

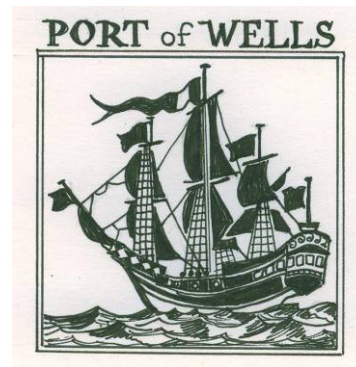
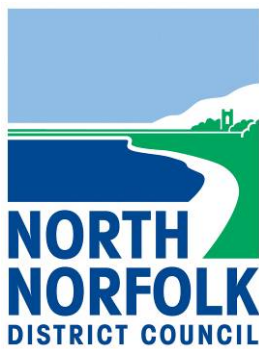
# **North Norfolk Shoreline Management Plan**

## **Final plan**

November 2010



Borough Council of  
**King's Lynn &  
West Norfolk**



## Contents

		Page
1	Introduction	1
1.1	The Shoreline Management Plan	1
1.2	Project area	4
1.3	The plan development process	6
1.3.1	Organisations involved	6
1.3.2	Stakeholder involvement	10
1.3.3	Overview of SMP development process	10
1.4	Principles for shoreline management of north Norfolk	12
1.5	Compliance with procedures	13
1.6	Structure of the Shoreline Management Plan	13
2	Basis for plan development	15
2.1	Coastal processes and flood and erosion risk management	15
2.1.1	Introduction	15
2.1.2	Geological development	20
2.1.3	Recent development	21
2.1.4	Contemporary processes and geomorphology	22
2.1.5	Coastal flood and erosion management	24
2.1.6	Future external development	32
2.2	Land use and environment	36
2.2.1	Introduction	36
2.2.2	Super-frontage 1 - Old Hunstanton to Thornham	37
2.2.3	Super-frontage 2 - Thornham to Stiffkey	40
2.2.4	Super-frontage 3 - Stiffkey to Kelling Hard	45
2.3	Role of shoreline management	48
2.3.1	Introduction	48
2.3.2	Super-frontage 1 - Old Hunstanton to Thornham	49
2.3.3	Super-frontage 2 - Thornham to Stiffkey	51
2.3.4	Super-frontage 3 - Stiffkey to Kelling Hard	55
2.4	Sustainable shoreline management: finding the right balance	57
2.4.1	The 'big decisions' for North Norfolk Shoreline Management Plan	57
2.4.2	Moving forward to solutions	58
3	General description of the plan	61
3.1	Overview of the plan	61
3.2	Implications of the plan	63
4	Policy statements	72
4.1	Introduction	72
4.2	Super-frontage 1: Old Hunstanton to Thornham	78
4.3	Super-frontage 2: Thornham to Stiffkey	95
4.4	Super-frontage 3: Stiffkey to Kelling Hard	138

5	Action plan	156
	Appendices (overview)	173

### List of appendices (provided as separate documents)

Appendix A	SMP development
Appendix B	Engagement and consultation
Appendix C	Baseline processes
Appendix D	Theme review
Appendix E	Policy development and appraisal
Appendix F	Shoreline interactions and responses
Appendix G	Draft policy appraisal
Appendix H	Economics
Appendix I	Metadatabase and bibliographic database
Appendix J	Sustainability appraisal signposting
Appendix K	Water Framework Directive compliance assessment
Appendix L	Strategic Environmental Assessment
Appendix M	Appropriate Assessment

### List of figures

Figure 1.1: Role of SMPs in the wider planning framework	3
Figure 1.2: North Norfolk SMP frontage	5
Figure 1.3: Neighbouring SMPs and CFMPs	6
Figure 2.1: Super-frontages in the North Norfolk SMP area	17
Figure 2.2: Estimated time of defence failure under no active intervention scenario	27
Figure 2.3: Recorded sea level rise	34
Figure 2.4: Recorded sea level rise at Lowestoft	35
Figure 2.5: Expected sea level rise over the period 1990 to 2115 for the East of England	36
Figure 3.1: Predicted change of flood risk area in epochs 1, 2 and 3	65
Figure 4.1: Overview of super-frontages and policy development zones	77
Figure 4.2: Indicative defence alignments following (potential) managed realignment - PDZ 1C	89
Figure 4.3: Super-frontage 1 (PDZ 1A to 1D) - Policies for the short term (epoch 1 - now to 2025)	922
Figure 4.4: Super-frontage 1 (PDZ 1A to 1D) - Policies for the medium term (epoch 2 - 2026 to 2055)	933
Figure 4.5: Super-frontage 1 (PDZ 1A to 1D) - Policies for the long term (epoch 3 - 2056 to 2105)	944
Figure 4.6: Indicative defence alignments following (potential) managed realignment - PDZ 2D	108
Figure 4.7: Indicative defence alignments following (potential) managed realignment - PDZ 2G.1	<b>Error! Bookmark not defined.</b>
Figure 4.8: Indicative defence alignments following (potential) managed realignment - PDZ 2G.3	119

