore sediment transport processes which will impact on the evolution of the coastline downdrift. Monitoring of cliff recession and beach profiles along the Holderness coast should continue. At the stage when coastal strategies and defence schemes consider design of defences in detail, it should be ensured that impacts on the coastal water body are considered to ensure no negative impact on the coastal water body. The impacts in epochs 2 and 3 depend upon future decisions in regard to protection of the site.

Summary of Economics Appraisal findings for this policy unit

9.96 The economic appraisal found that the policy will generate benefits which clearly outweigh the costs.

Policy Mapping



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold The Line for current defences. No Active Intervention elsewhere.	**No Active Intervention or Hold the Line for currently defended areas. No Active Intervention elsewhere.**	**No Active Intervention or Hold the Line for currently defended areas. No Active Intervention elsewhere.**
Management policy will be to continue to protect the Gas Terminals in line with the existing planning permission for the Gas Terminal site and as long as the planning status allows defences. No Active Intervention for currently undefended areas, however management of outflanking may be permitted, subject to necessary approvals to protect the nationally important gas supplies and while there is a strategic need for the site.		

Legend

- Current defences(ERYC maintained)
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3

N.B. Mapping shows a Hold the Line Policy for the Gas Terminal defences in all 3 epochs. There are no listed buildings or conservation areas within this policy unit.

Policy Unit I: Easington to Kilnsea

Policy Development Zone:	**PDZ2**
Policy Unit:	**I**
Character Area:	**9**
Location reference:	**Easington to Kilnsea**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
I	Easington to Kilnsea	HTL (P3) for current defences. NAI elsewhere	HTL (P3) for current defences. NAI elsewhere	HTL (P3) for current defences. NAI elsewhere	The Policy of No Active Intervention would continue for the currently undefended sections through all epochs. At Easington Lagoons and the Kilnsea flood defence, the line will be held in epoch 1 and the intent of management will be to hold the line in epochs 2 and 3 but other options may be considered subject to monitoring of coastal processes, future studies and dependent on third party decisions. To ensure sustainable flood defences, and meet the requirements of environmental legislation, limited Managed Realignment of defences may occur. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets. This process will be informed by the Humber Flood Risk Management Strategy.

Key:

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment

Codes in brackets refer to the future intent of flood risk management

- P2 – Reduce existing flood risk management actions, accepting increase of risk over time.
- P3 – Continue with existing or alternative actions to manage flood risk at the current level,

- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

accepting that flood risk will increase over time from this baseline.

- P4 – Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from climate change).
- P5 – Take further action to reduce flood risk.

Summary of Preferred Plan: Recommendations

9.97 The management intent for Policy Unit I is to continue providing sustainable coastal flood and erosion protection at Easington Lagoons and the Kilnsea flood defence to assets in the floodplain.

Justification for Recommendations

9.97 This approach is needed to balance the needs of the human, natural, and historic environments, with sediment budgetary demands and the requirements of applicable environmental legislation.

Appraisal of Impacts

9.98 The defences within this policy unit are comprised of two flood embankments; one is a private defence south of Kilnsea and the other is an Environment Agency defence landward of the Easington Lagoons.

9.99 This management intent will be achieved by a Hold the Line policy for the Easington Lagoons and Kilnsea flood defences. There is provision for limited Managed Realignment to ensure defence sustainability and compliance with current environmental legislation for all epochs. By creating habitats to compensate for losses due to coastal squeeze in all epochs. The conservation value of the Lagoons SSSI (part of the Humber Estuary SPA and Ramsar site) needs to be maintained. Managed realignment areas will be identified by detailed studies. The approximate defence alignments identified in the Humber Flood Risk Management Strategy have been adopted for SMP appraisal purposes.

9.100 The policy will remain No Active Intervention for currently undefended cliffs, which will ensure the continued feed of sediment to downdrift areas, thus helping to maintain important features such as Spurn, and the supply of sediment to the Humber and Lincolnshire.

9.101 The approach for managing the defence of the main settlement of Easington and the adjacent agricultural land will be informed by the Humber Flood Risk Management Strategy, taking account of the need for an integrated approach to flood risk in the area jointly protected by defences in Policy Unit K.

9.102 For the Kilnsea flood defence, the current defence line will be held for the short term at least, but the SMP has identified the need to continue monitoring coastal processes in this unit and the sustainability of defences is likely to need to be considered in epochs 2 or 3. The responsibility for managing this defence will rest with third parties.

9.103 A No Active Intervention policy will continue in undefended areas.

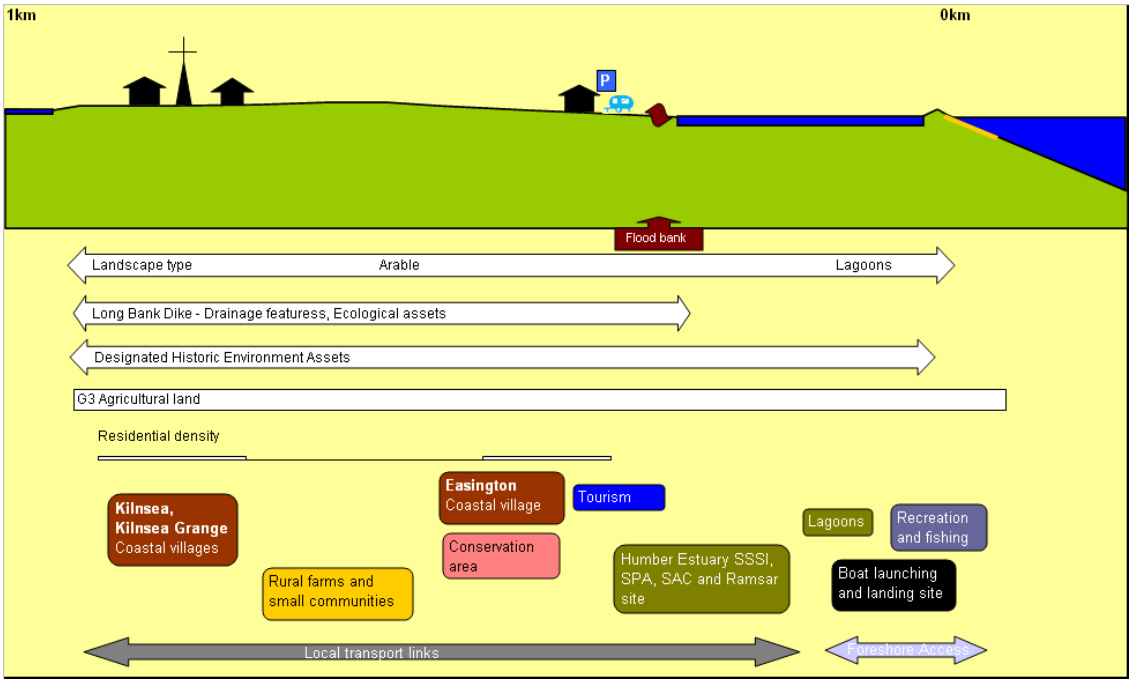
Preferred policy to implement Plan	
From present day to 2025	The conservation value provided by the Easington lagoons European site needs to be maintained. The intent of management is for the Easington Lagoons flood defences to be held in their current position. Limited Managed Realignment may be required to ensure defence sustainability and compliance with applicable environmental legislation by creating habitats to compensate for losses due to coastal squeeze. The Kilnsea flood defence will be held in its current position. No Active Intervention elsewhere allowing undefended cliffs to erode. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.
Medium term 2025 - 2055	The conservation value provided by the Easington lagoons European site needs to be maintained. The intent of management is for the Easington Lagoons flood defences to be held in their current position. Limited Managed Realignment may be required to ensure defence sustainability and compliance with applicable environmental legislation by creating habitats to compensate for losses due to coastal squeeze. The way the Kilnsea flood defence will be managed will be decided by third parties and informed by future studies and monitoring. No Active Intervention policy elsewhere allowing undefended cliffs to erode. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.
Long term 2055 - 2105	The intent of management is to continue to hold the line. Other options may be considered if a hold the line policy is becomes unsustainable. The way the Kilnsea flood defence will be managed will be decided by monitoring, future studies and third party decisions. No Active Intervention elsewhere allowing undefended cliffs to erode. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.

Changes from Present Management

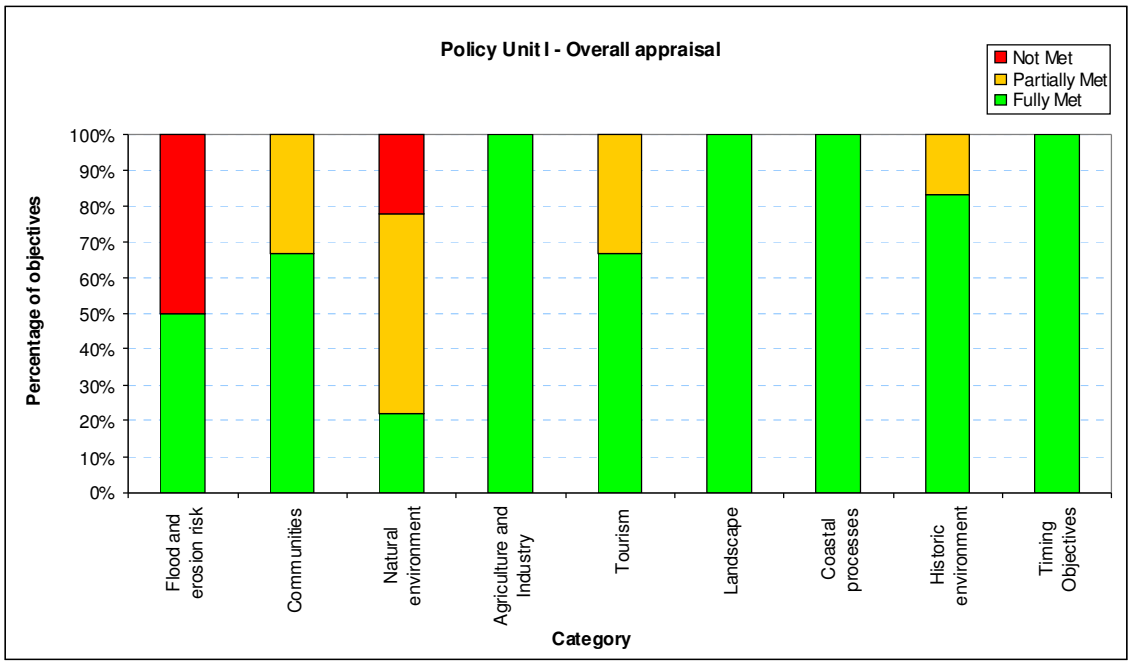
9.104 Present management practices will continue in epoch 1. Limited Managed Realignment may be required to maintain the conservation value of the Easington Lagoons habitat is likely to be required in epoch 1 and 2 to increase defence sustainability and balance the needs of the human, natural and historic environments. The way the Kilnsea flood defence is managed (all epochs) will depend upon the willingness of third parties to maintain and manage the private defence. A No Active Intervention policy will continue for undefended areas in all epochs.

Key Features

9.105 The key features within this policy unit are provided below (Character Area 9 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.106 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. Within this policy unit, there is the potential for the Humber Estuary Special Protection Area and Humber Estuary Ramsar site to be adversely affected.

9.107 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

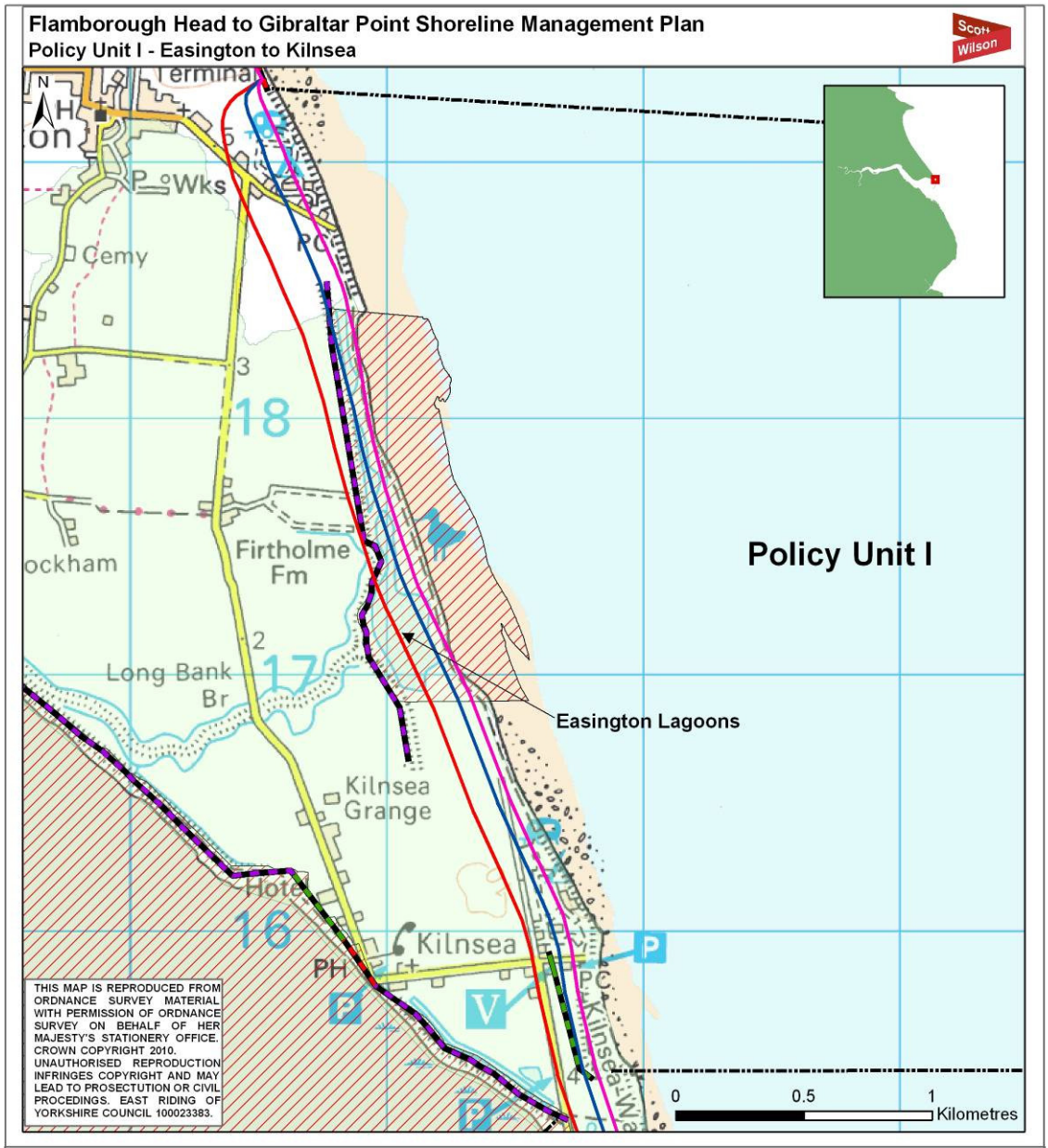
Summary of Water Framework Directive Assessment findings for this policy unit

9.108 The Water Framework Directive Assessment found that no change in the Ecological Potential of the Hull and East Riding groundwater body is anticipated resulting from policies within this policy unit. However, the hold the line policy in epoch 1 may result in adverse impacts on the coastal water body, through beach narrowing and steepening, with a consequent impact on benthic habitats of the coastal water body, this is likely to be mitigated in later epochs by a small-scale managed realignment of defences. Monitoring of cliff recession and beach profiles along the Holderness coast should continue. At the stage when coastal strategies and defence schemes consider design of defences in detail, it should be ensured that impacts on the coastal water body are considered to ensure no negative impact on the coastal water body.

Summary of Economics Appraisal findings for this policy unit

9.109 Marginal economic case for Hold the Line and is subject to further detailed economic assessments at the Strategy level.

Policy Mapping



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P3) for current defences. No Active Intervention elsewhere	Hold the Line (P3) for current defences. No Active Intervention elsewhere	Hold the Line (P3) for current defences. No Active Intervention elsewhere

The policy of No Active Intervention would continue for currently undefended sections through all epochs. At Easington Lagoons and the Kilnsea flood defence, the line will be held in epoch 1 and the intent of management will be to hold the line in epochs 2 and 3, but other options may be considered subject to monitoring of coasal processes, future studies and dependent on third party decisions.To ensure sustainable flood defences, and meet the requirements of environmental legislation, limited Managed Realignment of defences may occur. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets. This process will be informed by the Humber Flood Risk Management Strategy.

Legend

- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Current defences(OtherPriv maintained)
- Current defences(EA maintained)
- Current defences(ERYC maintained)
- Policy Unit boundaries
- Environment Agency Tidal Flood Zone 3
- Scheduled Monuments

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit J: Kilnsea to Spurn Point

Policy Development Zone:	**PDZ2**
Policy Unit:	**J**
Character Area:	**10**
Location reference:	**Kilnsea to Spurn Point**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
J	Kilnsea to Spurn Point	MR	MR or NAI	MR or NAI	The intention is to intervene only when necessary to maintain access to the facilities and Spurn Point. The integrity of the barrier will be maintained until it becomes unsustainable to do so.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Summary of Preferred Plan: Recommendations

9.110 The intent of management for Policy Unit J is to allow the Spurn barrier to evolve largely naturally with as limited intervention as is required to maintain the integrity of the Spurn barrier. The intention is to maintain access to the key facilities and assets at Spurn point, including the RNLI station, whilst causing minimal interruption to the natural environment, coastal processes and the geomorphological functioning of Spurn and the Humber Estuary.

Justification for Recommendations

9.111 There is uncertainty over the future evolution of the Spurn barrier, and changes in the form of Spurn could mean that continuing to repair breaches becomes unsustainable in technical, economic and environmental terms. This would probably be indicated by an increasing and repeated need for intervention beyond that which is considered sustainable. If this occurs it will be necessary to consider withdrawing management and allowing the barrier to evolve entirely naturally.

Appraisal of Impacts

9.112 Due to the dynamic and unique nature of the Spurn barrier, the management intent described above is not captured effectively by any of the standard SMP policies. The closest SMP policy that describes the management intent is Managed Realignment. This would not mean Managed Realignment in its true sense by constructing new defences, but the policy would be to allow the natural evolution and manage the alignment of the barrier, only intervening where necessary to assist the healing of breaches, if they occur. This will be undertaken through generally softer engineering solutions, such as sediment nourishment, to maintain the integrity of the barrier. Road repairs and realignment may also be required to maintain access to the facilities at Spurn Point.

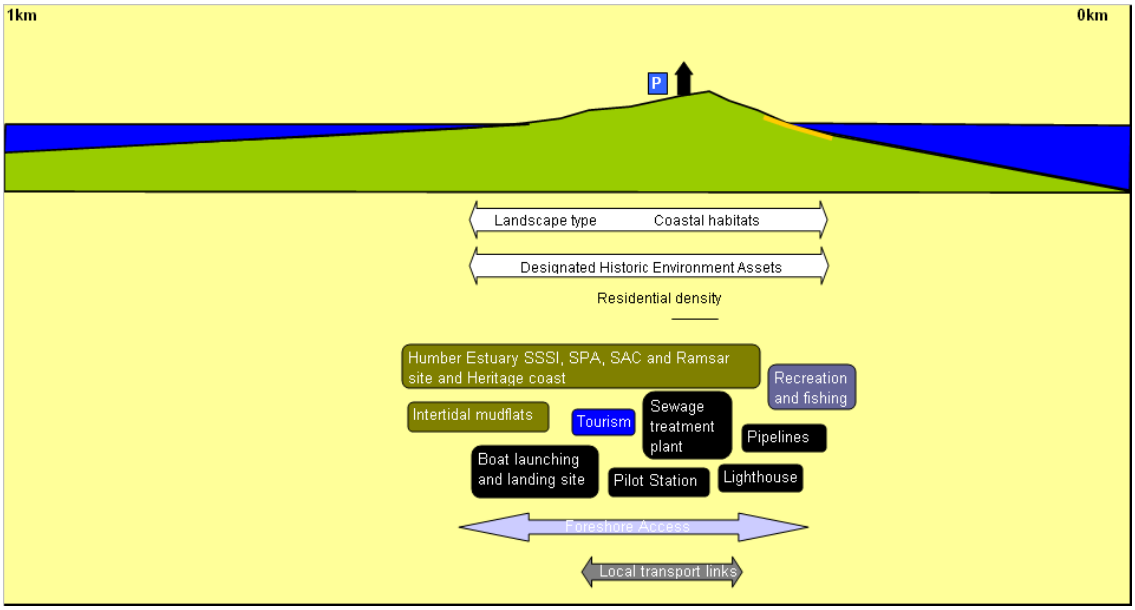
Preferred policy to implement Plan	
From present day to 2025	Allow the Spurn barrier to evolve largely naturally with limited intervention to maintain the barrier's integrity and access to Spurn Point as long as this is sustainable.
Medium term 2025 - 2055	Allow the Spurn barrier to evolve largely naturally with limited intervention to maintain the barrier's integrity and access to Spurn Point as long as this is sustainable. If this becomes unsustainable, management intervention will be withdrawn.
Long term 2055 - 2105	Allow the Spurn barrier to evolve largely naturally with limited intervention to maintain the barrier's integrity and access to Spurn Point as long as this is sustainable. If this becomes unsustainable, management intervention will be withdrawn.