Figure 4.9: Super-frontage 2 (PDZ 2A to 2H) - Policies for the short term (epoch 1 - now to 2025).....	133
Figure 4.10: Super-frontage 2 (PDZ 2A to 2H) - Policies for the medium term (epoch 2 - 2026 to 2055) .....	1334
Figure 4.11: Super-frontage 2 (PDZ 2A to 2H) - Policies for the long term (epoch 3 - 2056 to 2105) .....	1345
Figure 4.12: Super-frontage 2 (PDZ 2I to 2M) - Policies for the short term (epoch 1 - now to 2025).....	1356
Figure 4.13: Super-frontage 2 (PDZ 2I to 2M) - Policies for the medium term (epoch 2 - 2026 to 2055) .....	1367
Figure 4.14: Super-frontage 2 (PDZ 2I to 2M) - Policies for the long term (epoch 3 - 2056 to 2105) .....	1378
Figure 4.15: Indicative defence alignments following managed realignment - PDZ 3A.3 .....	147
Figure 4.16: Indicative defence alignments following (potential) managed realignment - PDZ 3A.5.....	148
Figure 4.17: Super-frontage 3 (PDZ 3A to 3D) - Policies for the short term (epoch 1 - now to 2025).....	155
Figure 4.18: Super-frontage 3 (PDZ 3A to 3D) - Policies for the medium term (epoch 2 - 2026 to 2055) .....	156
Figure 4.19: Super-frontage 3 (PDZ 3A to 3D) - Policies for the long term (epoch 3 - 2056 to 2105) .....	1557

### List of tables

Table 2.1: Properties and historic assets protected by flood defences.....	25
Table 2.3: Historic flood events in the SMP area.....	29
Table 2.2: Flood warning areas .....	31
Table 2.4: Defra (2006) sea level rise guidance for the east of England .....	35
Table 4.1: Overview of SMP2 policies and changes compared to SMP1 .....	75

## Glossary of terms

Term	Definition
Adaptation	A change in the way that an individual, community or feature such as a habitat, functions to fit a changed environment.
Aeolian	Formed by wind.
Agricultural land classification	GIS dataset that provides an assessment of the quality of agricultural land as a grade from 1 (best quality) to 5 (poorest quality).
Area of Outstanding Natural Beauty (AONB)	Statutory designation by the Countryside Commission. The purpose of the AONB designation is to identify areas of national importance and to promote the conservation and enhancement of natural beauty. This includes protecting its plants, animals, geological and landscape features.
Barrier island	A long, relatively narrow island running parallel to the mainland, built up by the action of waves and currents, that provides shelter to the shoreline behind.
Baseline scenarios	Used in developing a SMP to illustrate the role of shoreline management by assessing the effect of two extreme management approaches - no active intervention and with present management - for all frontages and all epochs.
Bathymetry	Water depth at various places in a body of water (the underwater equivalent of topography).
Beach nourishment	Artificial process of adding material from another source to a beach.
Benefit cost ratio	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.
Benefits	For the analysis of features and issues in the SMP's theme review: 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. For economic viability of flood and coastal defences: the reduction in flood and erosion damages provided by a defence throughout its whole life.
Biodiversity	The diversity of plant and animal life.
Brackish water	Fresh water mixed with sea water.
Breaker zone	Area in the sea where the waves break.
Chart Datum	Reference water level for navigation, generally a low tidal level.
Chenier	Beach ridge, usually composed of sand-sized material resting on clay or mud.

Term	Definition
Climate change	Long-term change in the patterns of average weather. It is relevant to shoreline management because of its effect on sea levels, current patterns and storminess.
Coastal squeeze	A situation where the coastal margin is squeezed between a fixed inland boundary (for example a sea wall or higher ground) and the rising sea level.
Condition grade	Indicator based on visual inspection of flood defence condition, ranging from condition grade 1 (very good) to 5 (very poor).
Conservation area	Area of special architectural or historic interest that needs to be preserved or enhanced.
Control point	Geographical feature, either natural or artificial, that determines the shape of the shoreline.
Damages	For economic viability of flood and coastal defences: the consequences of flooding or erosion.
Defra procedural guidance	Guidance produced by Defra to provide a nationally consistent structure for reviewing Shoreline Management Plans.
Department for Environment, Food and Rural Affairs (Defra)	Government department responsible for flood management policy in England and Wales. Incorporates the former Ministry of Agriculture, Fisheries and Food.
Devensian	Glacial period that occurred between 110,000 years before present (BP) and 12,500 years BP. The glacial maximum occurred at around 18,000 years BP.
Downdrift	In the direction of longshore movement of beach materials.
Ebb estuary	Estuaries or channel reaches that display an ebbing tide that is faster and shorter in time than the flooding tide. Ebb dominant estuaries tend to flush sediment out to sea from their entrance channels.
Ebb tide	The falling tide, part of the tidal cycle between high water and the next low water.
Ecosystem	Organisation of the biological community and the physical environment in a specific geographical area.
Enhance (improve)	The value of a feature increases.
Environmental impact assessment	Detailed studies that predict the effects of a development project on the environment. They also provide plans for mitigating any significant adverse effects.
Epoch	A period of time. There are three epochs in SMPs – epoch 1 (present day to 2025), epoch 2 (2026 to 2055) and epoch 3 (2056 to 2105).
Erosion	A feature or system that has a tendency to reduce in size, either horizontally or vertically, as a result of material being removed from it. Material can be removed by weathering, solution, corrosion or transportation.