Changes from Present Management

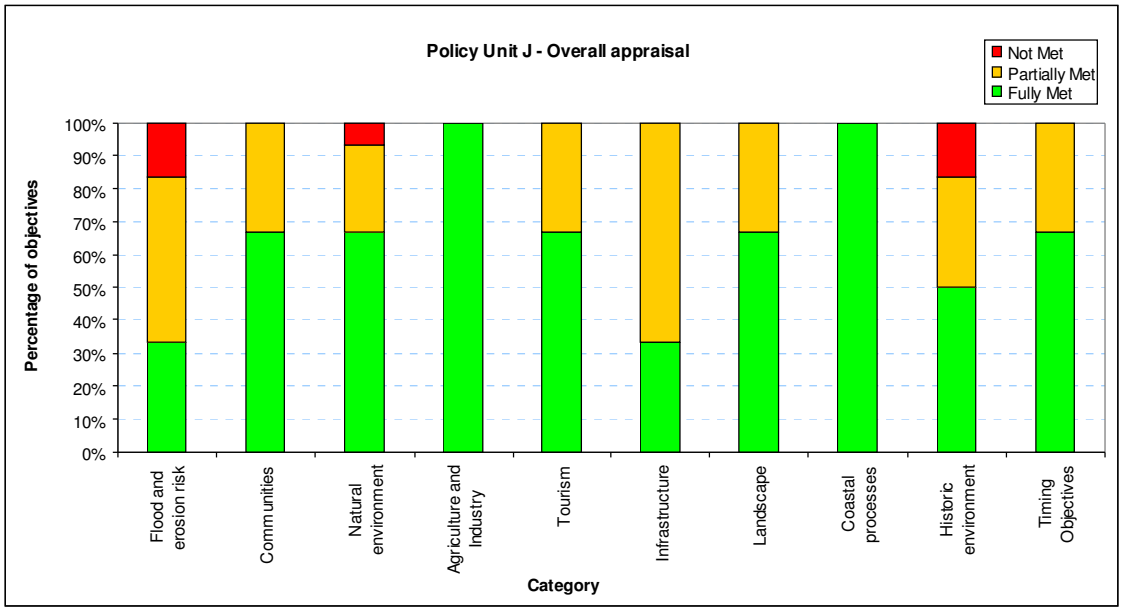
9.113 This policy is no different from the existing management undertaken. However, if intervention to maintain access to facilities and barrier integrity becomes unsustainable, this will be a change from present management. This is unlikely to be in the short term.

Key Features

9.114 The key features within this policy unit are provided below (Character Area 10 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.115 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. Within this policy unit, there is the potential for the Humber Estuary Special Area of Conservation, Humber Estuary Special Protection Area and Humber Estuary Ramsar site to be adversely affected.

9.116 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

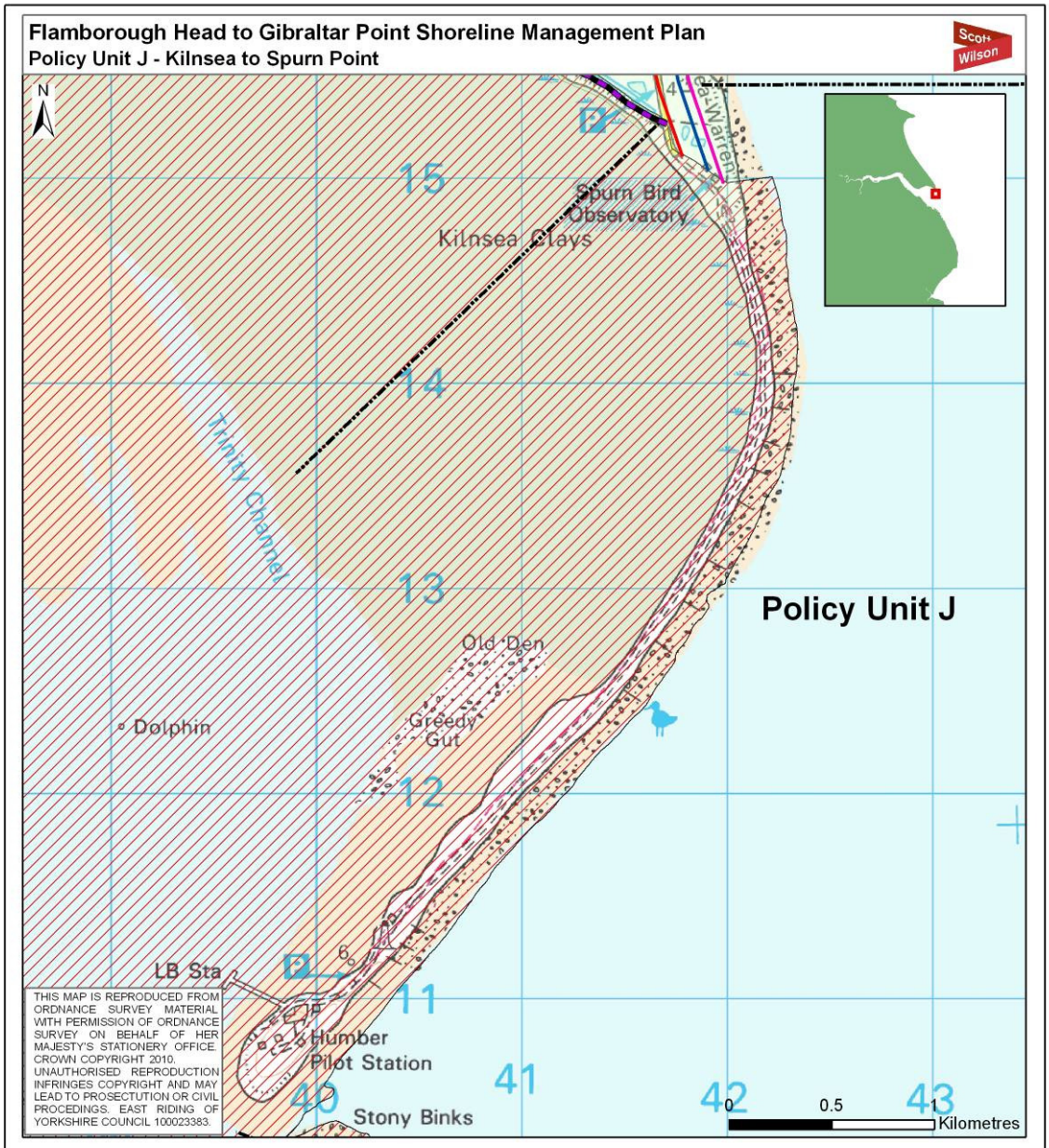
Summary of Water Framework Directive Assessment findings for this policy unit

9.117 The Water Framework Directive Assessment found that no deterioration in the Ecological Potential of the Hull and East Riding inland water bodies, coastal water body, Lower Humber transitional water body or Hull and East Riding groundwater body is anticipated resulting from policies within this policy unit.

Summary of Economics Appraisal findings for this policy unit

9.118 This policy has no costs associated with its implementation. However, it should be noted that losses to assets may occur during the lifetime of the SMP.

Policy Mapping



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Managed Realignment	**Managed Realignment or No Active Intervention**	**Managed Realignment or No Active Intervention**
The intention is to intervene only when necessary to maintain access to the facilities and Spurn Point. The integrity of the barrier will be maintained until it becomes unsustainable to do so.		

Legend

- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit K: Easington Road to Stone Creek

Policy Development Zone:	**PDZ2**
Policy Unit:	**K**
Character Area:	**11**
Location reference:	**Easington Road to Stone Creek**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
K	Easington Road to Stone Creek	HTL (P4)	HTL (P4)	HTL (P4)	The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defences, and meet the requirements of environmental legislation, limited Managed Realignment of defences may occur. Detailed studies will identify sites which will be in the order of 100 hectares for epochs 1 and 2 combined. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets. This process will be informed by the Humber Flood Risk Management Strategy.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Codes in brackets refer to the future intent of flood risk management

- P2 – Reduce existing flood risk management actions, accepting increase of risk over time.
- P3 – Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this baseline.
- P4 – Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from climate change).

- P5 – Take further action to reduce flood risk.

Summary of Preferred Plan: Recommendations

9.119 The management intent for Policy Unit K is to continue providing sustainable flood protection to assets in the floodplain.

Justification for Recommendations

9.120 This approach is needed to balance the needs of the human, natural and historic environments, including the requirements of applicable legislation.

Appraisal of Impacts

9.121 This management intent will be achieved by a Hold the Line policy. There is provision for limited Managed Realignment to ensure defence sustainability and compliance with current environmental legislation for all epochs. The current standard of protection against flooding will be maintained for assets behind the defences. This policy is shown to be preferable over a pure policy of Hold the Line (P3 or P4) with no Managed Realignment. This is because it provides potential for adjustments to the alignment of defences which will be necessary to ensure flood protection can be sustained for the majority of valuable assets in the flood plain. This policy will also allow current environmental legislation to be met, by creating habitats to compensate for losses due to coastal squeeze elsewhere in the outer Humber.

9.122 By ensuring sustainable flood protection to the majority of the floodplain assets, including the majority of agricultural land, there will be a loss of some grade 1 and 2 agricultural land; however, any Managed Realignment of defences will not affect property, known designated or significant historic environment assets or key infrastructure. Managed Realignment areas will be identified by detailed studies. The approximate defence alignments identified in the Humber Flood Risk Management Strategy were adopted for SMP appraisal purposes. This equates to a Managed Realignment area in the order of 100 hectares for this policy unit for epochs 1 and 2 combined. This has been undertaken to provide indicative scoring of this policy, but it should be recognised that impacts and benefits will vary depending on specific defence alignments adopted.

9.123 In the longer term (epoch 3), increased management activity may be required to carry out this policy. This is to ensure defence sustainability and compliance with applicable environmental legislation by creating habitats to compensate for losses due to coastal squeeze. There is significant uncertainty about the long term rate of sea level rise and the response of the inter-tidal area and the role of the flood defences. A decision to either hold the line or realign alone would have very large consequences and it is appropriate to define a policy of hold the line with limited managed realignment to ensure defence sustainability and compliance with applicable legislation.

Preferred policy to implement Plan	
From present day to 2025	The intent of management is for the flood defences to be held in their current position. The defences will maintain the present standard of protection against flooding. Limited Managed Realignment may be required to ensure defence sustainability and compliance with applicable environmental legislation by creating habitats to compensate for losses due to coastal squeeze. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.

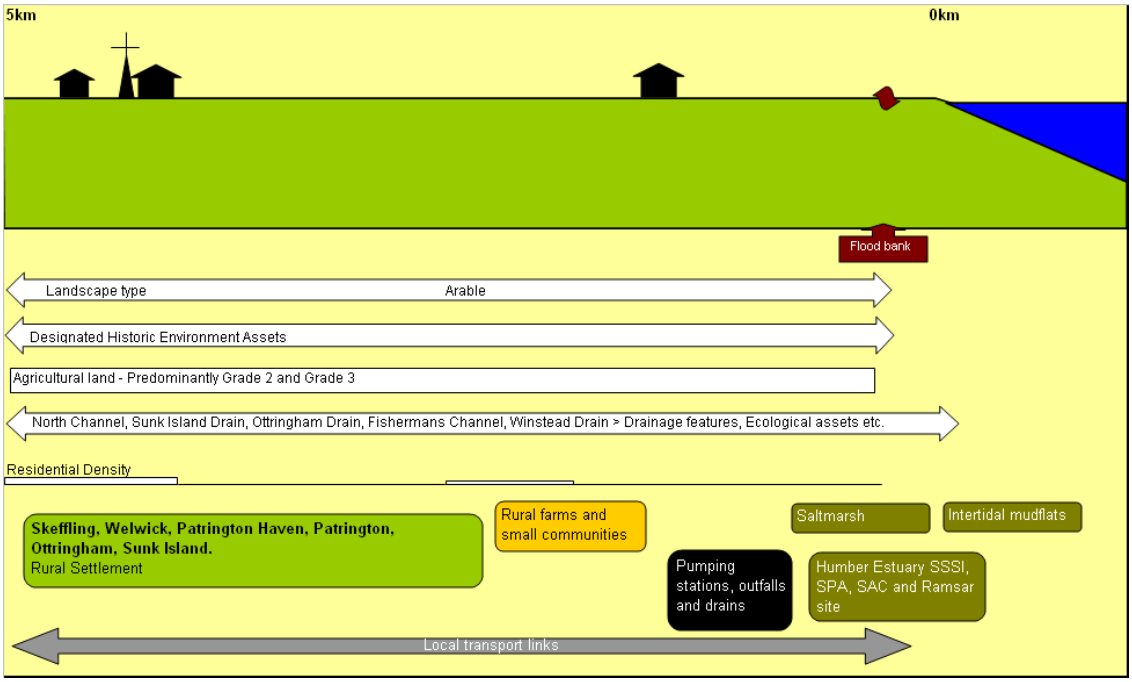
Medium term 2025 - 2055	The intent of management is for the flood defences to be held in their current position. The defences will maintain the present standard of protection against flooding. Limited Managed Realignment may be required to ensure defence sustainability and compliance with applicable environmental legislation by creating habitats to compensate for losses due to coastal squeeze. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.
Long term 2055 - 2105	The intent of management is for the flood defences to be held in their current position. The defences will maintain the present standard of protection against flooding. Limited Managed Realignment may be required to ensure defence sustainability and compliance with applicable environmental legislation by creating habitats to compensate for losses due to coastal squeeze. Other options may be considered if a hold the line policy becomes unsustainable. The way the flood defence will be managed will be decided by monitoring, future studies and third party decisions. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.

Changes from Present Management

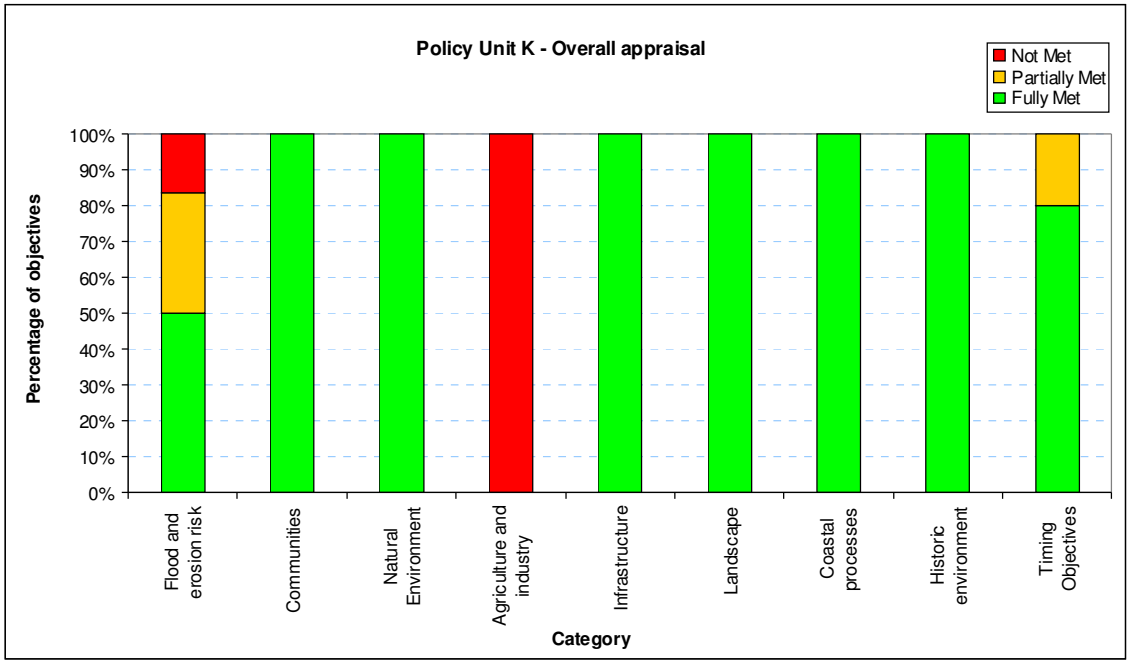
9.124 Defences are presently managed to protect floodplain assets from flooding. As sea levels rise in the future there will be increased pressure on the defences and limited Managed Realignment will be required to ensure flood protection remains sustainable. This policy will ensure flood protection can be sustained over the longer term for the majority of assets, including settlements, known significant and designated historic environment features and the majority of high grade agricultural land. The environmental benefits that result will also help meet the requirements of statutory habitats legislation by compensating for the loss of designated habitats due to coastal squeeze in the outer Humber.

Key Features

9.125 The key features within this policy unit are provided below (Character Area 11 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.126 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. Within this policy unit, there is the potential for the Humber Estuary Special Area of Conservation, Humber Estuary Special Protection Area and Humber Estuary Ramsar site to be adversely affected.

9.127 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

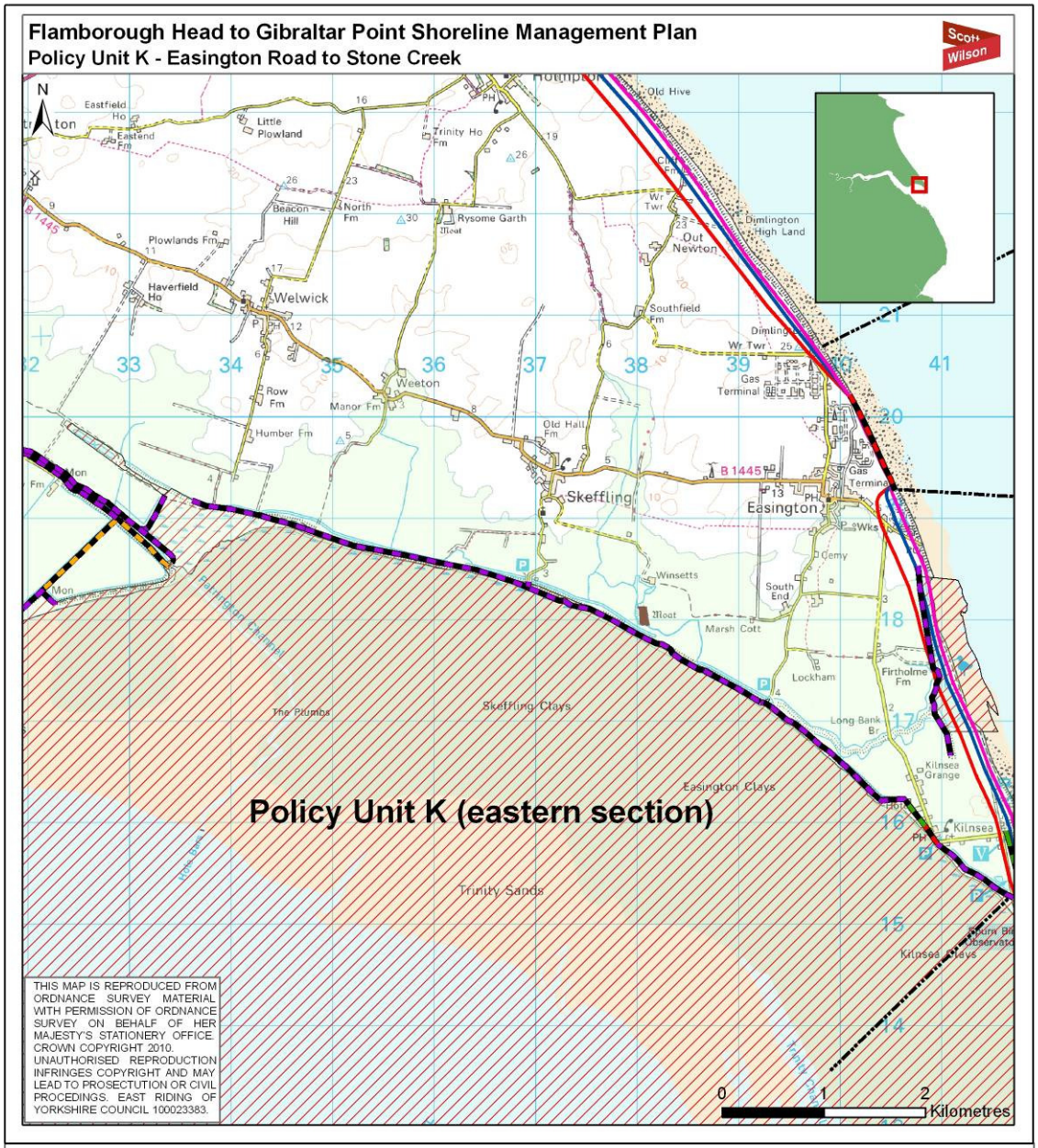
Summary of Water Framework Directive Assessment findings for this policy unit

9.128 The Water Framework Directive Assessment found that no change in the Ecological Potential of the Lower Humber transitional water body or Hull and East Riding groundwater body is anticipated resulting from policies within this policy unit. However, the hold the line policy with some localised areas of managed realignment policy may result in adverse impacts on the Hull and East Riding inland water bodies, through changes to the saltwater/freshwater interface which would impact the ecology of the individual streams.

Summary of Economics Appraisal findings for this policy unit

9.129 The economic appraisal found that the policy will generate benefits which clearly outweigh the costs.

Policy Mapping



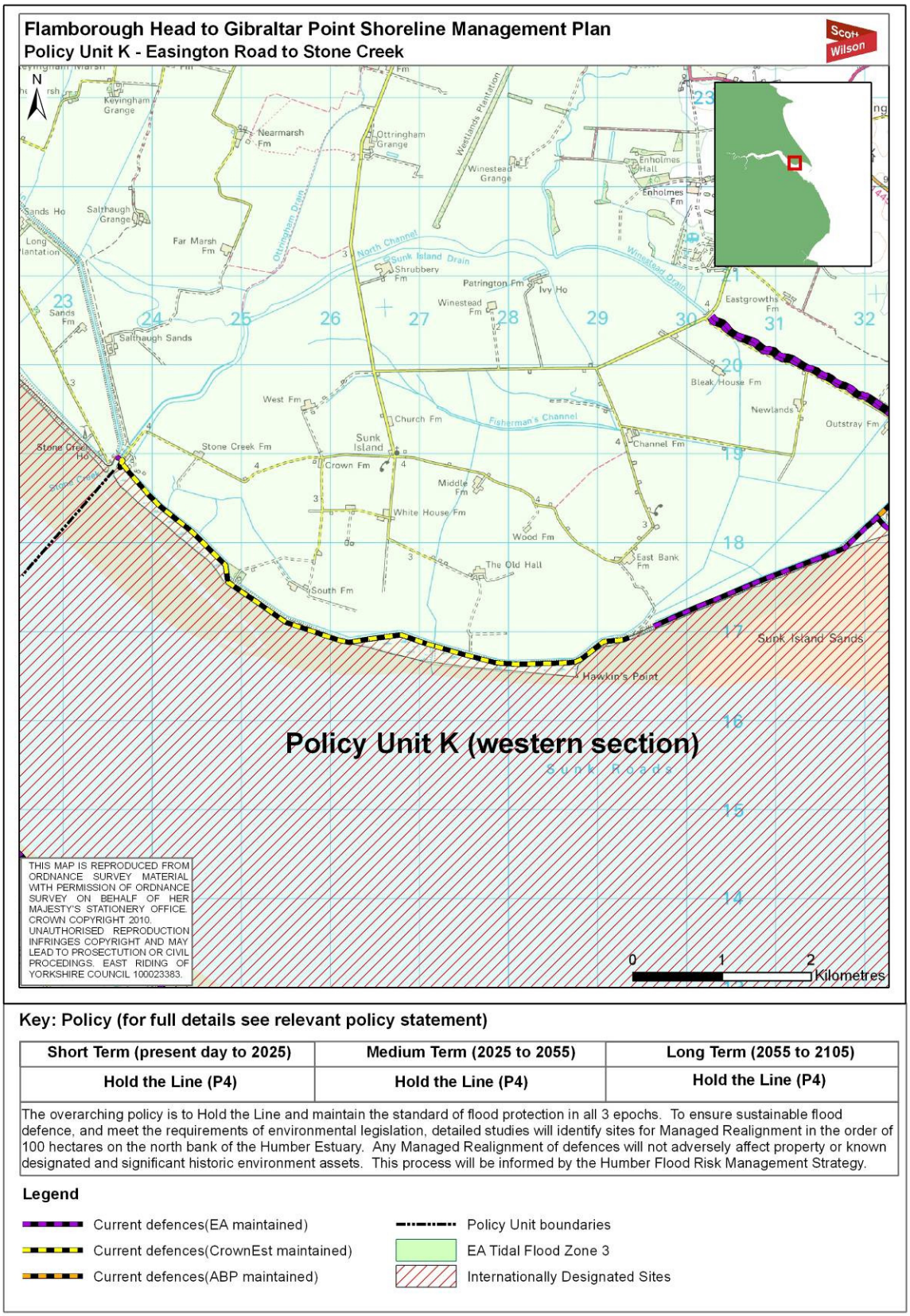
Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**

The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defence, and meet the requirements of environmental legislation, detailed studies will identify sites for Managed Realignment in the order of 100 hectares on the north bank of the Humber Estuary. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets. This process will be informed by the Humber Flood Risk Management Strategy.

Legend

- Current defences(OtherPriv maintained)
- Current defences(ERYC maintained)
- Current defences(EA maintained)
- Current defences(ABP maintained)
- Internationally Designated Sites
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments
- EA Tidal Flood Zone 3



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defence, and meet the requirements of environmental legislation, detailed studies will identify sites for Managed Realignment in the order of 100 hectares on the north bank of the Humber Estuary. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets. This process will be informed by the Humber Flood Risk Management Strategy.		

Legend

- Current defences(EA maintained)
- Current defences(CrownEst maintained)
- Current defences(ABP maintained)
- Policy Unit boundaries
- EA Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit L: East Immingham to Cleethorpes

Policy Development Zone:	**PDZ3**
Policy Unit:	**L**
Character Area:	**12 / 13a**
Location reference:	**East Immingham to Cleethorpes**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
L	Immingham to Cleethorpes	HTL (P4)	HTL (P4)	HTL (P4)	The defences will be held in their current position and their function will be maintained.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Codes in brackets refer to the future intent of flood risk management

- P2 – Reduce existing flood risk management actions, accepting increase of risk over time.
- P3 – Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this baseline.
- P4 – Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from climate change).
- P5 – Take further action to reduce flood risk.

Summary of Preferred Plan: Recommendations

9.130 The intent of management of Policy Unit L will be to maintain protection to the significant industry, port and residential areas present in the coastal hinterland.

Justification for Recommendations

9.131 The preferred policy has been recommended in order to maintain the flood defences to sustain the viability of industry, port and residential areas present.

Appraisal of Impacts

9.132 This management intent will be achieved through a Hold the Line policy in all epochs. Defences will prevent erosion and will be maintained and upgraded to continue the present standard of protection against flooding despite sea level rise. Significant upgrades and

defence maintenance is likely to be required as the foreshore will continue to lower and defences will come under increasing pressure.

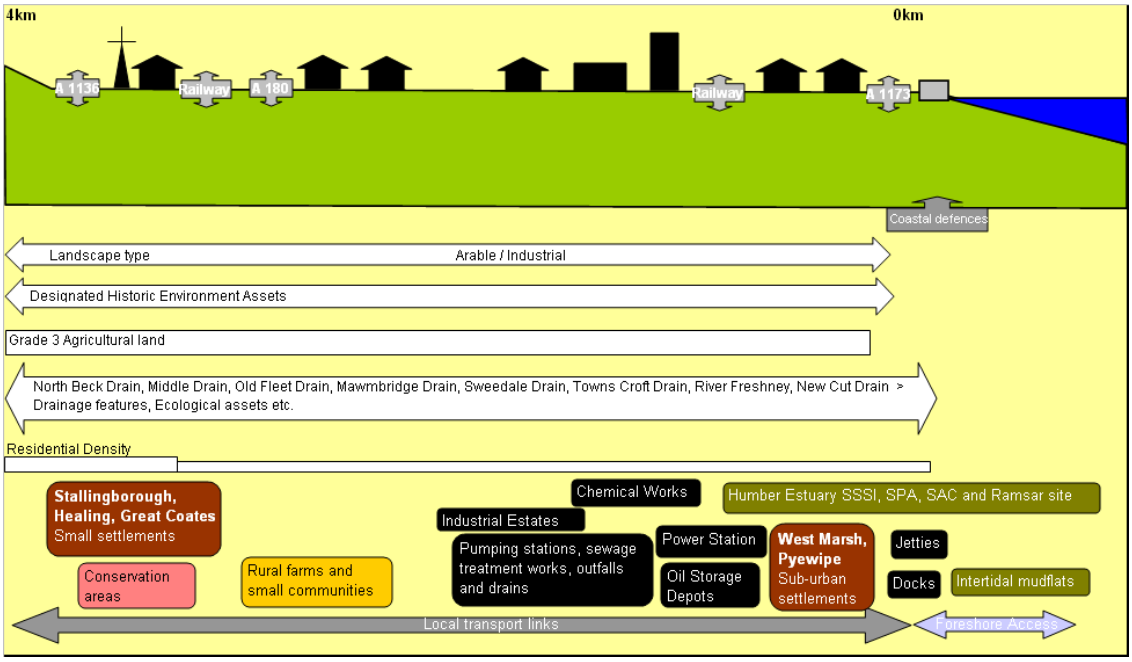
Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their function will be maintained.
Medium term 2025 - 2055	The defences will be held in their current position and their function will be maintained.
Long term 2055 - 2105	The defences will be held in their current position and their function will be maintained.

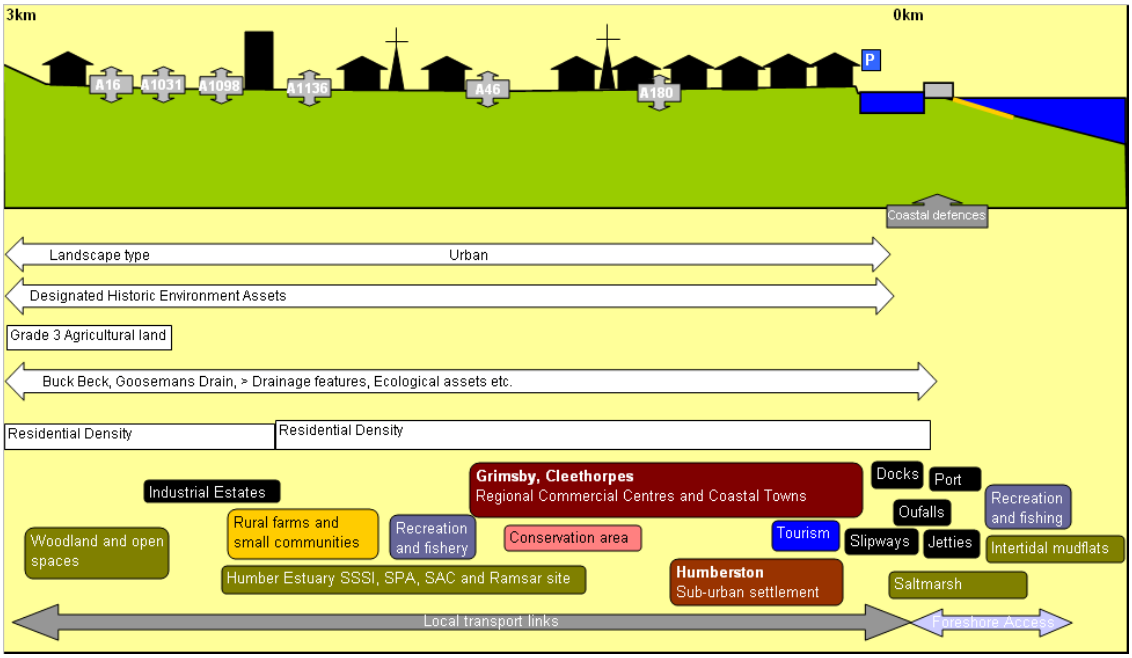
Changes from Present Management

9.133 For all three epochs there is no change from the existing policy.

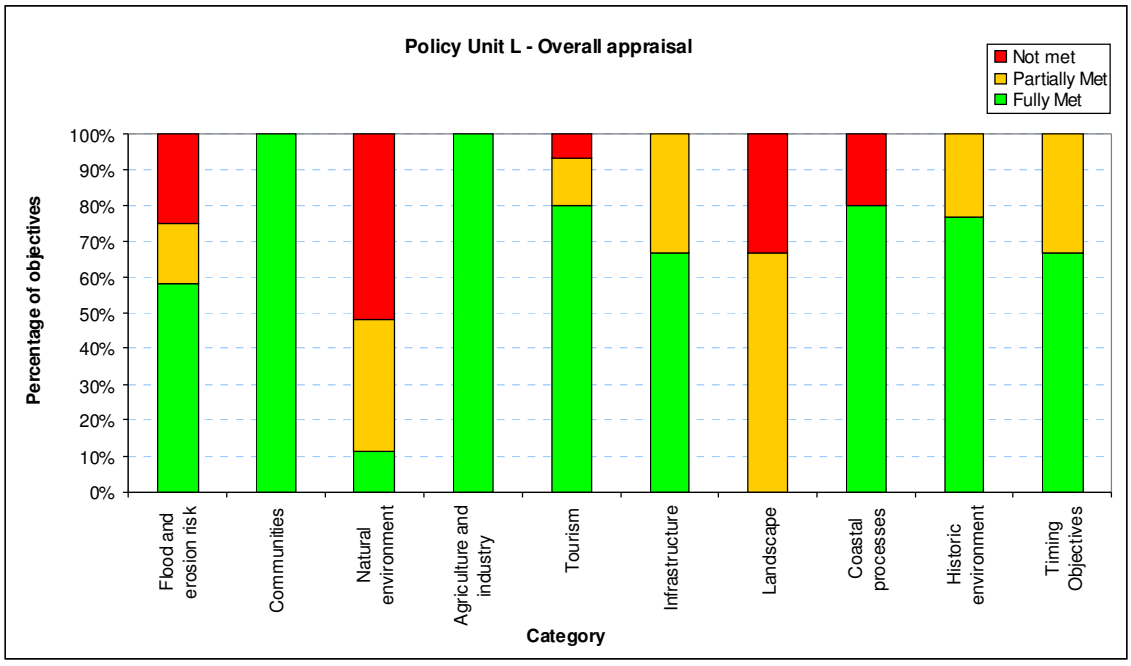
Key Features

9.134 The key features within this policy unit are provided below (Character Areas 12 and 13a schematic showing features).





Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.135 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. Within this policy unit, there is the potential for the Humber Estuary Special Area of Conservation, Humber Estuary Special Protection Area and Humber Estuary Ramsar site to be adversely affected.

9.136 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

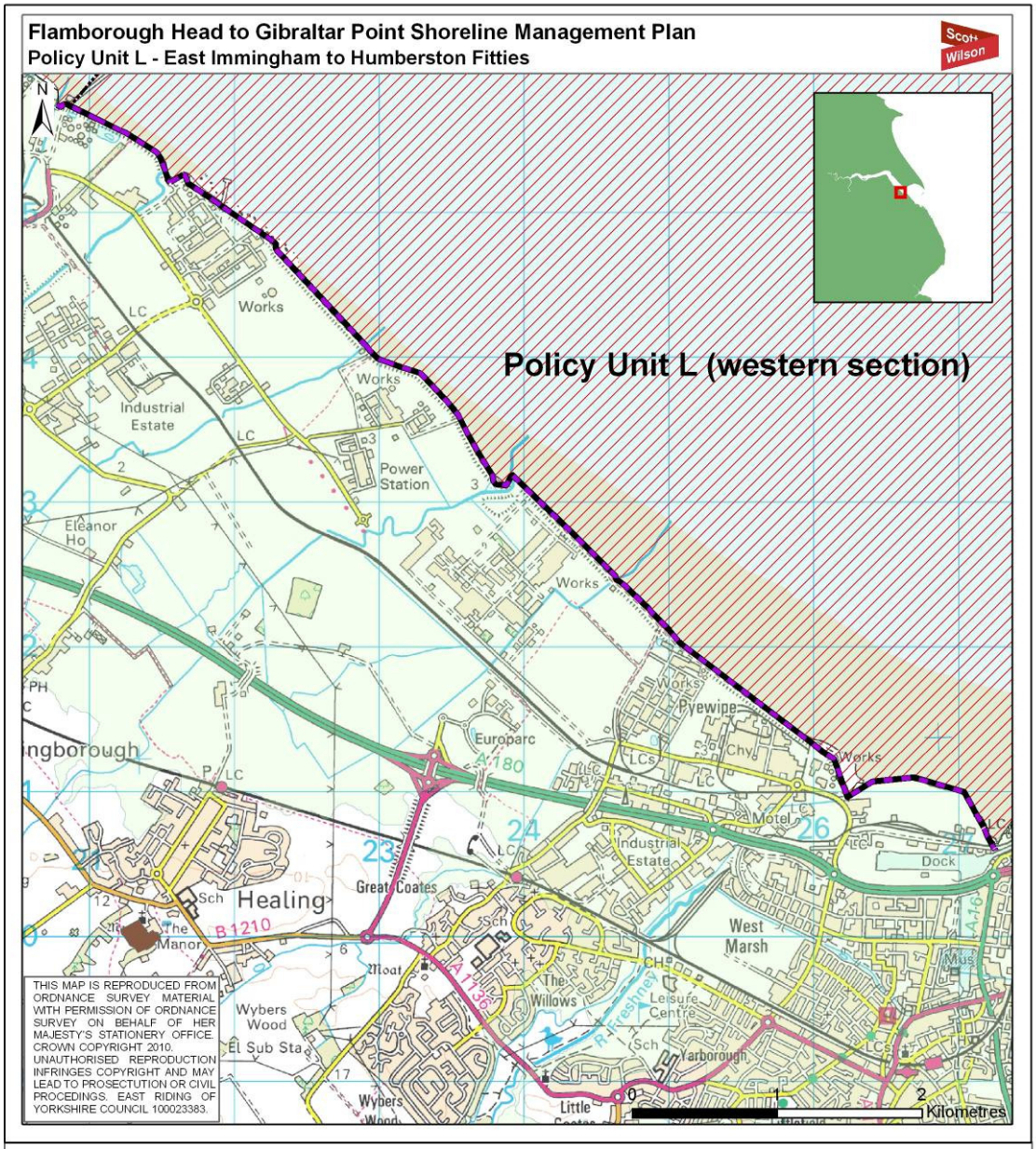
Summary of Water Framework Directive Assessment findings for this policy unit

9.137 The Water Framework Directive Assessment found that no change in the Ecological Potential of the Louth, Grimsby and Ancholme inland water bodies or Grimsby, Ancholme, Louth groundwater body is anticipated resulting from policies within this policy unit. However, the hold the line policy may result in adverse impacts on the Lower Humber transitional water body, through beach narrowing and steepening, with a consequent impact on seabed habitats of the transitional water body.

Summary of Economics Appraisal findings for this policy unit

9.138 The economic appraisal found that the policy will generate benefits which clearly outweigh the costs.

Policy Mapping

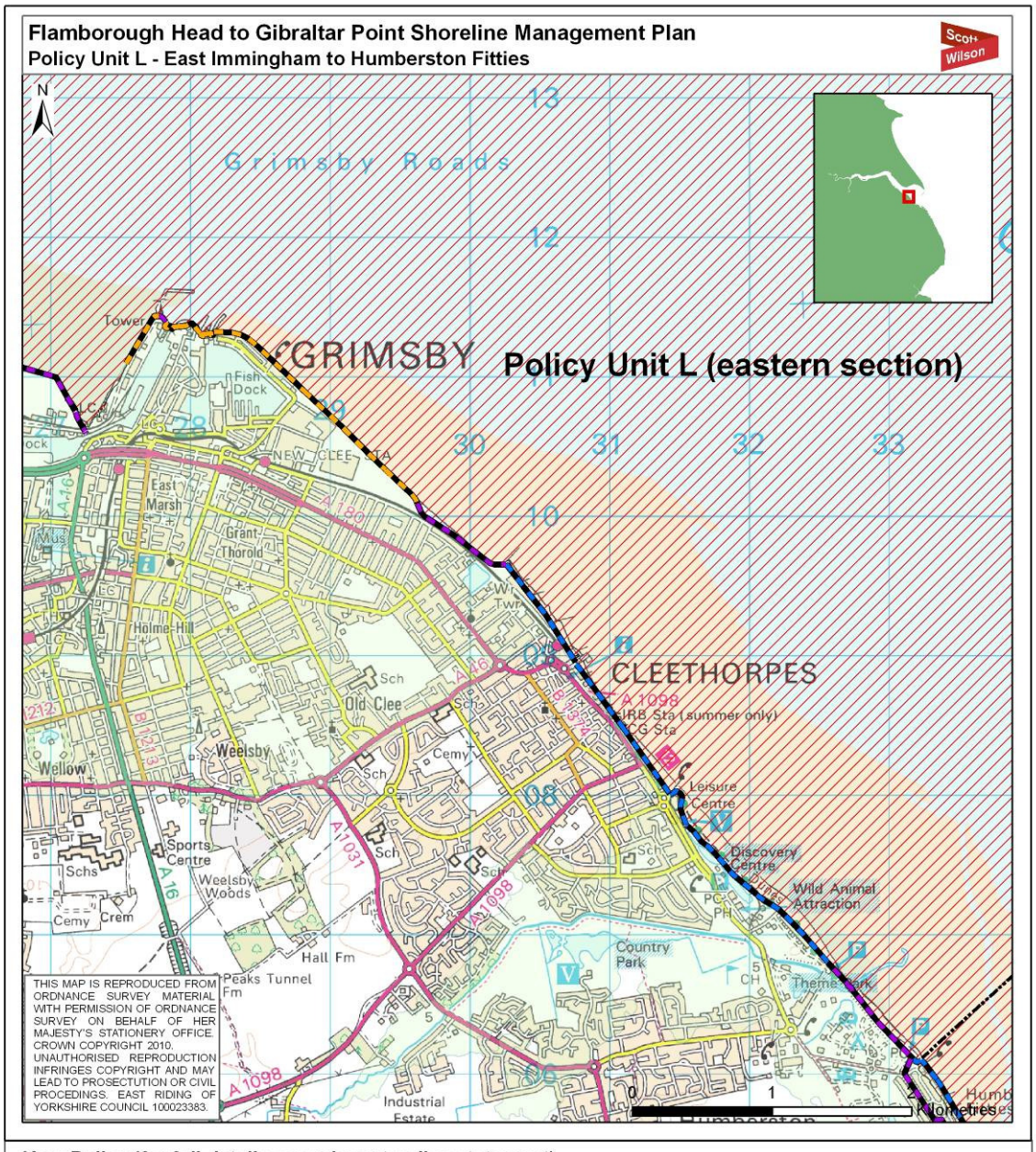


Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
The defences will be held in their current position and their function will be maintained.		

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- EA Tidal Flood Zone 3
- Internationally Designated Sites



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
The defences will be held in their current position and their flood defence function will be maintained.		