Term	Definition
Esker	A feature of glacial origin. An esker is a large and long winding ridge of sand and gravel deposited by a sub-glacial torrent.
EU Bathing Waters 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 try to meet ('guideline' standards).
EU Habitats directive	European legislation on the conservation of habitats.
European Annex I priority habitats	Annex I of the European Habitats directive defines certain habitats as being 'priority' because they are considered to be particularly vulnerable and are mainly, or exclusively, found within the European Union. There are two of these habitats in the North Norfolk SMP area - saline lagoons and grey dunes.
Eye	Local term for till island.
Facies	Characteristic of a particular rock unit.
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.
Fetch	Area of water over which waves are generated by the wind.
Flood-tide	Rising tide, part of the tidal cycle between low water and the next high water.
Foreshore	Zone between the high water and low water marks.
Gabion	A cage filled with rock used to stabilise the shoreline against erosion.
Geodiversity	All the variety of rocks, minerals and landforms and the processes that have formed these features throughout geological time.
Geodiversity Action Plan (GAP)	Plan that sets out a vision for conserving and enhancing all earth heritage resources and allocates associated actions, targets, resources and timescales.
Geomorphology/morphology	The branch of physical geography/geology that deals with the form of the Earth, the general configuration of its surface, the distribution of the land, water etc.
Grey dunes	Fixed and stable vegetated sand dunes, often species-rich.
Groyne	Shore protection structure built perpendicular to the shore and designed to trap sediment.
Heritage assets	Property, plant and equipment of historical, cultural, artistic or educational significance.



Term	Definition
Hinterland	Generally, area inland of the shoreline. In north Norfolk, this is the area inland of the tidal flood zone.
Historic environment	All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged and deliberately planted or managed flora.
Historic Environment Record (HER)	Formerly Sites and Monuments Register (SMR). This holds records of historic and archaeological structures, features and finds, as well as buildings and landscapes of historical or architectural interest within a given county or unitary authority area.
Indicators	Used to support the appraisal of policies against criteria.
Integrated	An approach that tries to take all issues and interests into account. In taking this approach, managing one issue adds value to the way another is dealt with.
Intent of management	The effect on land use and environment that the SMP aims to achieve.
Intertidal zone	The part of the shore that lies between the highest and lowest tides.
Listed building	A building or other structure officially designated as being of special architectural, historical or cultural significance The following grades are distinguished: <ul style="list-style-type: none"> <li>• Grade I buildings are of exceptional interest, sometimes considered to be internationally important. Just 2.5 per cent of listed buildings are grade 1.</li> <li>• Grade II* buildings are particularly important buildings of more than special interest. 5.5 per cent of listed buildings are grade II*.</li> <li>• Grade II buildings are nationally important and of special interest. 92 per cent of all listed buildings are in this class and it is the most likely grade of listing for a home owner.</li> </ul>
Local Development Framework (LDF)	A collection of local development documents that outlines how a local authority will manage planning in its area.
Local Nature Reserve (LNR)	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, recreation and interpretation.
Longshore	Along or parallel to the shore.
Longshore economy	The effects on the economy driven by factors in neighbouring locations along the coastline.
Maintain	That the value of a feature is not allowed to deteriorate.

Term	Definition
Mean high water	Average of all high waters observed over a sufficiently long period.
Mean low water	Average of all low waters observed over a sufficiently long period.
Mean sea level	Average height of the sea surface over a 19-year period.
Mitigation	<p>Practical measures taken to offset the effect of a policy on physical assets. The term mitigation has a specific meaning for particular types of physical asset:</p> <ul style="list-style-type: none"> <li>• For wildlife, mitigation may be any process or activity designed to avoid, reduce or remedy adverse environmental effects of the plan.</li> <li>• For the historic environment, mitigation may be 'preservation by investigation' for archaeological features or 'preservation by recording' followed by abandonment, demolition or re-location for listed buildings. There is no effective mitigation for the loss of historic landscapes.</li> </ul>
Mudflat	Low-lying muddy land that is covered at high tide and exposed at low tide.
National Coastal Erosion Risk Mapping	Environment Agency-led project that aims to map the risk of erosion for the whole of the coastline of England and Wales.
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 Reserve (NNR)	A statutory designation by Natural England. 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.
Natura 2000	An ecological network of protected areas in the EU (Special Protection Areas under the Birds directive and Special Areas of Conservation under the Habitats directive).
No-regret policies	Policies that don't have irreversible negative implications.
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 range of issues.
Offshore zone	Extends from the low water mark to a water depth of about 15 metres (49 feet) and is permanently covered with water.

Term	Definition
Ordnance Datum	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.
Playing field	Range of realistic shoreline management policies used in the process of developing SMP policies.
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 all issues and interactions to examine and develop management scenarios. These zones are only used to develop policy.
Policy package / policy scenario	A combination of policies selected against the various feature/benefit objectives for the whole SMP frontage.
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 per cent for years 0 to 30, 3.0 per cent for years 31 to 75 and 2.5 per cent thereafter.
Principle	High-level statement agreed by partner authorities and used to develop the SMP.
Prograding	When the shoreline is developing and building seaward by accumulation or deposition.
Ramsar site	Designated under the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1971. The objective of this designation is to prevent the progressive encroachment into, and the loss of, wetlands.
Rapid Coastal Zone Assessment Survey (RCZAS)	Survey of the historic assets on the coast started by English Heritage to improve knowledge and understanding of these features.
Registered park and garden	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.
Residual life	Period of time until a defence has deteriorated to a state in which it no longer performs its function.
Revetment	Regularly sized and shaped stones or concrete blocks placed in an ordered fashion as bank protection or wave protection.
Scheduled monument	Statutory designation under the Ancient Monuments and Archaeological Areas Act 1979. This act, building on legislation dating back to 1882, provides for nationally important archaeological sites to be statutorily protected as scheduled monuments.