Legend

- Current defences(EA maintained)
- Current defences(NELC maintained)
- Current defences(ABP maintained)
- Policy Unit boundaries
- Scheduled Monuments
- EA Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit M: Humberston Fitties

Policy Development Zone:	**PDZ3**
Policy Unit:	**M**
Character Area:	**13b**
Location reference:	**Humberston Fitties**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
M	Humberston Fitties	HTL (P3 for the front line) (P4 for the second line.)	HTL (P3 for the front line) (P4 for the second line.)*	HTL (P4 for the second line of defence)	*The Policy for the Chalet Park will be subject to further policy evaluation.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Codes in brackets refer to the future intent of flood risk management

- P2 – Reduce existing flood risk management actions, accepting increase of risk over time.
- P3 – Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this baseline.
- P4 – Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from climate change).
- P5 – Take further action to reduce flood risk.

Summary of Preferred Plan: Recommendations

9.139 The management intent for Policy Unit M is to continue providing sustainable flood protection to assets in the floodplain, whilst balancing the needs of the human, natural and historic environments, including requirements of applicable legislation.

Justification for Recommendations

9.140 It needs to be recognised that North East Lincolnshire Council has permissive powers under the Coastal Protection Act 1949 and currently manages the front line defences. The wider responsibilities extend to maintaining a viable economy (e.g. tourism) and for statutory planning (the Fitties is a Conservation Area). Significantly, responsibilities under the international habitat regulations are of paramount importance here. A degrading defence with degenerating area behind is also a significant threat to health and safety, the tourist economy and ecosystems of the Humber. All these issues will need to be evaluated before a decision can be made about the level of protection to be maintained after epoch 2 along this area of coast.

Appraisal of Impacts

9.141 The floodplain is currently protected by two lines of defence. The first line of defence consists of a flood bank fronted by a groyne field. The second line of defence consists of a floodbank through Humberston Fitties Chalet Park.

9.142 For epoch 1, the intent of management will be achieved by a Hold the Line policy for all defences. The first line of flood defences will be maintained at their present crest level, maintaining the existing standard of protection to the Humberston Fitties Chalet Park. The second line of defences will be maintained and raised to continue the present day standard of protection to the floodplain.

9.143 The same policy approach will be maintained into epoch 2 but it is understood that rising sea levels may effectively diminish the standard of defence for the front line of defences. The Fitties Chalet Park is recognised as an important local landmark and destination for tourists. It is a holiday destination and during epoch 2 it will be necessary to evaluate the overall feasibility of maintaining the defences against alternative strategies for reducing the threat that sea level rise poses to human life including the wider economic consequences of not maintaining the defences, particularly as they affect the Fitties.

9.144 In epoch 3 the second line of defence will be maintained and raised to counter sea level rise and will continue to ensure a very good standard of flood protection is provided. By epoch 3, the approach needed with regard to the Chalet park will need to have been decided. The approach will be developed involving all interested parties in the community and those with a responsibility for ensuring a satisfactory outcome can be brought about whilst allowing sufficient time for adaptation.

Preferred policy to implement Plan	
From present day to 2055	The defences will be held in their current position. The first line of defences will be maintained at current crest levels. The second line of defence in the Chalet Park will be improved as necessary to counter potential sea level rise. During this period the overall feasibility of maintaining into the long term the current standards of defence for the Fitties between the first and second lines of defence will be reviewed. Alternatives to the current approach of maintaining these defences will be discussed and evaluated through partnership working with those immediately affected and those public bodies responsible for bringing about practical solutions.
Long term 2055 - 2105	The second line of defences will be held in their current position and their function and the standard of protection against flooding will be maintained. The future strategy for the Fitties Chalet park will have been

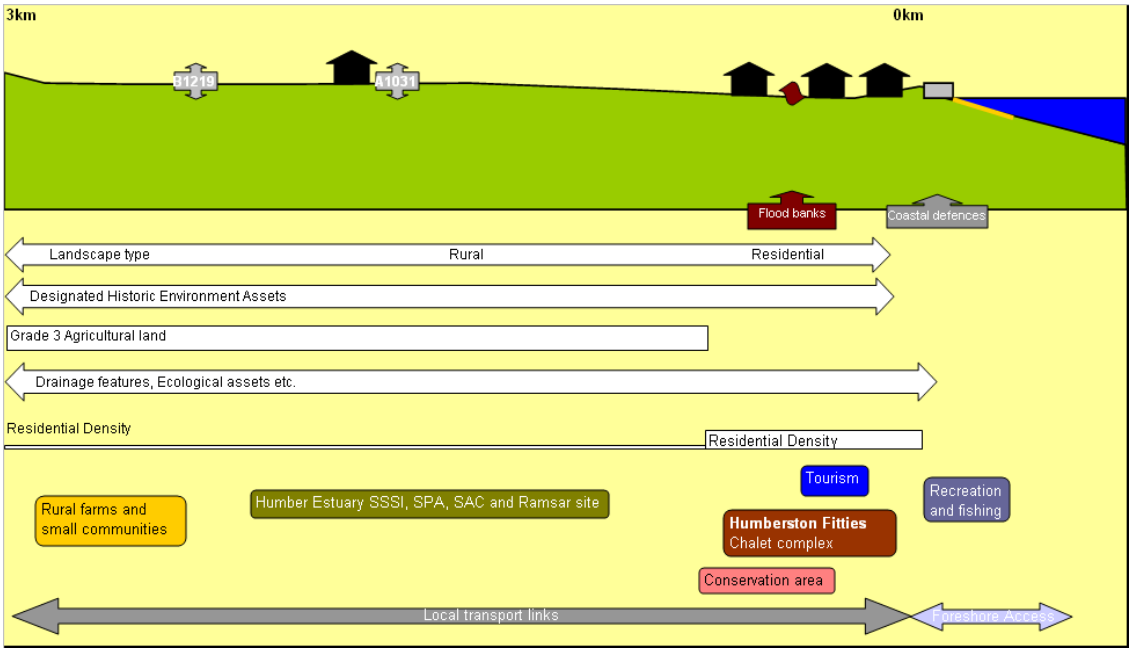
	decided.

Changes from Present Management

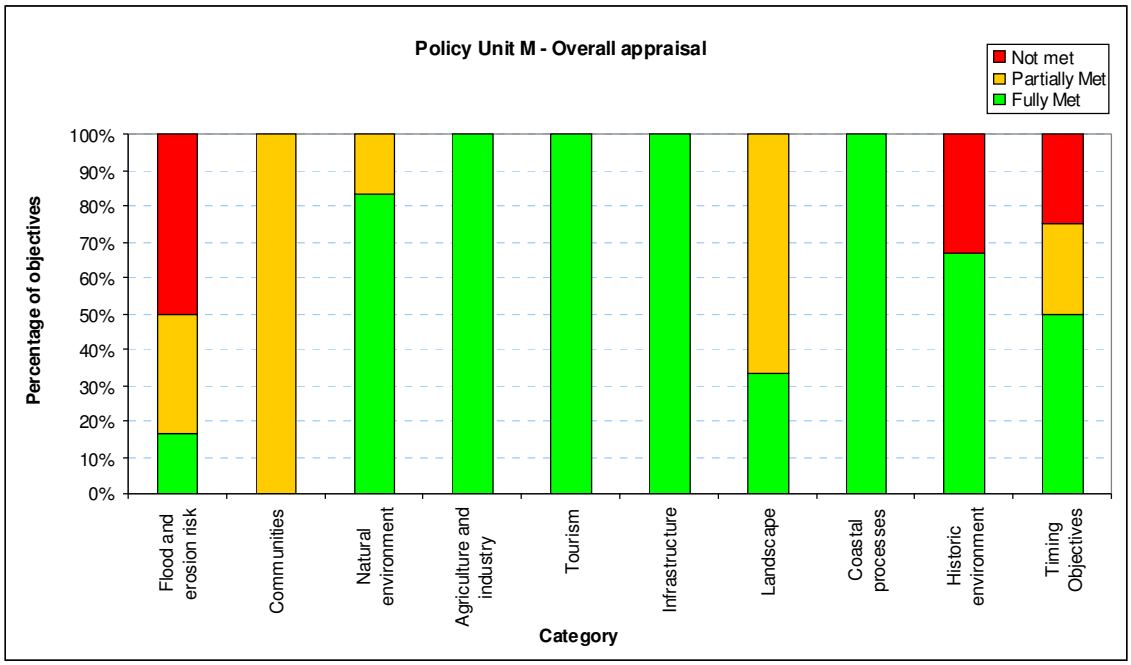
9.145 The present management approach to protect assets against flooding will continue but in the longer term, will require an examination of practical alternatives to maintaining defences for the Fitties Chalet park.

Key Features

9.146 The key features within this policy unit are provided below (Character Area 13b schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.147 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. Within this policy unit, there is the potential for the Humber Estuary Special Area of Conservation, Humber Estuary Special Protection Area and Humber Estuary Ramsar site to be adversely affected.

9.148 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

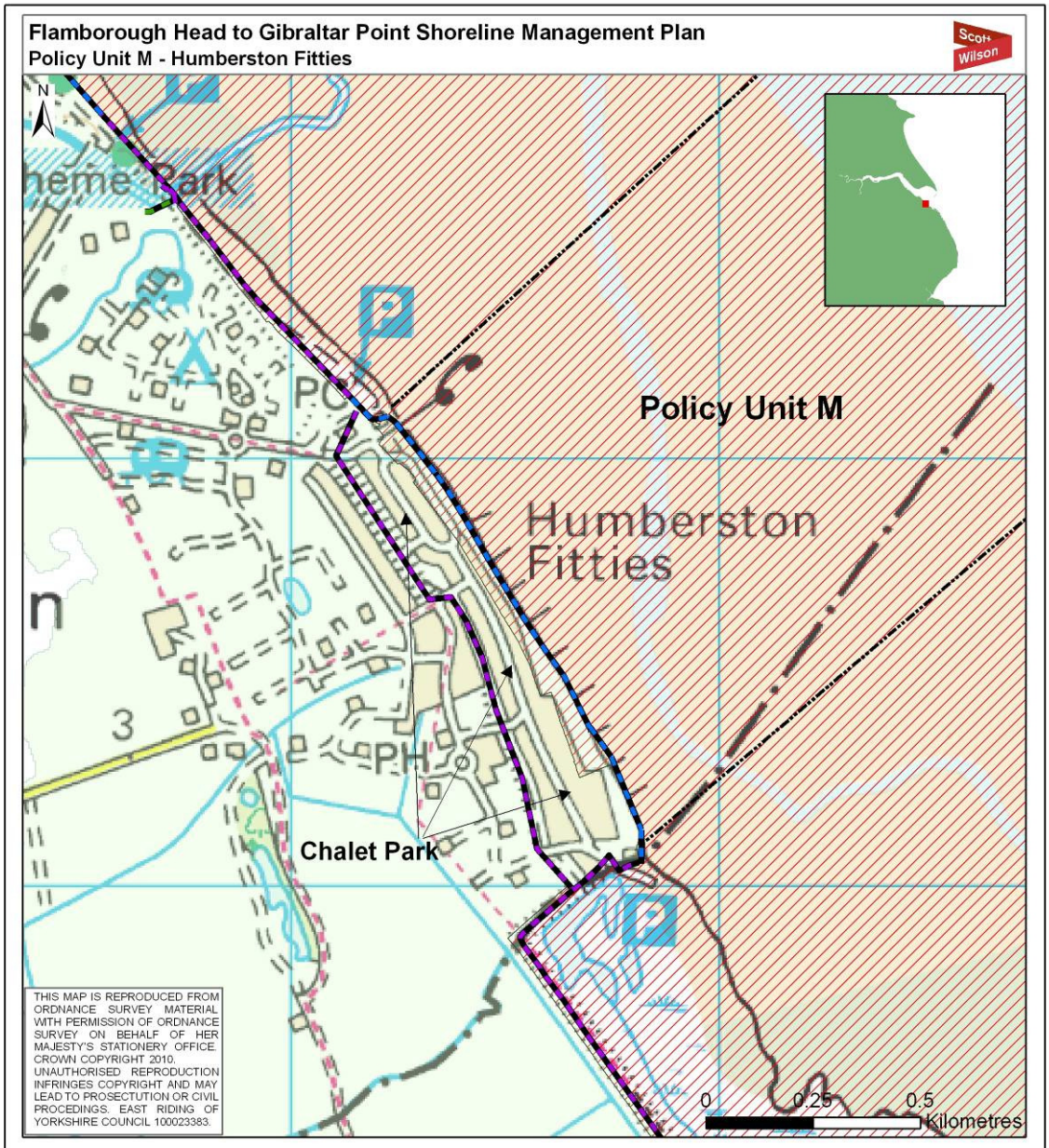
Summary of Water Framework Directive Assessment findings for this policy unit

9.149 The Water Framework Directive Assessment found that no change in the Ecological Potential of the Louth, Grimsby and Ancholme inland water bodies or Grimsby, Ancholme, Louth groundwater body is anticipated resulting from policies within this policy unit in epoch 1. However, the hold the line policy may result in adverse impacts on the Lower Humber transitional water body, through beach narrowing and steepening, with a consequent impact on seabed habitats of the transitional water body in epoch 1. In epochs 2 and 3, the impact depends upon future decisions in regard to the front line of defence.

Summary of Economics Appraisal findings for this policy unit

9.150 The economic appraisal found that the policy will generate benefits which clearly outweigh the costs.

Policy Mapping



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P3) for the front line and P4 for the second line.	**Hold the Line (P3) for the front line and P4 for the second line.**	**Hold the Line (P4) for the second line of defence**
The Policy for the Chalet Park will be subject to further policy evaluation.		

Legend

- Current defences(NELC maintained)
- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Internationally Designated Sites
- EA Tidal Flood Zone 3

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit N: South of Humberston Fitties to Theddlethorpe St Helen

Policy Development Zone:	**PDZ4**
Policy Unit:	**N**
Character Area:	**14 / 15**
Location reference:	**South of Humberston Fitties to Theddlethorpe St Helen**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
N	South of Humberston Fitties to Theddlethorpe St Helen	HTL (P4)	HTL (P4)	HTL (P4)	The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defences, and meet the requirements of current environmental legislation, limited Managed Realignment of defences may occur. Detailed studies will identify sites which will be in the order of 100 hectares of habitat on the south bank of the outer estuary in epochs 1 and 2 combined. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets and will be informed by the Humber Flood Risk Management Strategy.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Codes in brackets refer to the future intent of flood risk management

- P2 – Reduce existing flood risk management actions, accepting increase of risk over time.
- P3 – Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this baseline.
- P4 – Take further action to sustain the current

level of flood risk into the future (responding to the potential increase in risk from climate change).

- P5 – Take further action to reduce flood risk.

Summary of Preferred Plan: Recommendations

9.151 The management intent for Policy Unit N is to continue providing sustainable flood protection to assets in the floodplain, whilst balancing the needs of the human, natural and historic environment, including the requirements of applicable legislation.

Justification for Recommendations

9.152 This approach is needed to balance the needs of the human, natural and historic environment, including the requirements of applicable legislation. This is because it provides potential for adjustments to the alignment of defences which may be necessary to ensure flood protection can be sustained for the majority of valuable assets in the flood plain and so requirements of applicable environmental legislation can be met, by creating habitats to compensate for losses due to coastal squeeze if they are required.

Appraisal of Impacts

9.153 This management intent will be achieved by a Hold the Line policy. There is provision for limited Managed Realignment to ensure defence sustainability and compliance with current environmental legislation for all epochs. The current standard of protection against flooding will be maintained and sustained in response to sea level rise. This will ensure all people and property are protected and will also protect the large majority of extensive and productive agricultural land. The important tourism industry in this area will not be adversely affected in terms of flood risk.

9.154 This area receives an input of sediment from the Holderness cliffs; currently the upper foreshore is accreting whilst the lower foreshore is retreating within the Outer Humber Estuary. The net result is projected inter-tidal habitat losses. For this Hold the Line policy to be achievable it will be necessary to provide compensation for habitat loss due to defence works and rising sea levels. The amount of these losses have been identified and allowed for (in epochs 1 and 2) as part of the Environment Agency's approved Humber Flood Risk Management Strategy, and have been adopted for SMP appraisal purposes. Compensatory habitat creation of approximately 200 hectares in the Outer Estuary, seaward of a line from Hawkins Point to Grimsby will be sufficient to compensate for predicted habitat losses due to sea level rise in the first two epochs combined. Of this, approximately 100 hectares is currently predicted to be required on the south bank of the outer estuary.

9.155 Sand dunes form effective natural defences and these are supplemented by flood embankments. The defence provided by the dunes will be maintained largely through natural processes; however, flood embankments will require upgrading and improvement over time to counter rising sea levels. This also forms part of the Environment Agency's approved Humber Flood Risk Management strategy

9.156 In the longer term (epoch 3), increased management activity may be required to carry out this policy as the accretion trend is likely to slow and potentially reverse to an erosional trend. This is expected as sea level rise is predicted to accelerate and this may begin to outpace the deposition of sediment derived from the Holderness cliffs. There is significant uncertainty about the long term rate of sea level rise and the response of the inter-tidal area and the role of

the flood defences. A decision to either hold the line or realign alone would have very large consequences and it is appropriate to define a policy of hold the line with limited managed realignment to ensure defence sustainability and compliance with applicable legislation.

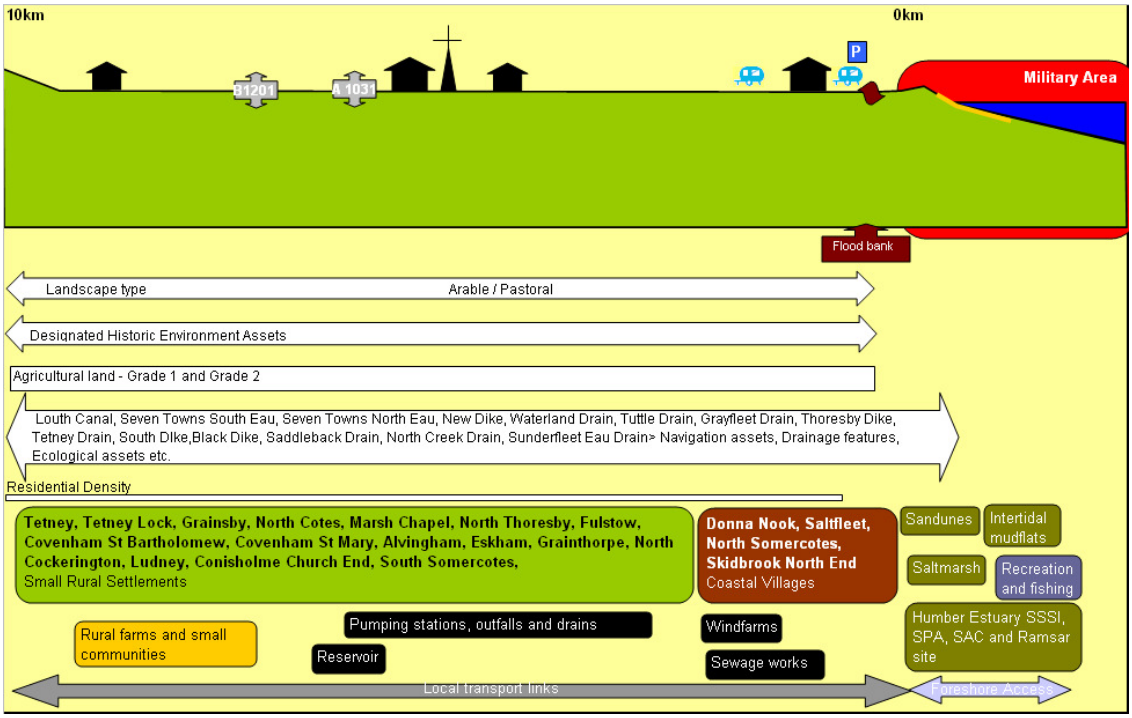
Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their flood defence function will be maintained. Dunes will continue to provide natural flood protection supplemented by flood embankments. Embankments may be raised and improved to counter sea level rise as required, to maintain the standard of protection. Intertidal habitat balances will need to be maintained.
Medium term 2025 - 2055	The defences will be held in their current position and their flood defence function will be maintained. Dunes will continue to provide natural flood protection supplemented by flood embankments. Embankments may be raised and improved to counter sea level rise as required, to maintain the standard of protection. Intertidal habitat balances will need to be maintained.
Long term 2055 - 2105	The defences will be held in their current position and their flood defence function will be maintained. Dunes will continue to provide natural flood protection supplemented by flood embankments. Embankments may be raised and improved to counter sea level rise as required, to maintain the standard of protection. Intertidal habitat balances will need to be maintained.