Term	Definition
Set-back	Prescribed distance inland of a coastal feature (for example the line of existing defences).
Shellfish Waters directive	Aims to protect or improve shellfish waters in order to support shellfish life and growth. It sets physical, chemical and microbiological water quality requirements that designated shellfish waters must either comply with ('mandatory' standards) or try to meet ('guideline' standards).
Shoreline Management Plan (SMP)	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)	Statutory designation under the Wildlife and Countryside Act 1981. Notified by Natural England. They represent some of the best examples of Britain's natural features including plants, animals and geology.
Special Area of Conservation (SAC)	This designation aims to protect habitats or species of European importance and can include marine areas. SACs are designated under the EU Habitats directive (92/43/EEC) and form part of the Natura 2000 site network. All SACs are also protected as SSSIs, except those in the marine environment below mean low water (MLW).
Special Protection Area (SPA)	A statutory designation for internationally important sites, set up to establish a network of protected areas for birds. SPAs are designated under the EU Birds directive (79/409/EEC).
Storm surge	A rise in the sea surface on an open coast resulting from a storm.
Strategic Environmental Assessment (SEA)	Provides a systematic appraisal of the potential environmental consequences of high-level decision making (that is plans, policies and programmes). By addressing strategic level issues, SEA aids the selection of the draft options, directs individual schemes towards the most appropriate solutions and locations and helps to ensure that resulting schemes comply with legislation and other environmental requirements.
Super-frontage	(Specific to North Norfolk SMP) Unit of shoreline made up of interrelated frontages but broadly independent from neighbouring frontages.
Sustain	Refers to some function of a feature. A feature may change, but the function is not allowed to fail.
Swell	Waves that have travelled out of the area in which they were generated.
Tidal exchange	The process of water and sediment transport into and out of a bay entrance driven by the tides.

Tidal prism (or tidal diamond)	The volume of water within an estuary between the level of high and low tide, typically taken for mean spring tides.
Tidal range	The vertical difference between the highest high tide and the lowest low tide.
Tide	Periodic rising and falling of large bodies of water resulting from the gravitational attraction of the moon and sun acting on the rotating earth.
Till	Body of soil deposited by a glacier, consisting of sand, clay, gravel and boulders mixed together.
Topography	Configuration of a surface including its relief and the position of its natural and man-made features.
Transgression	The movement of the shoreline towards land in response to a rise in relative sea level.
Tumulus	A mound of earth and stones raised over a grave or graves that are of historic value.
UK Biodiversity Action Plan	Plan that 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.
Wash & North Norfolk European Marine Site	The Wash & North Norfolk Special Area of Conservation.
Water Framework Directive (WFD)	The most substantial piece of EU water legislation to date. 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.
Wave direction	Direction from which a wave approaches.
Wave refraction	Process by which the direction of approach of a wave changes as it moves into shallow water.

## List of abbreviations and acronyms

<b>Organisations directly involved in SMP</b>	
AW	Anglian Water
BCKL&WN	Borough Council of King's Lynn & West Norfolk
EA	Environment Agency
EH	English Heritage
NCC	Norfolk County Council
NE	Natural England (formerly English Nature)
NLA	Norfolk Landscape Archaeology
NNDC	North Norfolk District Council
RFDC	Regional Flood Defence Committee
RSPB	Royal Society for the Protection of Birds
<b>External/other organisations</b>	
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CLG	Communities & Local Government
Defra	Department for Environment, Food and Rural Affairs
EACG	East Anglia Coastal Group (formerly ACAG - Anglian Coastal Authority Group)
EERA	East of England Regional Assembly
EU	European Union
IDB	Internal Drainage Board
OS	Ordnance Survey
QRG	Quality Review Group
RNLI	Royal National Lifeboat Institute
UEA	University of East Anglia
<b>SMP groups (consultation)</b>	
CSG	Client Steering Group
EMF	Elected Members' Forum
KSG	Key Stakeholder Group
<b>Plans/strategies/studies and assessments</b>	
AA	Appropriate Assessment
CFMP	Catchment Flood Management Plan
CHaMP	Coastal Habitat Management Plan
ICZM	Integrated Coastal Zone Management
LDF	Local Development Framework
MSfW	Making Space for Water
NCERM	National Coastal Erosion Risk Mapping
NI 188	National Indicator 188 (Climate change)
NI 189	National Indicator 189 (Flood risk)
PPG	Planning Policy Guidance
PPS25	Planning Policy Statement 25

RBMP	River Basin Management Plan
RCZAS	Rapid Coastal Zone Assessment Survey
RFRA	Regional Flood Risk Appraisal
RSS	Regional Spatial Strategy
SA	Sustainability Appraisal
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SNS2	Southern North Sea Sediment Transport Study
UKCP	United Kingdom Climate Programme (formerly UKCIP, United Kingdom Climate Impact Programme)
WFD	Water Framework Directive
WLMP	Water Level Management Plan
<b>Special interest sites</b>	
AONB	Area of Outstanding Natural Beauty
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
<b>Technical terms</b>	
AOD	Above Ordnance Datum
AtL	Advance the line
BAP	Biodiversity Action Plan
BCR / B - C ratio	Benefit-cost ratio
BP	Before present
CD	Chart datum
GIS	Geographical Information System
HAT	Highest astronomical tide
HtL	Hold the line
HWM	High water mark
IROPI	Imperative reasons of overriding public interest
LAT	Lowest astronomical tide
LiDAR	Light detection and ranging
MHWN	Mean high water neap
MHWS	Mean high water spring
MLWN	Mean low water neap
MLWS	Mean low water spring
MR	Managed realignment
MSL	Mean sea level
NADNAC	National appraisal of defence needs and costs
NAI	No active intervention
NFCDD	National flood and coastal defence database

NPD	National property dataset
OA	Operating authority
ODN	Ordnance datum Newlyn
OWF	Offshore wind farms
PDZ	Policy development zone
PV	Present value
SAMP	Systems asset management plan
SAR	Synthetic aperture radar
SMP2	Second round Shoreline Management Plan
SOP	Standard of protection
UKBAP	United Kingdom Biodiversity Action Plan
WPM	With present management



# 1 Introduction

## 1.1 The Shoreline Management Plan

A Shoreline Management Plan (SMP) is a high-level policy document in which the organisations that manage the shoreline set their long term plan. The SMP aims to identify the best ways to manage flood and erosion risk to people and the developed, historic and natural environment and to identify opportunities where shoreline management can work with others to make improvements.