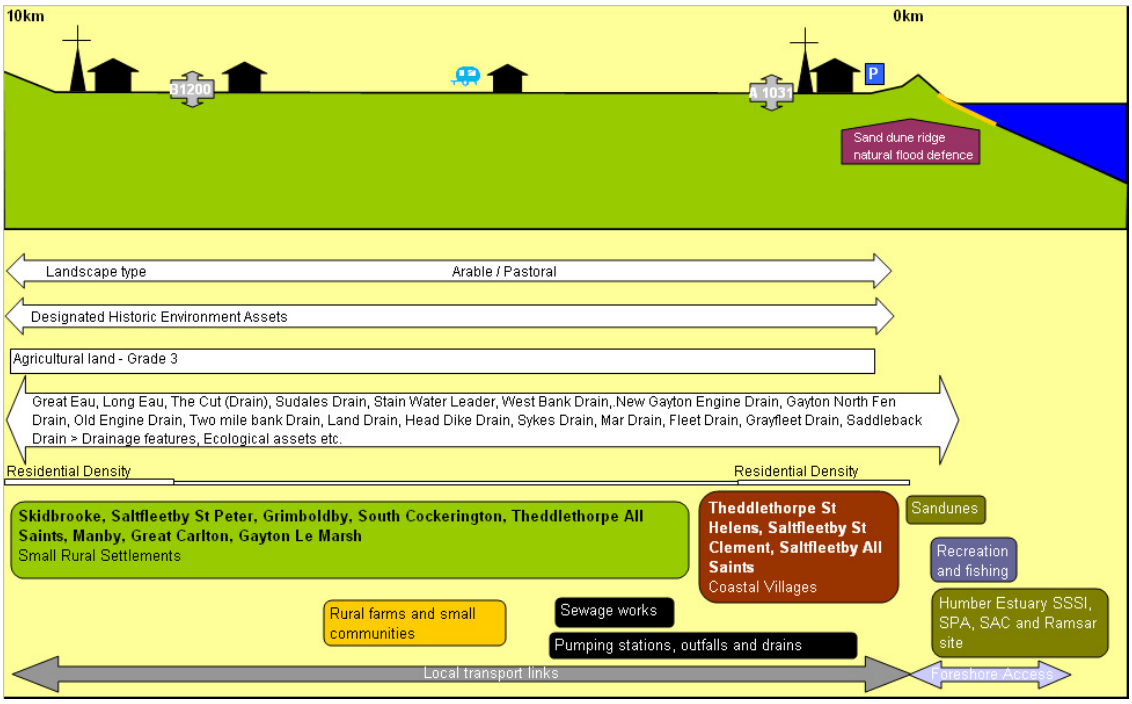
Changes from Present Management

9.157 Defences are presently managed to protect floodplain assets from flooding. As sea levels rise in the future there will be increased pressure on some of the defences and limited managed realignment (as discussed above) may be required to ensure flood protection remains sustainable. This policy will ensure flood protection can be sustained over the longer term for the majority of assets, including settlements, significant and designated historic environment features and the majority of high grade agricultural land. The environmental benefits that result will also ensure that the requirements of current environmental legislation can be met by compensating for the loss of designated habitats due to coastal squeeze in the outer Humber.

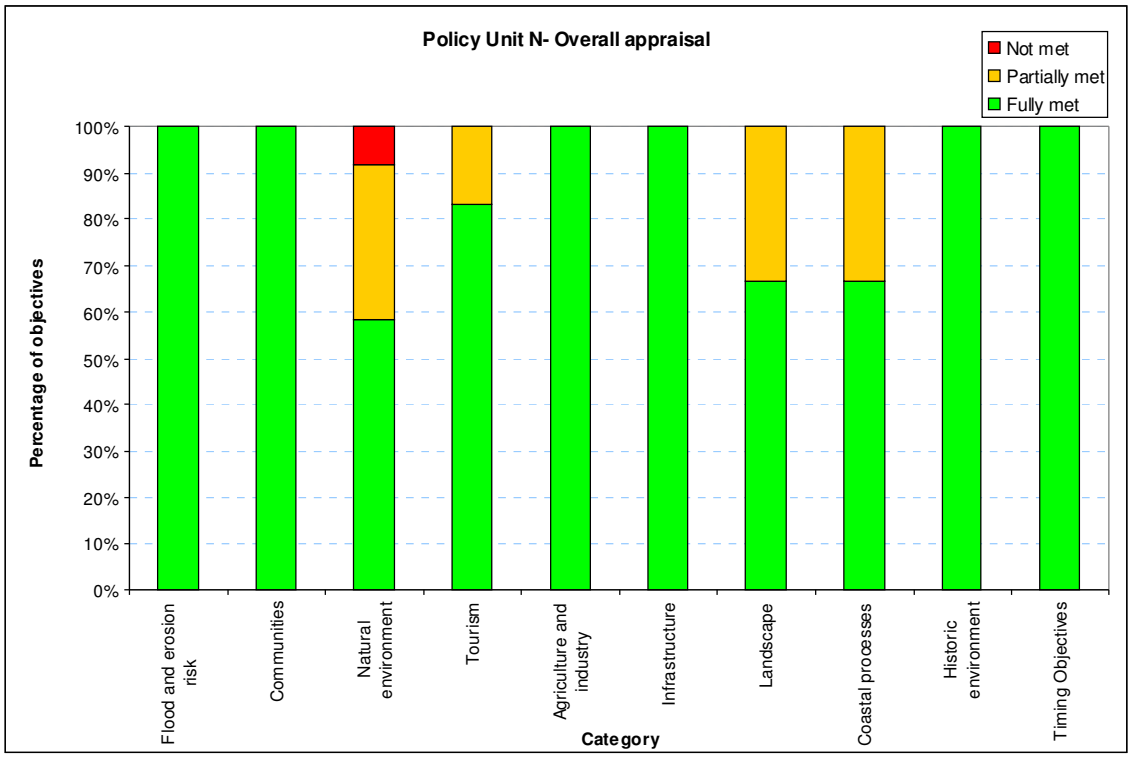
Key Features

9.158 The key features within this policy unit are provided below (Character Areas 14 and 15 schematic showing features).


10km
0km
B1201
A 1031
P
Military Area
Flood bank
Landscape type
Arable / Pastoral
Designated Historic Environment Assets
Agricultural land - Grade 1 and Grade 2
Louth Canal, Seven Towns South Eau, Seven Towns North Eau, New Dike, Waterland Drain, Tuttle Drain, Grayfleet Drain, Thoresby Dike, Tetney Drain, South Dike,Black Dike, Saddleback Drain, North Creek Drain, Sunderfleet Eau Drain> Navigation assets, Drainage features, Ecological assets etc.
Residential Density
Tetney, Tetney Lock, Grainsby, North Cotes, Marsh Chapel, North Thoresby, Fulstow, Covenham St Bartholomew, Covenham St Mary, Alvingham, Eskham, Grainthorpe, North Cockerington, Ludney, Conisholme Church End, South Somercotes,
Small Rural Settlements
Donna Nook, Saltfleet, North Somercotes, Skidbrook North End
Coastal Villages
Sandunes
Intertidal mudflats
Saltmarsh
Recreation and fishing
Rural farms and small communities
Pumping stations, outfalls and drains
Reservoir
Windfarms
Sewage works
Humber Estuary SSSI, SPA, SAC and Ramsar site
Local transport links
Foreshore Access


10km
0km
B1200
A 1031
P
Sand dune ridge natural flood defence
Landscape type
Arable / Pastoral
Designated Historic Environment Assets
Agricultural land - Grade 3
Great Eau, Long Eau, The Cut (Drain), Sudales Drain, Stain Water Leader, West Bank Drain, New Gayton Engine Drain, Gayton North Fen Drain, Old Engine Drain, Two mile bank Drain, Land Drain, Head Dike Drain, Sykes Drain, Mar Drain, Fleet Drain, Grayfleet Drain, Saddleback Drain > Drainage features, Ecological assets etc.
Residential Density
Residential Density
Skidbrooke, Saltfleetby St Peter, Grimboldby, South Cockerington, Theddlethorpe All Saints, Manby, Great Carlton, Gayton Le Marsh
Small Rural Settlements
Theddlethorpe St Helens, Saltfleetby St Clement, Saltfleetby All Saints
Coastal Villages
Sandunes
Recreation and fishing
Rural farms and small communities
Sewage works
Pumping stations, outfalls and drains
Humber Estuary SSSI, SPA, SAC and Ramsar site
Local transport links
Foreshore Access

Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.159 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. Within this policy unit, there is the potential for the Humber Estuary Special Area of Conservation, Saltfleetby – Theddlethorpe Dunes & Gibraltar Point Special Area of Conservation, Humber Estuary Special Protection Area and Humber Estuary Ramsar site to be adversely affected.

9.160 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

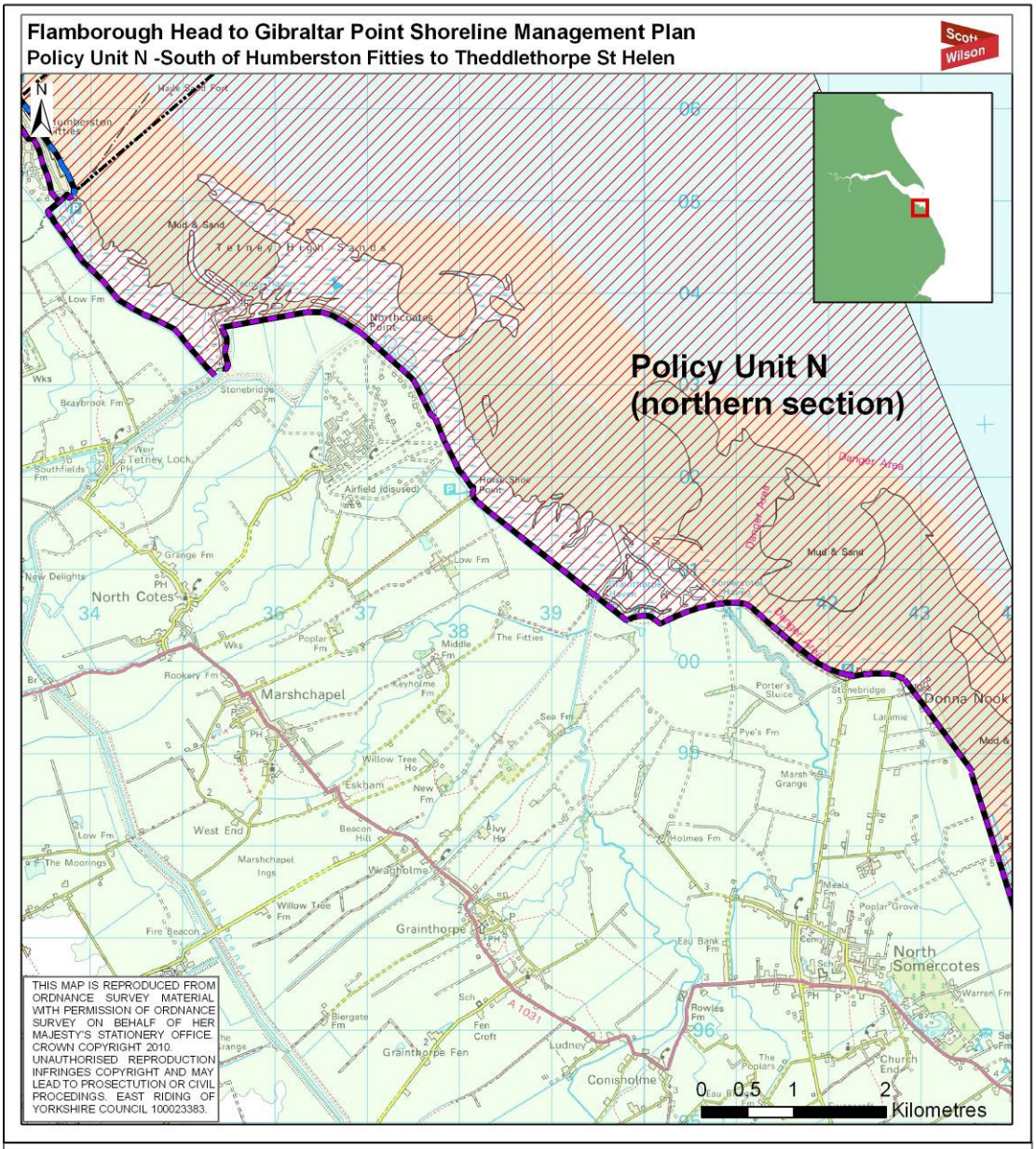
Summary of Water Framework Directive Assessment findings for this policy unit

9.161 The Water Framework Directive Assessment found that no change in the Ecological Potential of the coastal water body, Lower Humber transitional water body or Steeping Long Eau Great Eau groundwater body is anticipated resulting from policies within this policy unit. However, the hold the line policy with some localised areas of managed realignment policy may result in adverse impacts on the River Witham inland water bodies, through changes to the saltwater/freshwater interface which would impact the ecology of the individual streams.

Summary of Economics Appraisal findings for this policy unit

9.162 The economic appraisal found that the policy will generate benefits which clearly outweigh the costs..

Policy Mapping

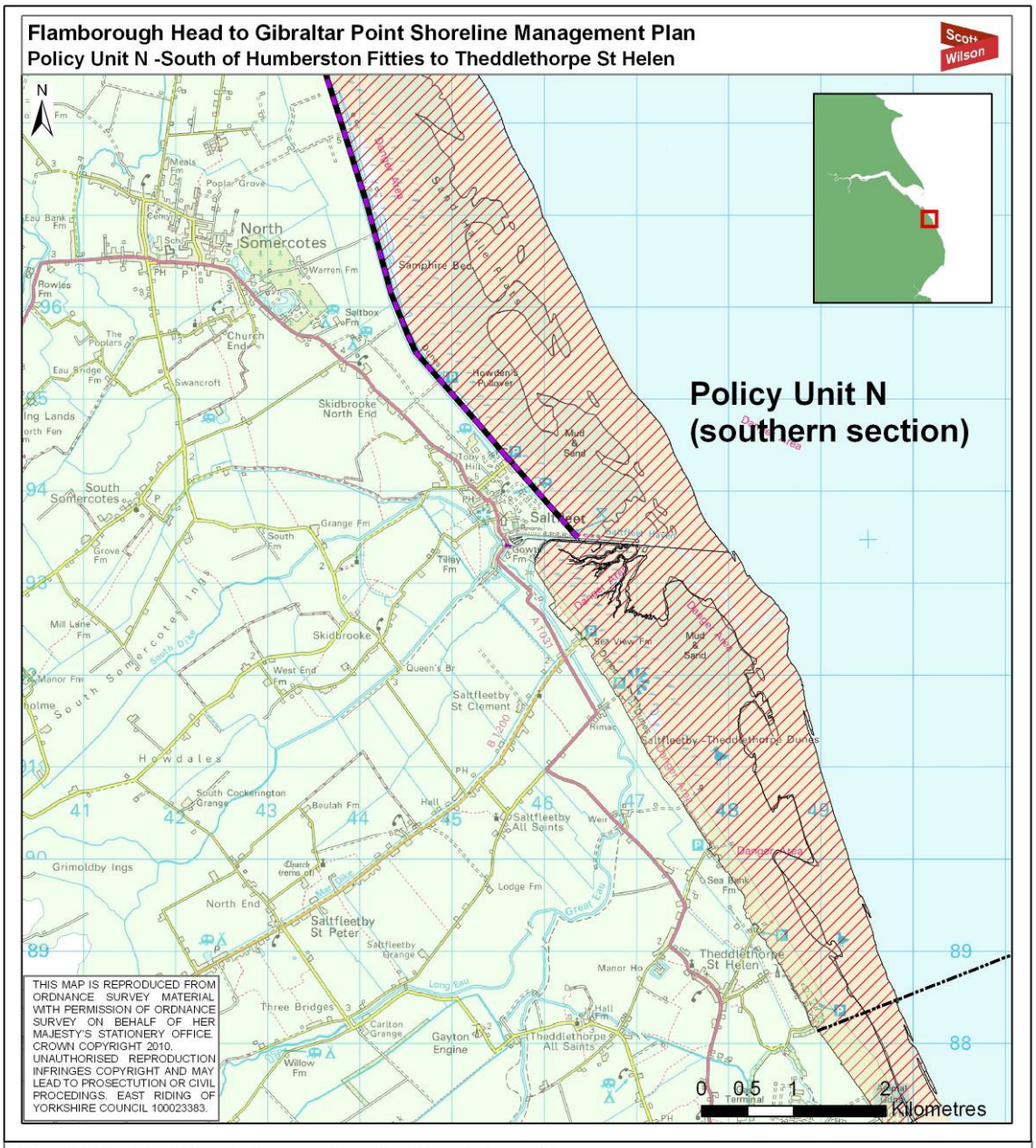


Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defence, and meet the requirements of current environmental legislation, detailed studies will identify sites for limited Managed Realignment in the order of 100 hectares on the south bank of the Humber Estuary. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets and will be informed by the Humber Flood Risk Management Strategy.		

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defence, and meet the requirements of current environmental legislation, detailed studies will identify sites for limited Managed Realignment in the order of 100 hectares on the south bank of the Humber Estuary. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets and will be informed by the Humber Flood Risk Management Strategy.		

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit O: Viking Gas Terminal (Mablethorpe) to southern end of Skegness

Policy Development Zone:	**PDZ4**
Policy Unit:	**O**
Character Area:	**16 / 17 / 18a / 18b**
Location reference:	**Viking Gas Terminal (Mablethorpe) to the southern end of Skegness**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
O	Viking Gas terminal (Mablethorpe) to the southern end of Skegness	HTL (P4)	HTL (P4)	HTL (P4) with localised MR considered where appropriate	The management intent will be to hold the line for all epochs continuing the present day standard of protection against flooding. In epoch 3, localised managed realignment could be considered in appropriate areas to increase defence sustainability. Specific sites have not been identified, but further detailed studies in the future should investigate potential sites.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Codes in brackets refer to the future intent of flood risk management

- P2 – Reduce existing flood risk management actions, accepting increase of risk over time.
- P3 – Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this baseline.
- P4 – Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from climate change).
- P5 – Take further action to reduce flood risk.

Summary of Preferred Plan: Recommendations

9.163 The management intent for Policy Unit O is to continue protecting against flooding at the same standard as the present day.

Justification for Recommendations

9.164 The recommended preferred policy will ensure all people and property, including the two principal towns of Mablethorpe and Skegness, are protected. This will also protect the extensive and productive agricultural land. The important tourism industry in this area will not be adversely affected in terms of flood risk.

Appraisal of Impacts

9.165 This management intent will be carried out by a Hold the Line policy. Defences will need to be upgraded and improved over time to counter rising sea levels. Currently, beach nourishment occurs via the ongoing Lincshore scheme and this forms an important part of the defences. Beach nourishment can continue under this policy as currently it contributes effectively towards the Hold the Line policy, as well as providing benefits for tourism by creating wider beaches as well as contributing to the sediment volume supplied to downdrift areas.

9.166 In the longer term (epoch 3), accelerating sea level rise could begin to cause problems for defence sustainability as sea levels rise. Managed realignment could be considered locally, in areas where appropriate, to ensure sustainable flood risk management for the future. The landward extent of any new defence line would be the minimum required to ensure sustainable defences; minimising the impacts on agricultural land, people, property and the historic environment. There will need to be sufficient planning and time allocated for adaptation if this is undertaken.

9.167 This policy could also potentially provide environmental, landscape and tourism benefits if undertaken in appropriate areas. There will be a need for further studies to monitor management inputs required to defend the coastline (which will depend on the rate of future sea level rise and increased storminess) and consider potential localised managed realignment sites (where appropriate) and assess the benefits and impacts of any potential managed realignment scheme.

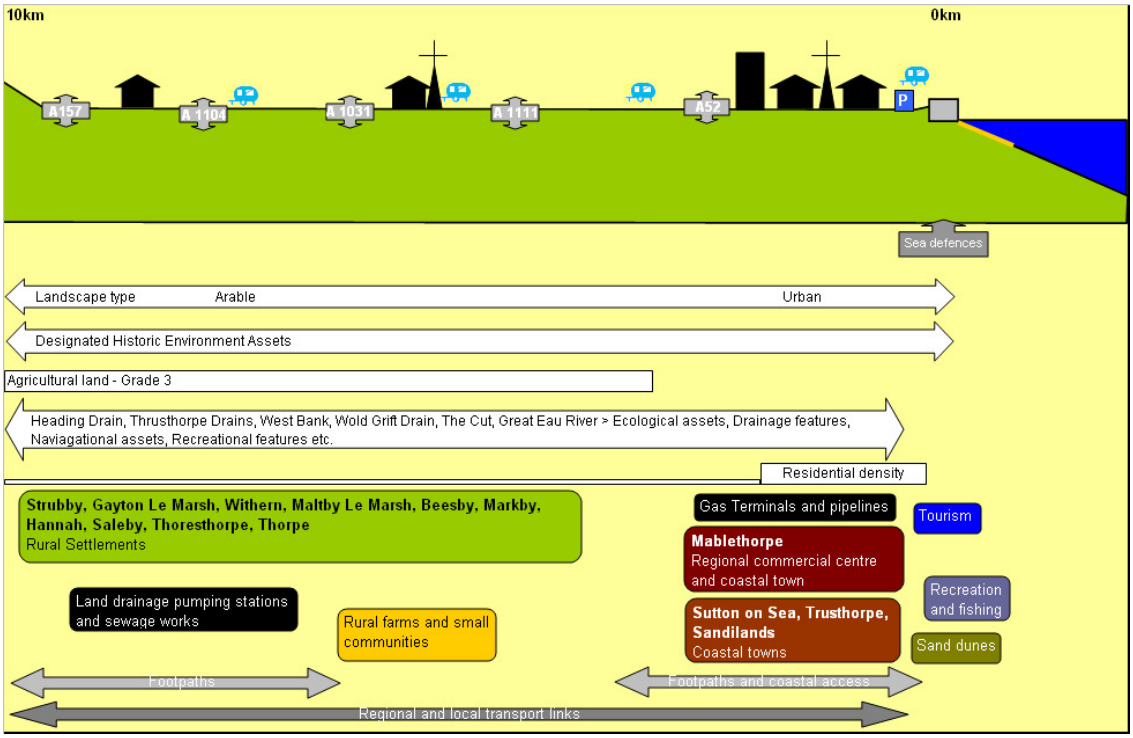
Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their flood defence function will be maintained. Defences will be raised and improved to counter sea level rise as required.
Medium term 2025 - 2055	The defences will be held in their current position and their flood defence function will be maintained. Defences will be raised and improved to counter sea level rise as required.
Long term 2055 - 2105	The defences will be held in their current position and their flood defence function will be maintained. Defences will be raised and improved to counter sea level rise as required. Localised managed realignment could be considered to increase defence sustainability, in areas where appropriate.