We developed a draft version of this SMP, which was out for public consultation from 20 July to 13 November 2009. The consultation generated a wide range of responses from the people and organisations with an interest in the shoreline of north Norfolk from Old Hunstanton to Kelling Hard. We have considered these in developing this final version of the plan (see appendix B).

The SMP is an important part of the Department for Environment, Food and Rural Affairs' (Defra) strategy for managing flood and coastal erosion risk. This strategy has two key aims:

- to reduce the threat of flooding and erosion to people and their property
- to benefit the environment, society and the economy as far as possible, in line with the Government's 'sustainable development principles'. These are standards set by the UK Government, the Scottish Executive and Welsh Assembly Government for a policy to be sustainable.

The SMP is the highest-level planning stage of Defra's strategy for flood and coastal risk management. The SMP sets high-level policies that are implemented through delivery plans (such as strategies and asset management plans) and subsequently by projects and actions (such as schemes).

About 10 years ago, a first round of SMPs was completed for the whole of the coastline of England and Wales. The first SMP for North Norfolk was completed in 1996. The revised SMP (SMP2) builds on the first round of plans because it is based on the additional information, studies and guidance developed since the first SMP was published.

- The SMP is based on revised guidance that was published following Defra-funded reviews (2001, 2003) of the strengths and weaknesses of various plans.
- The SMP uses updated information collected from the Environment Agency's coastal monitoring programme and other published literature on climate change and sea level rise, including Futurecoast (Defra/Halcrow 2002). This also includes the Rapid Coastal Zone Assessment Survey for Norfolk (Norfolk Archaeological Unit 2005).
- It looks at the SMP boundaries following work undertaken as part of the Futurecoast study (Defra/Halcrow 2002) and the English Nature internal

report “Shoreline Management Plans: advice on key boundary locations” (Halcrow 2001).

The reference numbers for Shoreline Management Plans have recently been revised. All the SMPs in England and Wales are now numbered in order from the Scottish border on the east coast round to the border on the west coast. Consequently, the revised North Norfolk SMP is number 5 (rather than the original 3a).

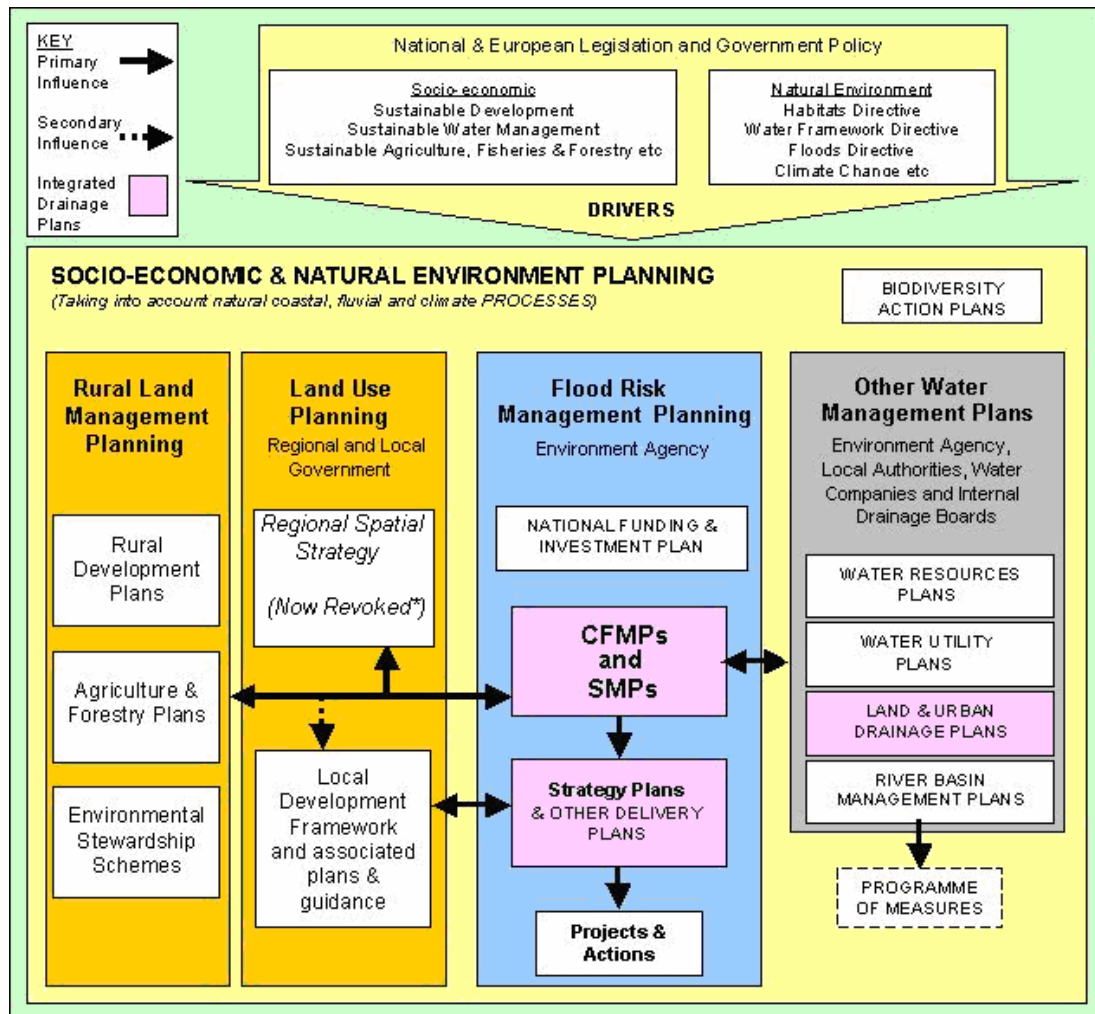
The main aim of the SMP is to develop an ‘intent of management’ for the shoreline that achieves the best possible balance of all the values and features around the shoreline for the next 100 years. This ‘intent of management’ is mainly about how we manage the shoreline and its flood and erosion defences. There is, of course, also a strong relationship with social, economic and environmental activities and values around the shoreline. SMP policies are therefore not driven by flood and coastal risk management economics because it is impossible to quantify all the impacts of shoreline management. However, chosen policies need to be realistic, especially in the short term. In the UK, no organisation has a legal responsibility to provide or maintain flood and erosion defences. The Environment Agency and the maritime local authorities only have powers to do so and they need to work within the limited budgets that are available. This means that implementing SMP policies will depend on funding being available. This may be from the national flood and coastal erosion risk management budget, but it could also come from other national sources or from local and/or third-party funding.



**Photo 1.1: Wells-next-the-Sea beach huts**

The SMP does not make decisions about land use and environmental values, but it does 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 other organisations with an interest or responsibility along the north Norfolk coast. 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). Figure 1.1 illustrates the role of SMPs in land use planning. Section 1.5 explains how the SMP takes account of other related plans and procedures.



**Figure 1.1 Role of SMPs in the wider planning framework**

The 'intent of management' is usually expressed in terms of the effect of shoreline management on land use and environment. It describes what we want to achieve by managing the shoreline. However, for coastal flood and erosion risk management, the intent of management has to be translated into one of four policies that describe how the shoreline is actually managed:

- **Hold the line (HtL)** – this involves holding the defence system where it is now by maintaining or changing the standard of protection. This policy should cover those situations where work or operations are carried out in front of the existing defences (such as beach recharge), rebuilding the toe of a structure, building offshore breakwaters and so on. This includes

other policies that involve operations to the back of existing defences (such as building secondary flood walls) where they form an essential part of maintaining the current coastal defence system.

- **Advance the line (AtL)** – this involves building new defences seaward of the existing defence line. If relevant, this policy should only be used on those stretches of coastline where significant land reclamation is considered.
- **Managed realignment (MR)** – this involves allowing the shoreline to move seaward or landward, with associated management to control or limit the effect on land use and environment. This can take various forms, depending on what we want to achieve. All are characterised by managing change not only technically (by breaching and building defences) but also for land use and environment (by aiding or ensuring adaptation).
- **No active intervention (NAI)** – this involves no further investment in coastal defences or operations.

It is important to note that the central decision in the SMP concerns the ‘intent of management’ to be achieved. This is the actual plan. The policies are only a means to implement the plan.

The first three policy options usually involve building or maintaining defences. The policies do not imply any particular standard of protection to be provided. They could be implemented by maintaining or changing the standard of protection. This is usually a decision taken in a strategy study or scheme.

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

- epoch 1: now till 2025 (short term)
- epoch 2: 2026 to 2055 (medium term)
- epoch 3: 2056 to 2105 (long term)

For the later epochs as uncertainty increases, the intent of management and associated policies will be less fixed. Shoreline management planning is an ongoing process so SMPs are reviewed as new information and knowledge becomes available. In principle, this review happens every five to 10 years.

## 1.2 Project area

The project area is the section of shoreline for which the SMP describes the plan and sets the policies. For the North Norfolk SMP, this is the frontage from Old Hunstanton up to the end of the shingle ridge at Kelling Hard (see figure 1.2). This is coastal frontage number 5 within the national shoreline management programme (see figure 1.3). Chapter 2 provides a description of the project area and explains how the character of the area has played a vital role in developing the plan.

The boundaries at Old Hunstanton and Kelling Hard match the neighbouring SMPs: the Wash SMP (number 4) and the Kelling to Lowestoft SMP (number 6). These boundaries have changed from the original SMP. The boundary at Old Hunstanton was selected so that the whole of the Wash could be covered by one SMP. The boundary at Kelling Hard was selected to coincide with the north Norfolk drift divide (this is known to move between Cromer and Weybourne, which are both to the east of this SMP).

The exact location of the two 'open coast boundaries' is:

- western boundary – the transition from cliffs to dunes to the immediate east of Old Hunstanton. This is the eastern boundary of the Wash SMP.
- eastern boundary – the transition from shingle ridge to cliffs at Kelling Hard. This is the western boundary of the Kelling to Lowestoft SMP.

The neighbouring SMPs were developed partly in parallel and with involvement from the same people and organisations, which ensures that the policies are compatible. This is discussed further in the relevant policy statements in section 4.

The SMP also has an inland boundary (see figure 1.2). This runs roughly parallel to the coast between the outfalls of the four river valleys. This is the boundary between the North Norfolk Shoreline Management Plan and the North Norfolk Catchment Flood Management Plan (CFMP).