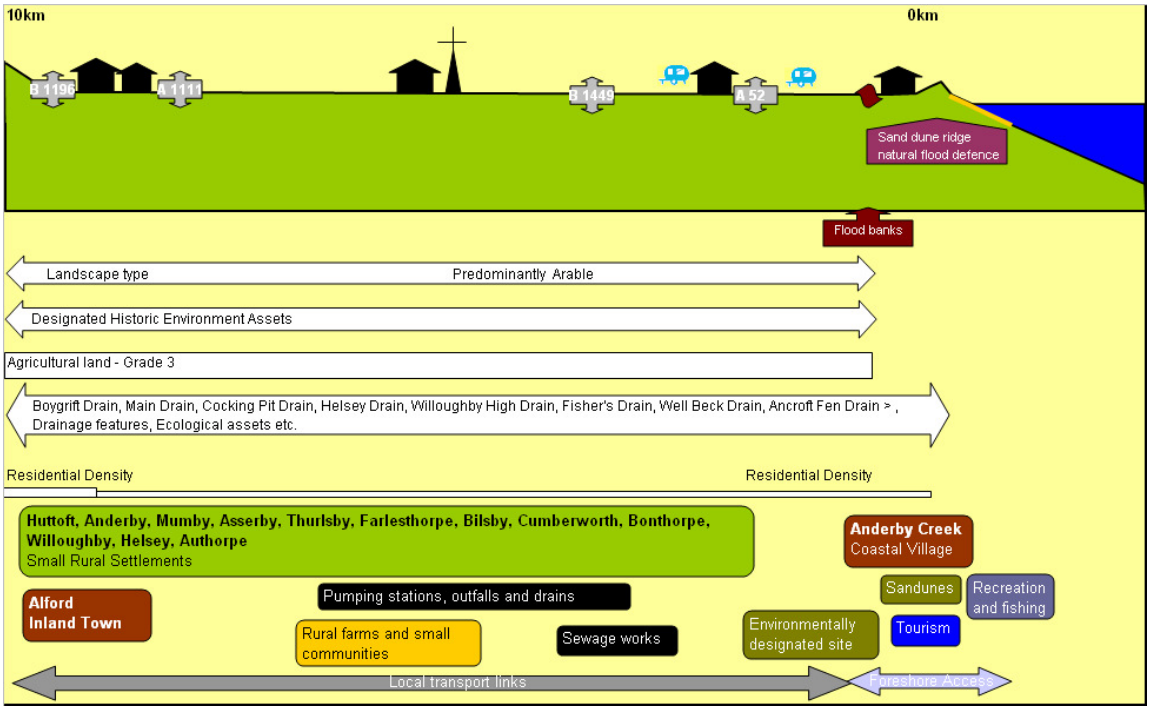
Changes from Present Management

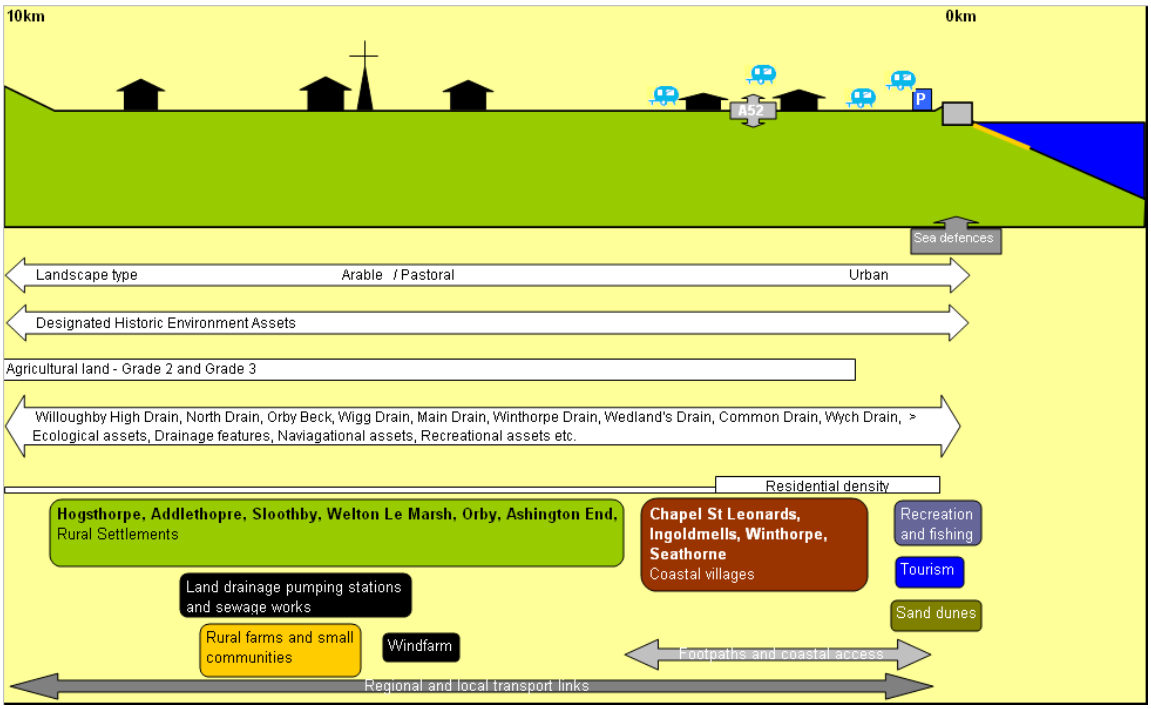
9.168 There will be no change from the present management in epochs 1 and 2. Significantly increased management activity may be required to carry out this policy in the longer term. By epoch 3 it may be necessary to consider the use of new defences to ensure sustainable flood protection to assets as sea level rise accelerates.

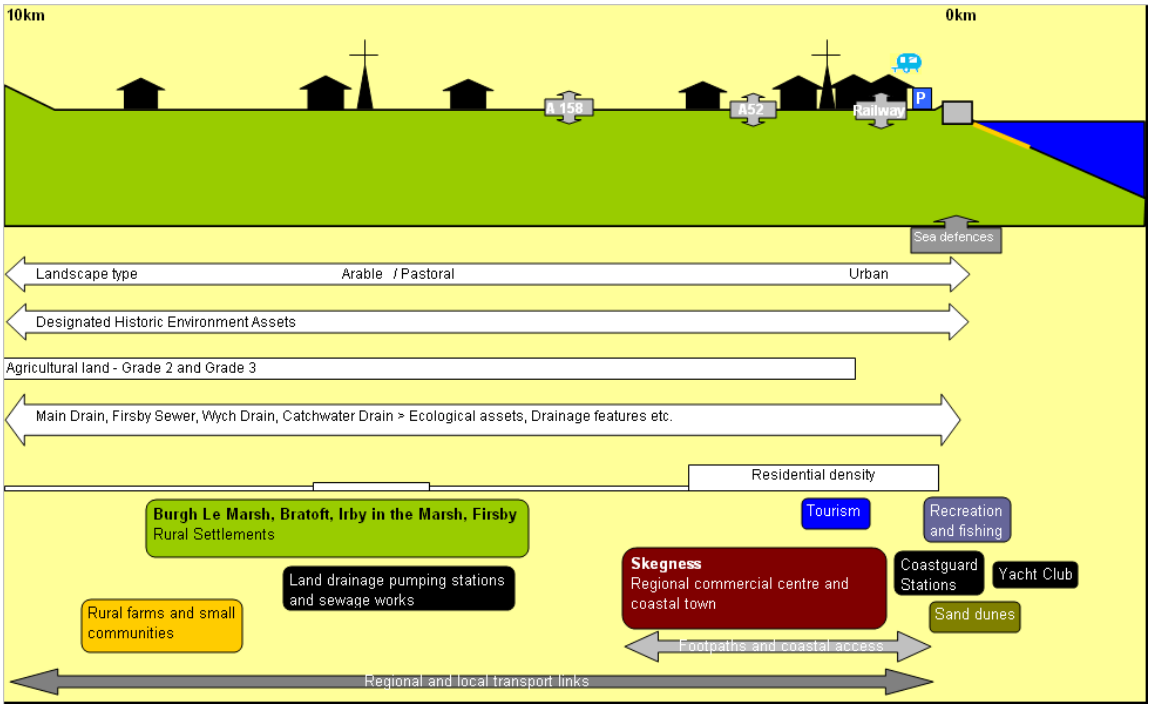
Key Features

9.169 The key features within this policy unit are provided below (Character Areas 16, 17, 18a and 18b schematic showing features).

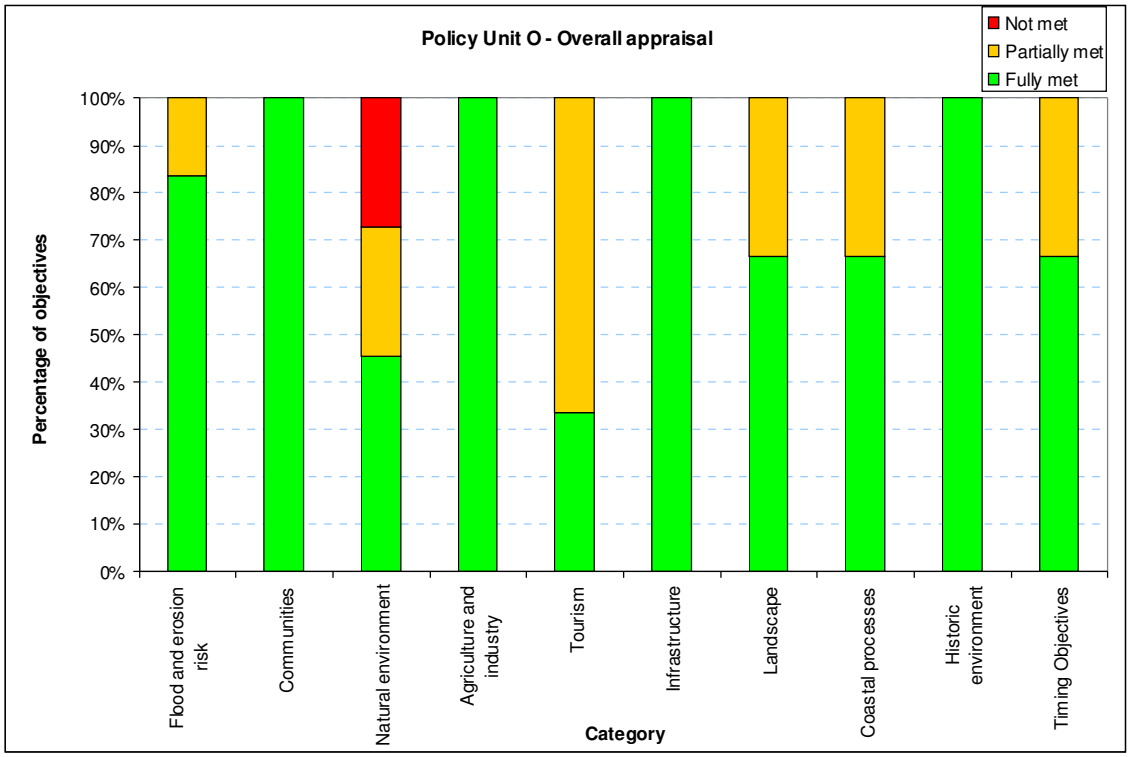



10km
0km
B 1196
A 1111
B 1445
A 52
Sand dune ridge
natural flood defence
Flood banks
Landscape type
Predominantly Arable
Designated Historic Environment Assets
Agricultural land - Grade 3
Boygrift Drain, Main Drain, Cocking Pit Drain, Helsey Drain, Willoughby High Drain, Fisher's Drain, Well Beck Drain, Ancroft Fen Drain >,
Drainage features, Ecological assets etc.
Residential Density
Residential Density
Huttoft, Anderby, Mumby, Asserby, Thurlsby, Farlesthorpe, Bilsby, Cumberworth, Bonthorpe, Willoughby, Helsey, Authorpe
Small Rural Settlements
Anderby Creek
Coastal Village
Alford
Inland Town
Pumping stations, outfalls and drains
Sandunes
Recreation and fishing
Rural farms and small communities
Sewage works
Environmentally designated site
Tourism
Local transport links
Foreshore Access


10km
0km
A52
P
Sea defences
Landscape type
Arable / Pastoral
Urban
Designated Historic Environment Assets
Agricultural land - Grade 2 and Grade 3
Willoughby High Drain, North Drain, Orby Beck, Wigg Drain, Main Drain, Winthorpe Drain, Wedland's Drain, Common Drain, Wych Drain, >
Ecological assets, Drainage features, Naviagational assets, Recreational assets etc.
Residential density
Hogsthorpe, Addlethopre, Sloothby, Welton Le Marsh, Orby, Ashington End,
Rural Settlements
Chapel St Leonards, Ingoldmells, Winthorpe, Seathorne
Coastal villages
Recreation and fishing
Tourism
Land drainage pumping stations and sewage works
Sand dunes
Rural farms and small communities
Windfarm
Footpaths and coastal access
Regional and local transport links



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.170 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues.

9.171 At each end of this policy unit there is the Saltfleetby - Theddlethorpe Dunes & Gibraltar Point Special Area of Conservation and Gibraltar Point Special Protection Area; there is the potential for these areas to be adversely affected.

9.172 The Habitat Regulations Assessment has also identified the potential for management actions undertaken within this policy unit to have an impact on internationally designated sites in other policy units due to impacts on sediment transport.

9.173 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

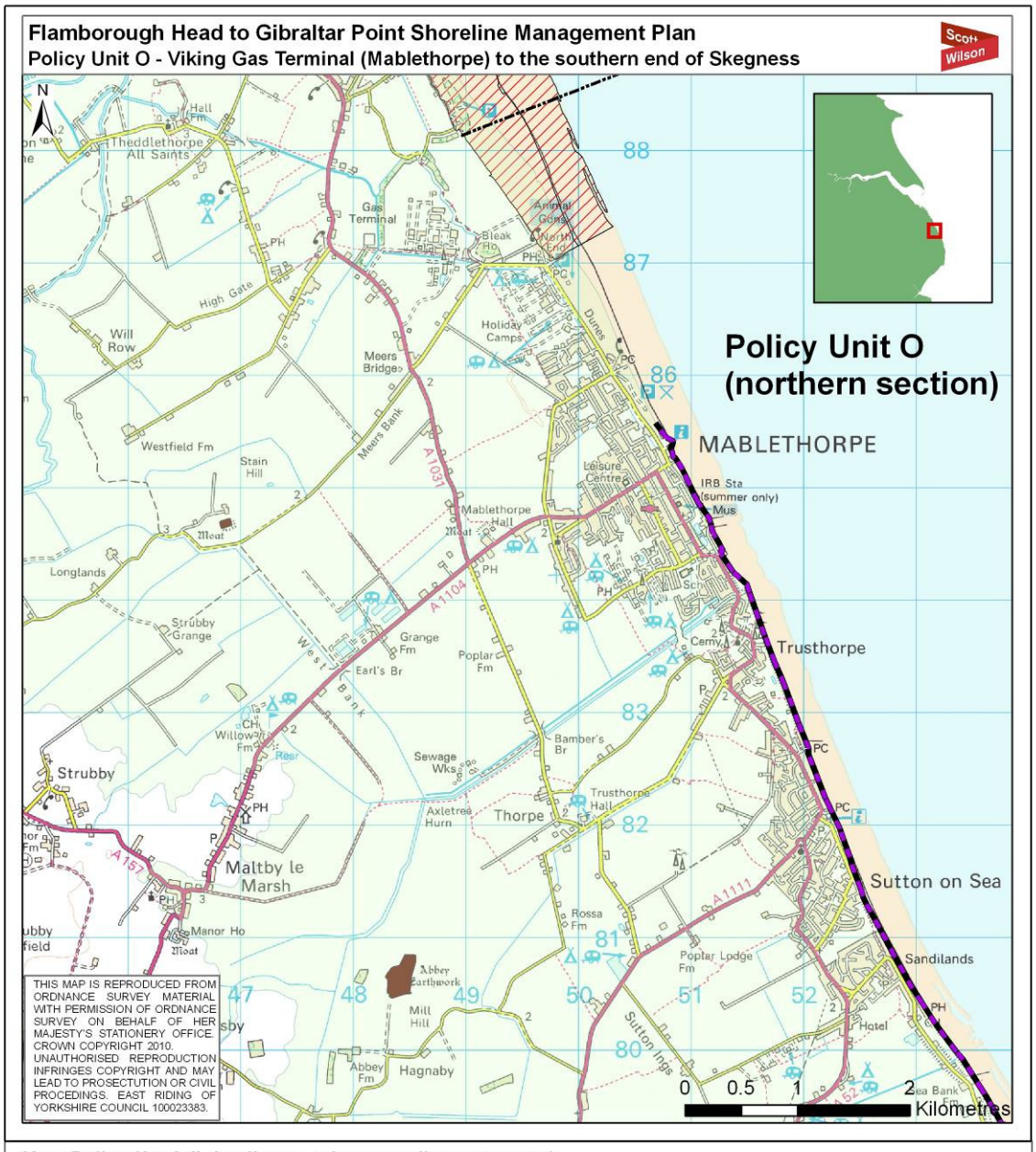
Summary of Water Framework Directive Assessment findings for this policy unit

9.174 The Water Framework Directive Assessment found that no change in the Ecological Potential of the coastal water body or Steeping Long Eau Great Eau groundwater body is anticipated resulting from policies within this policy unit. However, the hold the line policy with some localised areas of managed realignment policy may result in adverse impacts on the River Witham inland water bodies, through changes to the saltwater/freshwater interface which would impact the ecology of the individual streams.

Summary of Economics Appraisal findings for this policy unit

9.175 The economic appraisal found that the policy will generate benefits which clearly outweigh the costs.

Policy Mapping



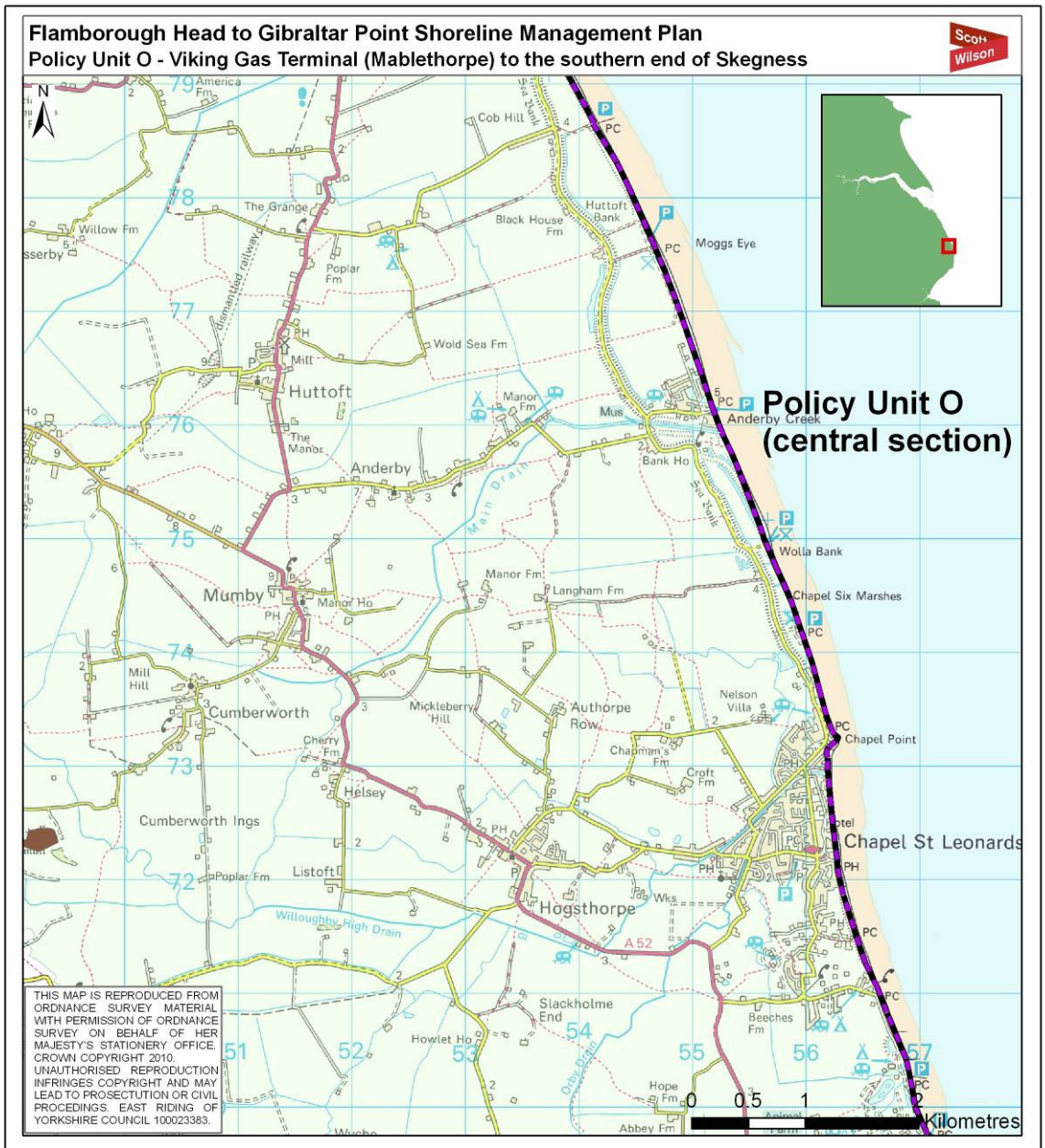
Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4) with localised Managed Realignment considered where appropriate.**

The management intent will be to hold the line for all epochs continuing the present day standard of protection against flooding. In epoch 3, localised Managed Realignment could be considered in appropriate areas to increase defence sustainability. Specific sites have not been identified, but further detailed studies in the future should investigate potential sites.