The exact location of the SMP/CFMP boundary is:

- River Hun – outfall at Thornham
- River Burn – outfalls at Burnham Overy Staithe
- River Stiffkey – outfall north east of Stiffkey village
- River Glaven – outfalls located around Cley-next-the-Sea.

The outfall structures that form this boundary limit the tide from coming up into the river valleys. This SMP determines the policy for the outfalls that reduces the risk of flooding from the sea in the river valleys. The CFMPs provide policies for managing flood risk from rivers, including the effect that high tides can have on river flooding (tide locking). The CFMP policies therefore apply to all properties and infrastructure in the flood plain inland from the river outfalls. The CFMP's policy for this area is 'policy 2 – reduce flood risk management'. The area is at low to moderate risk of river flooding which means that it is generally possible to reduce existing flood risk management actions.

The North Norfolk CFMP was published in 2010. A non-technical summary and post-adoption statement are available to download from the Environment

Agency's website at <http://www.environment-agency.gov.uk/research/planning/114303.aspx>. The SMP has taken the policies in this CFMP into account in developing the shoreline management policies.

A much wider area has been taken into account in developing the plan. This study area includes everything that can influence shoreline management and everything that can be influenced by it. This study area covers much of the North Sea, the rivers up to at least their tidal limit, the whole area within the tidal flood zone and also, to some extent, the hinterland and further away that has links to all the features in and around the north Norfolk coastline.

## **1.3 The plan development process**

### **1.3.1 Organisations involved**

The SMP has been developed through a partnership approach between all relevant authorities: the authorities that manage the shoreline, the planning authorities, the statutory stakeholders and other organisations that have an interest or responsibility along this stretch of the north Norfolk coast. These organisations have been involved through both officers and elected members.

The SMP is, in the first place, the long-term plan of the authorities that manage the shoreline. For the North Norfolk SMP, the Environment Agency manages the flood defences for the whole of the SMP area other than on frontages where the defences are privately owned.

Interaction between the SMP and land use planning is essential so all planning authorities have been involved as full partners. There are two local authorities and one county council covering the North Norfolk SMP area:

- Borough Council of King's Lynn and West Norfolk
- North Norfolk District Council
- Norfolk County Council

The statutory organisations for the Strategic Environmental Assessment (see section 1.5) are:

- Natural England
- English Heritage

Of the other organisations that have an interest or responsibility in managing the north Norfolk coast, the following two are involved as partner organisations:

- Wells Harbour Commissioners
- Norfolk Coast AONB partnership



Key:

- Open Coast Boundary
- Tidal River Outfall
- Tidal Flood Zone
- North Norfolk SMP Frontage
- Project Area Inland Boundary

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Figure 1.2 North Norfolk SMP frontage