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites



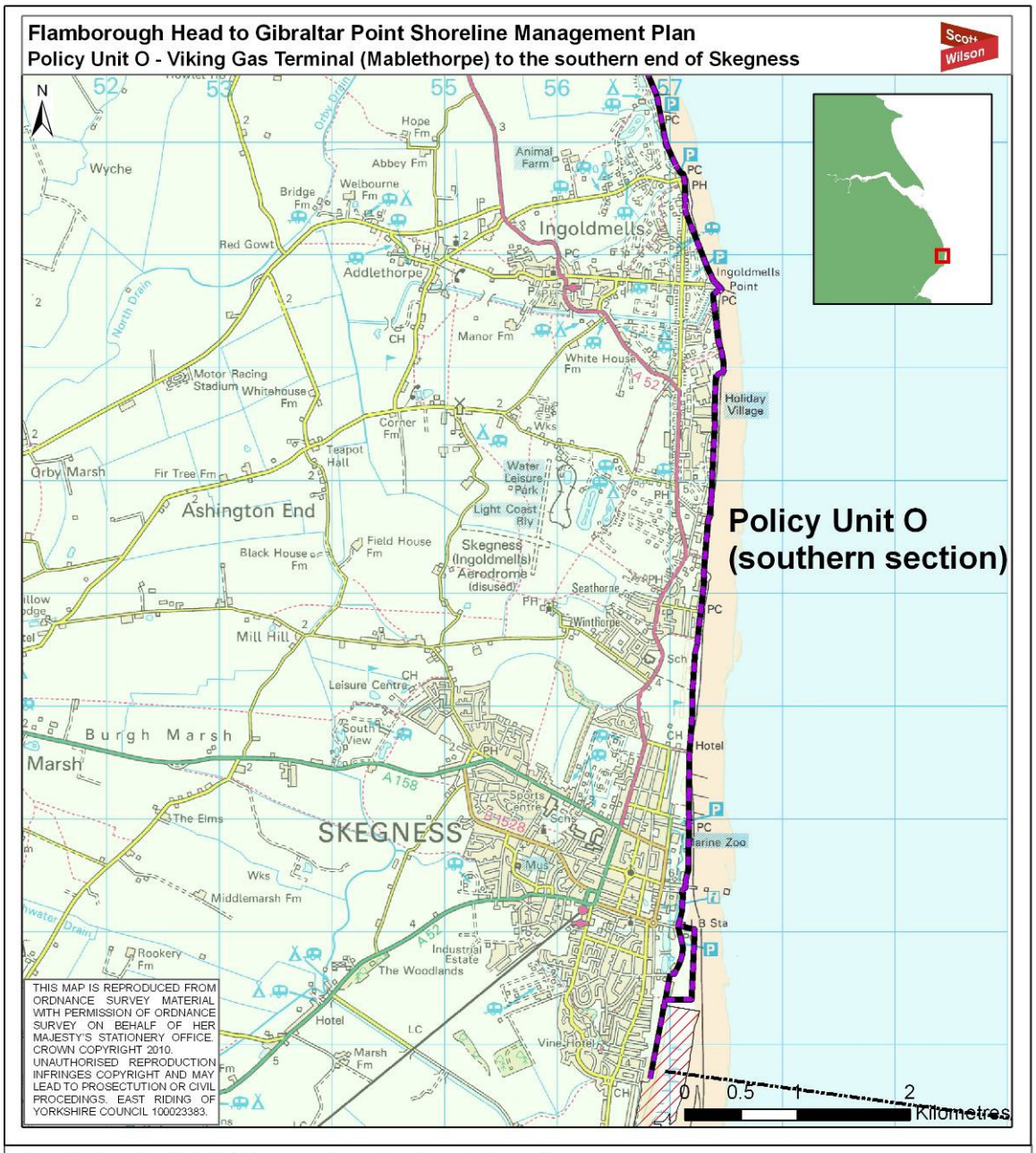
Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4) with localised Managed Realignment considered where appropriate.**

The management intent will be to hold the line for all epochs continuing the present day standard of protection against flooding. In epoch 3, localised Managed Realignment could be considered in appropriate areas to increase defence sustainability. Specific sites have not been identified, but further detailed studies in the future should investigate potential sites.

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4) with localised Managed Realignment considered where appropriate.**

The management intent will be to hold the line for all epochs continuing the present day standard of protection against flooding. In epoch 3, localised Managed Realignment could be considered in appropriate areas to increase defence sustainability. Specific sites have not been identified, but further detailed studies in the future should investigate potential sites.

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit P: Seacroft to Gibraltar Point

Policy Development Zone:	**PDZ4**
Policy Unit:	**P**
Character Area:	**19**
Location reference:	**Seacroft to Gibraltar Point**

Summary of Specific Policies

Policy Unit		Policy Plan			
		Present - 2025	2025 - 2055	2055 - 2105	Comments
P	Seacroft to Gibraltar Point	HTL (P4)	HTL (P4)	HTL or MR (P4)	The policies for the long term are conditional. They depend on the results of monitoring and research into climate change, shoreline response and the role of defences.

Key

SMP policies

- HTL – Hold the Line
- ATL – Advance the Line
- MR – Managed Realignment
- NAI – No Active Intervention
- HR – Hold the Line on a realigned position

Codes in brackets refer to the future intent of flood risk management

- P2 – Reduce existing flood risk management actions, accepting increase of risk over time.
- P3 – Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this baseline.
- P4 – Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from climate change).
- P5 – Take further action to reduce flood risk.

Summary of Preferred Plan: Recommendations

9.176 The management intent for Policy Unit P is to continue protecting against flooding at the same standard as the present day.

Justification for Recommendations

9.177 The recommended preferred policy will ensure all people and property are protected. This will also protect the extensive and productive agricultural land. The important tourism industry in this area will not be adversely affected in terms of flood risk.

Appraisal of Impacts

9.178 This management intent will be carried out by a Hold the Line policy. Currently this area is accreting, partly dependent on material from the Holderness cliffs and this trend is likely to continue in the short and medium term at least. Sand dunes form effective natural defences and these are supplemented by flood embankments around the Steeping River. The defence provided by the dunes will be maintained largely through natural processes; however, flood embankments may require upgrading and improvement over time to counter rising sea levels. Due to continued accretion, this is unlikely to be necessary in the short term.

9.179 In the longer term (epoch 3), increased management activity may be required to carry out this policy as the accretion trend is expected to slow and potentially change to an erosional trend. Currently, there is not enough evidence to be able to firmly predict if and when this may happen. This will depend on the mechanism used to carry out the Hold the Line policy in Policy Unit O and the supply of sediment transported from the offshore zone. If beach nourishments continue and increase in volume to account for sea level rise this will help maintain accretion despite accelerating sea level rise, although presently, the majority of sediment along the shoreline in this area has been transported from offshore. If nourishments cease or do not increase sufficiently to counter sea level rise, this is likely to bring forward the change from accretion to erosion and significant intervention and additional defences would be required to carry out this policy. If this occurs, landward realignment needs to be considered as an alternative to holding the line. A realignment would come at the expense of land directly behind the defences, but it would provide more sustainable flood defence for both the people and the high quality agricultural land further inland. It would also support intertidal habitats with associated benefits, such as for fisheries, and provide compensation for intertidal habitat loss caused by coastal squeeze, as required under applicable environmental legislation.

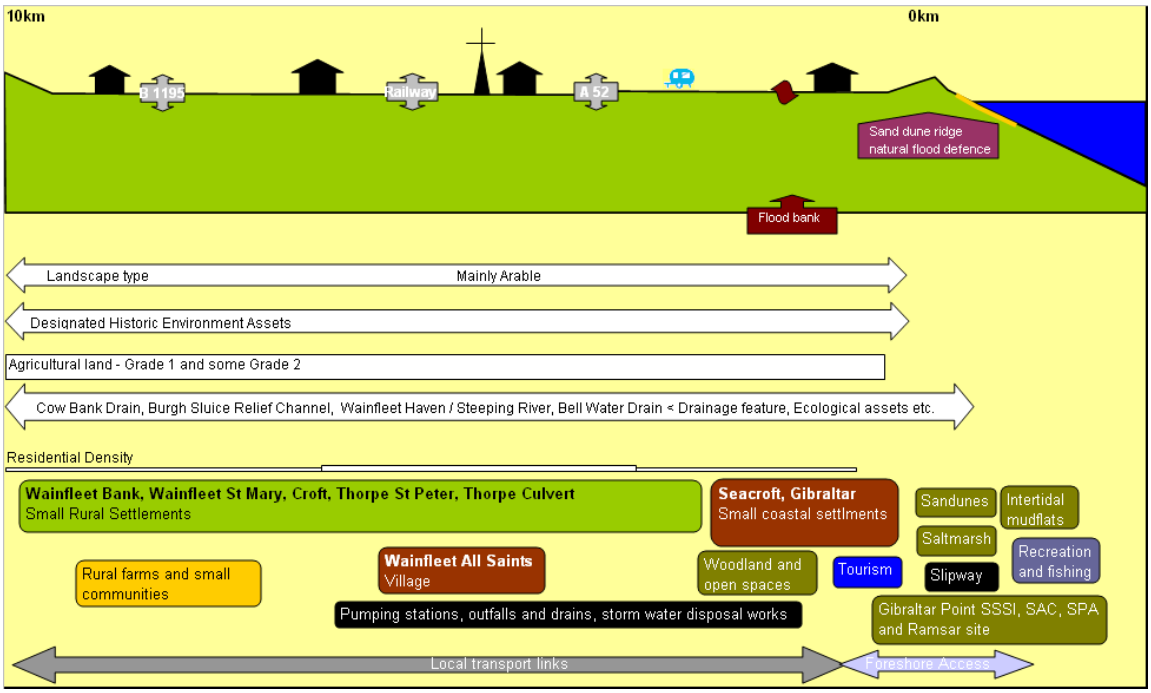
Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their flood defence function will be maintained. Dunes will continue to provide natural flood protection supplemented by flood embankments. Embankments will be raised and improved to counter sea level rise as required, to maintain the standard of protection.
Medium term 2025 - 2055	The defences will be held in their current position and their flood defence function will be maintained. Dunes will continue to provide natural flood protection supplemented by flood embankments. Embankments will be raised and improved to counter sea level rise as required, to maintain the standard of protection.
Long term 2055 - 2105	It is possible that the current alignment can be held, but it is also possible that landward realignment will be needed for part of this frontage. If realignment is needed, the timing, location and extent will be determined to optimise defence sustainability, to provide time for adaptation, and to compensate for the potential deterioration of designated habitat at Gibraltar Point.

Changes from Present Management

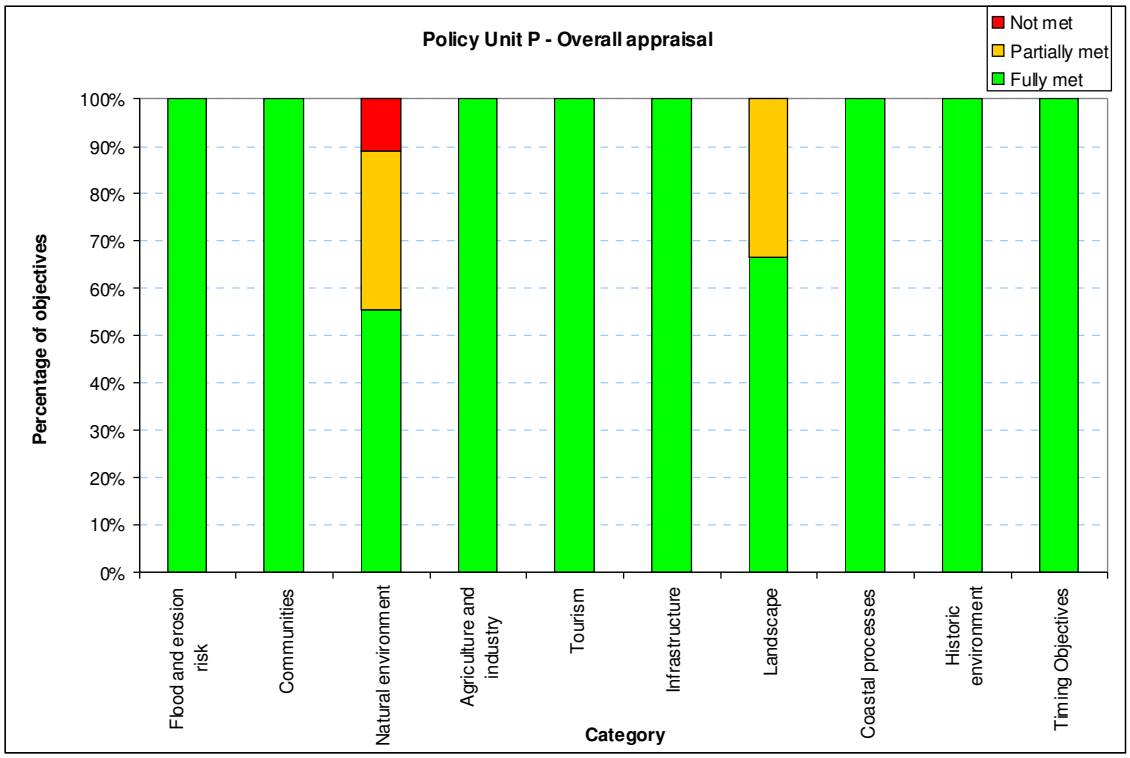
9.180 In epochs 1 and 2, there will be no change from the existing management. In epoch 3, the policy may change, depending on the results of monitoring and research.

Key Features

9.181 The key features within this policy unit are provided below (Character Area 19 schematic showing features).



Policy appraisal results



Summary of Habitat Regulations Assessment findings for this policy unit

9.182 The Habitat Regulations Assessment has identified the potential for adverse impacts on internationally designated sites due to coastal squeeze and sediment budget issues. Within this policy unit, there is the potential for the Saltfleetby - Theddlethorpe Dunes & Gibraltar Point Special Area of Conservation and Gibraltar Point Special Protection Area to be adversely affected.

9.183 Requirements for monitoring and possible mitigation are addressed within the policies and will be taken forward within the SMP Action Plan.

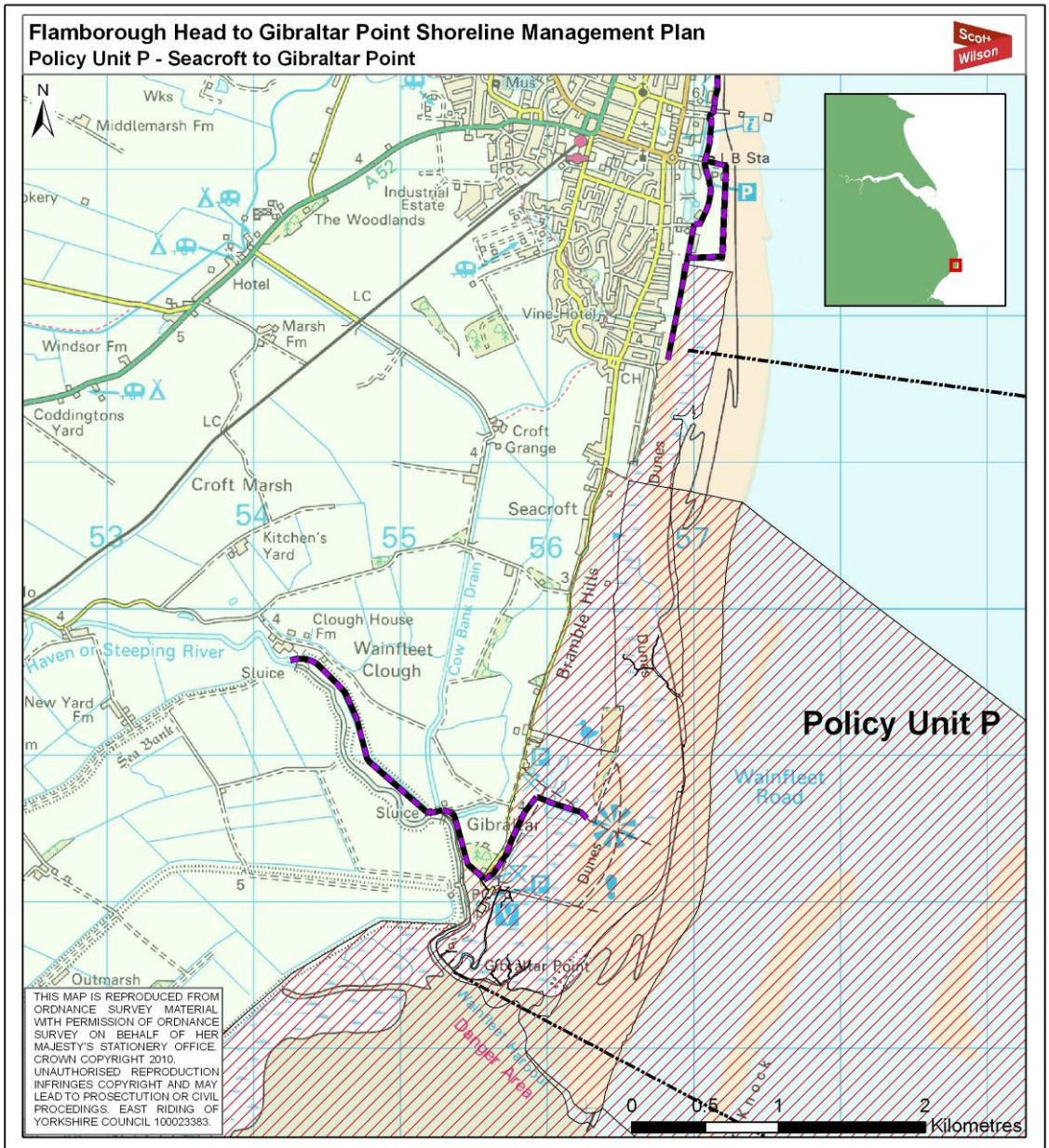
Summary of Water Framework Directive Assessment findings for this policy unit

9.184 The Water Framework Directive Assessment found that no change in the Ecological Potential of the coastal water body or Steeping Long Eau Great Eau groundwater body is anticipated resulting from policies within this policy unit. However, the hold the line policy with some localised areas of managed realignment policy may result in adverse impacts on the River Witham inland water bodies, through changes to the saltwater/freshwater interface which would impact the ecology of the individual streams.

Summary of Economics Appraisal findings for this policy unit

9.185 The economic appraisal found that the policy will generate benefits which clearly outweigh the costs.

Policy Mapping



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line or Managed Realignment (P4)**
The policies for the long term are conditional. They depend on the results of monitoring and research into climate change, shoreline response and the role of defences.		

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites

There are no listed buildings or conservation areas within this policy unit.

10 Action Plan

10.1 This Action Plan has been developed alongside the Shoreline Management Plan (SMP2) and includes all actions and activities that are necessary to implement the preferred management intent as well as to gather the necessary information that is currently lacking to inform future SMP revisions.

10.2 This document summarises the specific actions that are required to implement the plan and the policies set out therein. For these actions it sets out who has responsibility, what priority they are and the start date. This Plan includes actions for the Environment Agency (EA), Local Authorities and private operators to develop flood and erosion defence strategies and schemes, but it also includes actions on the other partner authorities, for example to incorporate the plan into the land use planning system or support adaptation of affected people, businesses and organisations. This Action Plan will continue to be updated by the relevant responsible organisations to enable the effective management of required activities in the period up to the next SMP review, which is due in 5 to 10 years. Thus this action plan is an evolving document, which will change as actions are progressed and completed.

10.3 It is anticipated that many of the recommendations proposed in the Action Plan will be implemented through the development of coastal defence strategies and subsequently coastal defence schemes along the frontage. During these subsequent stages, the Habitat Regulations Assessment (Appendix L) has identified that issues relating to disturbance of waterfowl and increased defence footprint will need to be addressed: works will need to be timed to avoid significant disturbance and the working area will be subject to detailed assessment to avoid damage. Where Hold the Line schemes are implemented, the outline and detailed designs will need to avoid any adverse impact on internationally important wildlife sites unless the tests set out in the Conservation of Habitats and Species Regulations 2010 can be met.

SMP Wide Actions

Action Reference	Works Required	Responsibility	Priority	Target Start Date	Actual Start Date	Completion Date	Cost £000s	Funding source	Action Status (N/O/C)[3]
Z1	Implementation of SMP policies and actions through continuation of periodic Client Steering Group (CSG) and Elected Member Forum (EMF) meetings. This will ensure formal tracking of the SMP's Action Plan and will also be essential in ensuring that findings of specific studies/monitoring are communicated back to the whole CSG/EMF and inform planning policy.	EA with all partners	High	2010 - 2011		NA	*		O
Z2	Continue consultation with key stakeholders and general public in the period up to SMP3 (progress of action plan; conveying messages around flood and erosion risk, potential coastal change). This can be achieved through existing mechanisms such as Coastal Partnerships and ICZM.	EA with all partners	High	2010 - 2011		NA	*		O
Z3	Continue linkage / liaison between SMP2 and Humber Flood Risk Management Strategy (HFRMS) to ensure the HECAG SMP influences future development of the HFRMS ongoing officer liaison between the two projects.	EA with all parties	High	Ongoing		NA	*		O

[3] N = not yet commenced, O = ongoing, C = complete.
N.B. Greyed out cells for future use by the relevant authorities to log progress and the status of the actions.
* Cost covered under current budgets or not possible to determine at this time.

Action Reference	Works Required	Responsibility	Priority	Target Start Date	Actual Start Date	Completion Date	Cost £000s	Funding source	Action Status (N/O/C)[3]
Z4	Continue to work to identify potential Managed Realignment sites for habitat compensation and defence sustainability through the Regional Habitat Creation Programme.	EA with all partners	High	Ongoing		NA	*		O
Z5	Study the role of a Hold the Line Policy for policy units on the Holderness Coast in relation to the potential for sediment supply to be affected in the Humber and beyond.	EA and other partners	High	2012 - 2013			500		N
Z6	Ensure that local and regional development and planning documents take account of SMP2 policies and flood and erosion risks.	Planning authorities and EA	High	2010 - 2011			*		O
Z7	Development, monitoring and review of emergency response plans to prepare for extreme events that exceed standards of protection.	Local authorities and EA	High	2010 - 2011			*		N
Z8	Continue with improvements to flood risk maps and inundation modelling to provide improved flood warning service.	EA	High	Ongoing			*		O
Z9	High level study to clarify the importance of agricultural land for food security in relation to habitat requirements.	Departnment of Environment Food and Rural Affairs (Defra), National Farmers' Union (NFU)	High	2012 - 2013			200		N

Action Reference	Works Required	Responsibility	Priority	Target Start Date	Actual Start Date	Completion Date	Cost £000s	Funding source	Action Status (N/O/C)[3]
Z10	Continue with Rapid Coastal Zone Assessment Survey (RCZAS) for Yorkshire and Lincolnshire	English Heritage (EH)	Medium	To inform SMP3			*		O
Z11	Continued lobbying of central government to request further independent studies into offshore dredging and its potential to impact physical processes at the coast.	EA, Natural England (NE), other partners.	High	To inform SMP3			*		O
Z12	Review of sea level rise figures accounting for latest data / information.	Defra / EA	Medium	To inform SMP3			*		O
Z13	Review of the medium to long term sustainability (technical, economic, social, environmental, and historic environment aspects) of continuing the Lincshore beach nourishments beyond 2015 and into the medium term (up to 2055).	EA and other partners	High	2012 - 2013			*		N
Z14	Studies into opportunities for biodiversity enhancement to inform future Biodiversity Action Plan (BAP) revisions.	NE, Local Biodiversity Partnerships	Medium	To inform SMP3			*		N
Z15	Monitoring of impacts of continuing to Hold the Line on landscape and tourism assets for all policy units where Hold the Line is the preferred policy.	EA, NE, other partners.	Medium	To inform SMP3			*		N
Z16	Although the SMP2 indicates the preferred aspirational flood risk management approach / intent, detailed strategy level studies are required to define specifically the standards of flood protection.	EA with all partners	High	2010 - 2015			*		N

Action Reference	Works Required	Responsibility	Priority	Target Start Date	Actual Start Date	Completion Date	Cost £000s	Funding source	Action Status (N/O/C)[3]
Z17	An audit of the current beach access situation along the Holderness coastline is needed as well as a plan to manage and maintain access in the future.	East Riding of Yorkshire Council (ERYC), EA	Medium	2012 - 2015			50		N
Z18	Involve water and drainage organisations when implementing SMP2 policies in the low-lying flood risk areas. This may be achieved through consulting with these organisations at the strategy/scheme preparation stage or by inviting representatives to period EMF/CSG meetings, if appropriate.	Local Authorities, EA, Internal Drainage Boards (IDB), Water companies.	High	2010 - 2015			*		O
Z19	EA regional monitoring programmes should be continued with particular focus on complex behaviour of Spurn, Lincshore monitoring and behaviour of Gibraltar Point.	EA	High	Ongoing			*		O
Z20	ERYC monitoring programme should be continued with particular focus on outflanking of Holderness defences and erosion rates of Holderness cliffs,	ERYC	High	Ongoing			*		O
Z21	Detailed study into the impacts of a Hold the Line Policy on tourism within Lincolnshire is required in relation to issues that have identified within the SMP of increasing defence size, reducing beach width etc due to sea level rise.	Lincolnshire County Council (LCC), North East Lincolnshire Council (NELC), ERYC	Medium	To inform SMP3			70		N
Z22	Verification / Validation of erosion line projections for the Holderness Coast with the EA National Erosion Mapping project.	ERYC, EA	Medium	2010 - 2011			*		N

Action Reference	Works Required	Responsibility	Priority	Target Start Date	Actual Start Date	Completion Date	Cost £000s	Funding source	Action Status (N/O/C)[3]
Z23	Overview of work being carried out in response to coastal change as part of climate change adaptation.	EA with all partners	High	2010 - 2011					N

Specific Actions by Policy Unit

Policy Unit	Action Ref	Works Required	Responsibility	Priority	Target Start Date	Actual Start Date	Completion Date	Cost	Funding source	Action Status (N/O/C)[4]
B: Bridlington to Hilderthorpe	B1	Coastal strategy study for Bridlington, with particular attention to outflanking of defences and beach changes in front of defences.	ERYC / EA	Medium	2010 - 2011			*		O
B: Bridlington to Hilderthorpe	B2	Continued management of defences to deliver Hold the Line P4 policy for Epoch 1. Maintenance and refurbishment as required.	ERYC	High	2010 - 2011			*		O
C: Wilsthorpe to Atwick	C1	Study to identify the range of options to maintain the future functionality of Barmston Drain.	EA	Medium	2014 - 2015			*		N

[4] N = not yet commenced, O = ongoing, C = complete.
N.B. Greyed out cells for future use by the relevant authorities to log progress and the status of the actions.
* Cost covered under current budgets or not possible to determine at this time.

Policy Unit	Action Ref	Works Required	Responsibility	Priority	Target Start Date	Actual Start Date	Completion Date	Cost	Funding source	Action Status (N/O/C)[4]
D: North Cliff to Hornsea Burton (Hornsea)	D1	Coastal strategy study for Hornsea, with particular attention to outflanking of defences and beach changes in front of defences. It is likely to be necessary to combine this work with the work described for Mappleton in action E1.	ERYC	High	2011 - 2012			200		N
E: Rolston to Waxholme	E1	Strategic study of coastal processes around Mappleton, with particular attention to outflanking of defences, erosion rates of cliffs and beach changes in front of defences. It is likely to be necessary to combine this work with the work described for Hornsea in action D1.	ERYC	High	2015 - 2016			150		N
F: Owthorne to Hollym (Withernsea)	F1	Coastal strategy study for Withernsea, with particular attention to outflanking of defences and beach changes in front of defences.	ERYC	Medium	2014 - 2015			150		O
I: Easington to Kilnsea	I1	Monitoring of coastal processes to clarify uncertainty over future behaviour of the lagoons	ERYC/EA	Medium	2010 - 2011			*		O
J: Kilnsea to Spurn Point	J1	Monitoring of behaviour of Spurn and detailed study into the linkages and processes which control the behaviour of the barrier.	EA / ERYC / other partners	Medium	Ongoing			*		O

Policy Unit	Action Ref	Works Required	Responsibility	Priority	Target Start Date	Actual Start Date	Completion Date	Cost	Funding source	Action Status (N/O/C)[4]
K: Easington Road to Stone Creek	K1	Detailed strategy level studies into potential Managed Realignment locations, working with the local communities that could potentially be affected and working with the HFRMS process.	EA	High	2010 - 2015			100		O
L: East Immingham to Cleethorpes	L1	Monitoring of the change in intertidal habitat within this area – working with the HFRMS process.								
M: Humberston Fitties	M1	Continue to work in close consultation with the communities of the Chalet Park to inform them of the future policies for Humberston Fitties.	NELC	High	2011 - 2012			*		O
M: Humberston Fitties	M2	Strategy study required to inform future management activities within this area.	NELC	High	To inform SMP3			*		N
N: South of Humberston Fitties to Theddlethorpe St Helen	N1	Monitoring of the change in intertidal habitat within this area – working with the HFRMS process.	EA	High	2010 - 2015			100		O
O: Viking Gas Terminal (Mablethorpe) to southern end of Skegness	O1	Monitoring of defence and beach changes to ensure future sustainability	EA	High	To inform SMP3					O
P: Seacroft to Gibraltar Point	P1	Monitoring of the complex coastal process behaviour and sediment linkages around Gibraltar Point.	ELDC, LCC, EA	Medium	To inform SMP3			*		N

Policy Unit	Action Ref	Works Required	Responsibility	Priority	Target Start Date	Actual Start Date	Completion Date	Cost	Funding source	Action Status (N/O/C)[4]
P: Seacroft to Gibraltar Point	P2	Studies to identify whether managed realignment is needed in epoch 3, considering the outcome of the study identified in P1. If realignment is needed, the timing, location and extent will need to be considered to optimise defence sustainability, provide time for adaptation and compensate for any potential deterioration of designated habitat at Gibraltar Point.	EA and other partners	Medium	To inform SMP3			*		N

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Glossary

Term	Definition
Accretion	The addition of newly deposited sediment leading to a relative rise in elevation of a beach or surface.
Adaptation	The need for a community or habitat to modify the way it functions in response to a changing environment.
Agricultural land classification	An assessment that provides an indication of the quality of agricultural land as a grade from 1 (best quality) to 5 (poorest quality). The classification system is the responsibility of Defra.
Appropriate Assessment (AA)	An Appropriate Assessment is required to comply with the requirements of the EU Habitats Directive for land use plans that are likely to have a significant effect on a Natura 2000 site.
Baseline scenarios	Concept used in developing a SMP to illustrate the role of shoreline management by assessing the effect of two contrasting management approaches – 'no active intervention' and 'with present management' – for all frontages and all epochs.
Bathymetry	Describes the sea bed levels and the changes in depth.
Beach nourishment	Artificial process of replenishing the beach with material from another source.
Beach recycling	Artificial process of replenishing a beach by taking surplus sand from one part of the coastline to recharge depleted areas.
Benefits (related to issue)	The service that a feature provides. In other words, why people value or use a feature. For example, a nature reserve, as well as helping to preserve biodiversity and meet national legislation, may also provide a recreation outlet much like a sports centre provides a recreation function.
Benefit-cost ratio	This is the ratio between the value of the benefits that a section of defence protects and the cost of maintaining that defence over the period of the SMP. This is used to assess the economic viability of a proposed policy.
Biodiversity Action Plan	This sets out a programme for conserving the UK's biodiversity through targets for a range of specific habitats with the aim of reducing loss of biodiversity.
Breaker zone	Area in the sea where incoming waves begin to break.
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 by sea wall.
Condition grade	Indicator based on visual inspection of defence condition ranging from condition grade 1 (very good) to grade 5 (very poor). Undertaken by the operating authority.
Conservation Areas	Places of special architectural or historic interest deserving special protection which are designated as conservation areas

Department for Environment, Food and Rural Affairs (Defra)	Government department which is responsible for the environment, for food and farming, and for rural matters.
Downdrift	Relates to the movement of beach materials along the shoreline. Places that are downdrift receive an input of sediment from erosion of 'updrift' areas.
Ebb tide	The falling tide, the part of the tidal cycle between high water and the next low water.
Economic viability	Within this document, economic viability refers to the situation where the benefits of defending protected areas outweigh the costs. Implementing SMP policies will require funding, which may be national, local and/or third party.
Ecosystem	Organisation of the biological community and the physical environment in a specific geographical area.
Environmental impact assessment	Detailed studies that predict the effects of a development project on the environment They also provide plans for mitigating any significant environmental effects.
Epoch	A period of time. For SMPs, three epochs are defined: Epoch 1: present day to 2025 Epoch 2: 2025 to 2055 Epoch 3: 2055 to 2105
Erosion	The process of removing sediment from the cliff or beach.
EU Bathing Water Directive	The aim of this directive is to protect public health and the environment from faecal pollution at bathing waters. It sets a number of microbiological and physico-chemical standards that bathing waters must either comply with ('mandatory' standards) or endeavour to meet ('guideline' standards).
EU Birds Directive	European legislation on the conservation of birds.
EU Habitats Directive	European legislation on the conservation of habitats.
European Annex 1 priority habitats	Annex 1 of the European Habitats Directive defines certain habitats as being a priority because they are considered to be particularly vulnerable. Examples within this SMP area include coastal lagoons and 'grey dunes'.
Feature	Something tangible that provides a service to society in one form or another or, more simply, benefits certain aspects of society by its very existence. Usually this will be in a specific place and relevant to the SMP.
Flood tide	Rising tide, part of the tidal cycle between low water and the next high water.
Foreshore	Zone on the beach between the high water and low water marks.
Gabion	A cage filled with rock used to stabilise the shoreline against erosion.
Geomorphology	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.
Groyne	Coast protection structure built perpendicular to the shoreline and designed to trap sediment (shingle, sand and mud).
Heritage Coast	A non-statutory designation by Natural England for coasts of scenic quality, their largely undeveloped nature and their special wildlife and

	historic interest. Local authorities assist with the management of Heritage Coasts.
Hinterland	Generally, used to refer to the area landward of the shoreline that is influenced in some way by the coast / sea.
Indicators	Used to support the appraisal of policies against criteria.
Intent of management	A vision for the future of shoreline management along a certain frontage for all epochs. This vision is then translated to specific policies for the purpose of management.
Intertidal	The area between high and low tide.
Imperative Reasons of Overriding Public Interest (IROPI)	Reasons where the interests of a Natura 2000 site are overridden by other concerns – listed in the Habitat Regulations.
Listed building	A building or other structure officially designated as being of special architectural, historical or cultural significance.
Local Development Framework (LDF)	A collection of local development documents that outline how a local authority will manage planning in their area.
Local nature reserves	A statutory designation for sites established by local authorities in consultation with Natural England. These sites are generally of local significance and also provide important opportunities for public enjoyment and recreation.
Longshore transport/ drift	The natural transport of beach material along the coast.
Maintain	That the value of a feature is not allowed to deteriorate
Mean sea level	Average height of the sea surface over a 19-year period.
Mean high water	The average level of all high waters observed over a sufficiently long period.
Mean low water	The average level of all low waters observed over a sufficiently long period.
Mitigation	Practical measures taken to offset the impact of a policy.
Mudflat	Low-lying muddy land that is covered at high tide and exposed at low tide.
National Flood and Coastal Defence Database (NFCDD)	National database for managing flood risk management asset data.
National property dataset	GIS dataset that provides information on the location and type of properties in England and Wales. This includes the value of properties based on 2005 values.
National nature reserves	These represent some of the most important natural and semi-natural ecosystems in Great Britain and are managed to protect the conservation value of the habitats that occur on these sites. These are a statutory designation by Natural England.
Natura 2000	A term used commonly to refer to Special Protection Areas and Special Areas of Conservation.
Objective	A desired state to be achieved in the future. An objective is set, through consultation with key parties, to encourage the resolution of an issue or a range of issues.
Offshore zone	Extends from the low water mark seawards.
Ordnance datum	A baseline elevation used on ordnance survey maps for deriving

	height. In the UK, this is mean sea level in Newlyn, Cornwall, measured between 1915 and 1921.
Outflanking	The process whereby erosion occurs immediately adjacent to a defended section of coast, eventually resulting in the land behind the defence being eroded from the side.
Policy	In this context, "policy" refers to the generic shoreline management options (no active intervention, hold the existing line of defence, managed realignment and advance the existing line of defence)
Policy Development Zone (PDZ)	A length of coastline defined to assess similar issues and interactions to examine and develop management scenarios. These zones are only used to develop policy.
Present value (PV)	The value of a stream of benefits or costs when discounted back to the present day. For this SMP, the discount factors used are the latest provided by Defra for assessing schemes, that is 3.5% for years 0-30, 3.0% for years 31-75 and 2.5% thereafter.
Principle	High-level statement outlining a goal or vision agreed by partner authorities and used to develop the SMP.
Prograding	When the shoreline is developing and building seaward through accretion.
Ramsar site	Area designated under the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1971
Rapid Coastal Zone Assessment (RCZA)	Survey of the historic environment assets within the coastal strip being undertaken by English Heritage.
Regional Spatial Strategy (RSS)	A collection of regional development documents that outline how a regional assembly will manage planning in their area.
Registered parks and gardens	Parks and gardens registered for their historic value so they are considered in the planning process. Local planning authorities must consult English Heritage where planning applications may affect these sites.
Residential density	The number of people living in a residential area compared with the total area of residential land.
Residual life	Period of time until a defence has deteriorated to a state in which it no longer performs its function
Rollback	The process by which assets physically move further inland away from the threat of coastal erosion.
Revetment	A structure at the rear of the beach to provide protection to the cliff, dune or hard structure at the rear of the beach.
Scheduled Monument	A statutory designation under the Ancient Monuments and Archaeological Areas Act, 1979.
Sea level rise	Increase in sea levels in relation to land levels
Sediment budget	Volumes of sediment which enter (and exit) a particular section of the coast (or an estuary).
Sediment cell	A sediment cell is a length of coastline and its nearshore area within which the movement of sand and shingle is largely self-contained.
Sediment transport	The movement of shingle, sand and mud within the coastal zone through the actions of waves, currents, tides and wind.

Shoreline Management Plan	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.
Site of Special Scientific Interest (SSSI)	An area designated under the Wildlife and Countryside Act, 1981 as representing some of the best examples of Britain's natural features including flora, fauna and geology.
Special Area of Conservation (SAC)	Area designated under the EU Habitats Directive (92/43/EEC) in order to protect habitats or species of European importance.
Special Protection Area (SPA)	Area designated under the EU Birds Directive (79/409/EEC) in order to establish a network of protected areas for birds.
Stakeholder	An organisation or individual affected by or interested in the Flamborough Head to Gibraltar Point Shoreline Management Plan.
Storm surge	A temporary rise in the sea level on an open coast resulting from a storm.
Strategic Environmental Assessment (SEA)	An environmental assessment required by the EU SEA Directive (2001/42/EC) for a range of land use plans and programmes. SEA is not a statutory requirement for Shoreline Management Plans.
Sub-littoral	The area of the seas between the intertidal zone and the edge of the continental shelf.
Sustainable	Meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. In terms of sustainability of coastal defences, this refers to the technical, economic and environmental viability of maintaining a defence line.
Swell	Waves which have travelled into the area after having been generated by winds in other areas. These waves may travel thousands of kilometres from their origin before dying away
Tidal prism	The volume of water within an estuary between the level of high and low tide, typically taken for mean spring tides.
Tidal flood risk	The risk of flooding associated with the normal and extreme tidal cycles. Flood risk is measured as the probability of flooding (that is, at location X, there is a 1 in 100 or one per cent chance of flooding in any given year) multiplied by the impact or consequences that will result if flooding occurs.
Tide	Periodic rising and falling of the sea resulting from the gravitational attraction of the moon and sun acting on the rotating earth.
Topography	Describes the level or surface of the land and the features of a landscape.
Transgression	The landward movement of the shoreline in response to a rise in sea level.
Water Framework Directive (WFD)	EU water legislation designed to improve and integrate the way water bodies are managed throughout Europe.
Water table	The upper surface of groundwater. Below this level, the soil is saturated with water.

List of Abbreviations and Acronyms

Organisations directly involved in SMP	
EA	Environment Agency
EH	English Heritage
ELDC	East Lindsey District Council
ERYC	East Riding of Yorkshire Council
LCC	Lincolnshire County Council
NE	Natural England
NELC	North East Lincolnshire Council
NFU	National Farmers' Union
RFDC	Regional Flood Defence Committee
External/other organisations	
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CLG	Communities & Local Government
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
HECAG	Humber Estuary Coastal Authorities Group
IDB	Internal Drainage Board
NECAG	North East Coastal Authorities Group
OS	Ordnance Survey
QRG	Quality Review Group
SMP Groups (Consultation)	
CSG	Client Steering Group
EMF	Elected Members Forum
KSG	Key Stakeholder Group
Plans/Strategies/Studies & Assessments	
AA	Appropriate Assessment
CFMP	Catchment Flood Management Plan
CHaMP	Coastal Habitat Management Plan
HRA	Habitat Regulations Assessment
HFRMS	Humber Flood Risk Management Strategy
ICZM	Integrated Coastal Zone Management
LDF	Local Development Framework
MSfW	Making Space for Water
PPG	Planning Policy Guidance
PPS25	Planning Policy Statement 25
RBMP	River Basin Management Plan
RCZA	Rapid Coastal Zone Assessment
RSS	Regional Spatial Strategy
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SNSSTS	Southern North Sea Sediment Transport Study

UKCP	United Kingdom Climate Programme (formally UKCIP, United Kingdom Climate Impact Programme)
WFD	Water Framework Directive
Special interest sites	
LNR	Local Nature Reserve
NNR	National Nature Reserve
SAC	Special Area of Conservation
SM	Scheduled monument
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
Technical terms	
AOD	Above Ordnance Datum
ATL	Advance the line
BAP	Biodiversity Action Plan
BCR / B - C Ratio	Benefit cost ratio
GIS	Geographical Information System
HTL	Hold the line
IROPI	Imperative reasons of overriding public interest
LiDAR	Light detection and ranging
MR	Managed realignment
NAI	No active intervention
NFCDD	National flood and coastal defence database
NPD	National property dataset
ODN	Ordnance datum Newlyn
PDZ	Policy development zone
PU	Policy unit
PV	Present value
SOP	Standard of protection
WPM	With present management