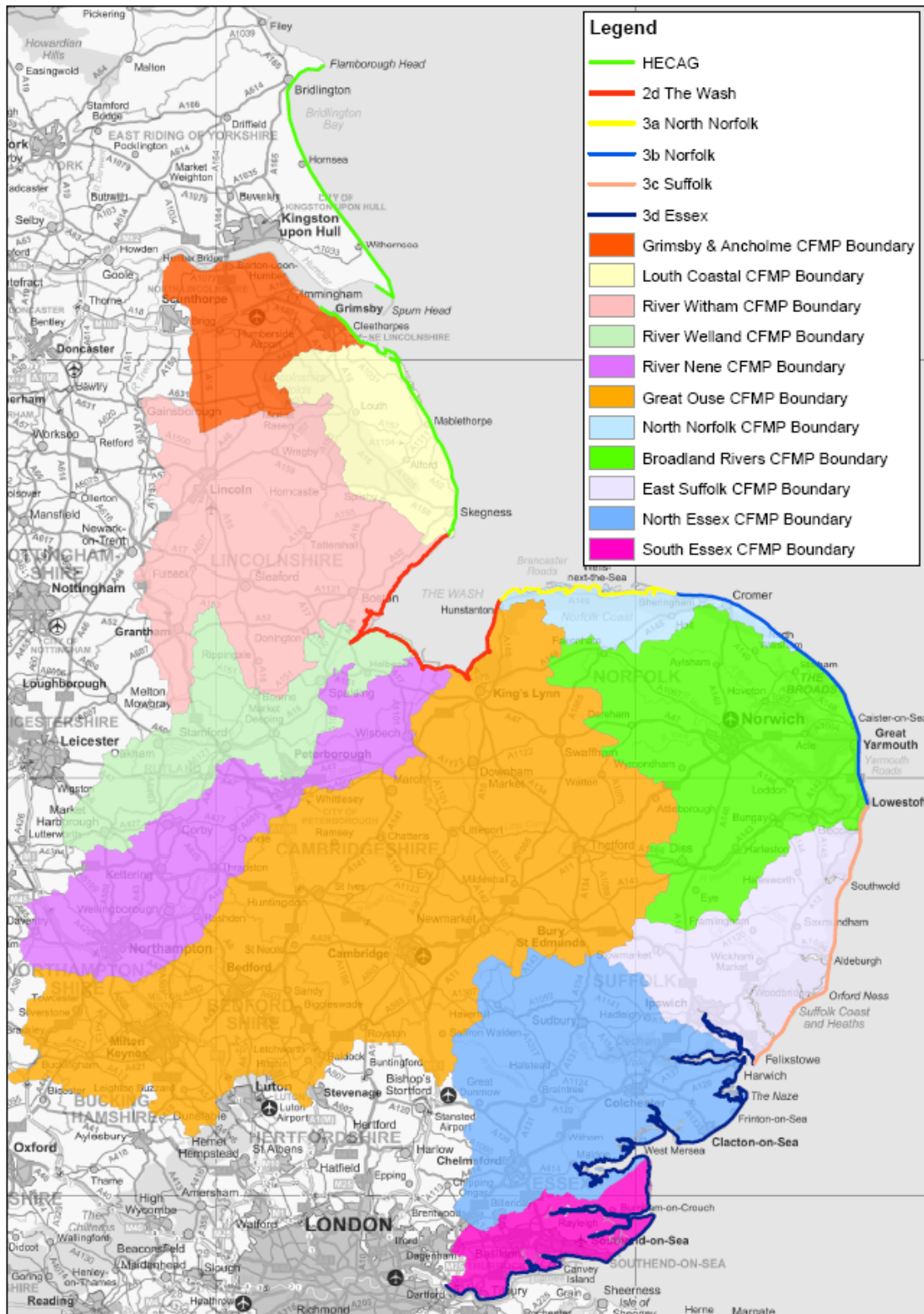


Figure 1.3 Neighbouring SMPs and CFMPs



### 1.3.2 Stakeholder involvement

Appendix B contains a detailed account about how we have involved others in developing the North Norfolk SMP. The process of developing this SMP has been led by the organisations listed above (the Client Steering Group). Previous members of the Client Steering Group are the Royal Society for the Protection of Birds, the National Trust, Norfolk Wildlife Trust, the Wash & North Norfolk European Marine Site management scheme and the Water Management Alliance.

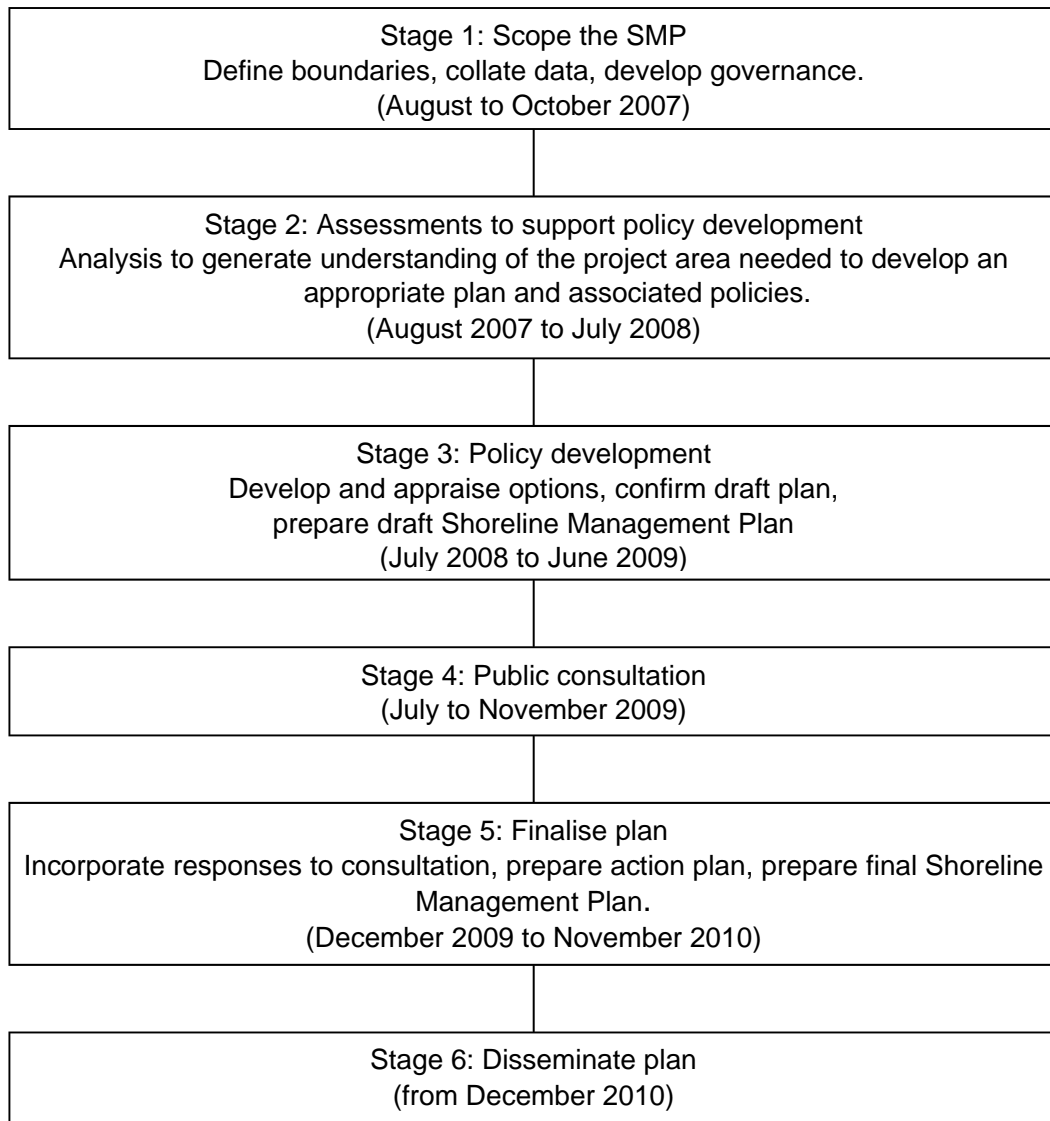
In addition, we have involved members from both local authorities, Norfolk County Council and the Environment Agency's Regional Flood Defence Committee in the Elected Members' Forum. These representatives have scrutinised the SMP process from the start and have provided a way for these authorities to influence the plan.

We have also identified a group of more than 50 key stakeholders who have a greater interest in the outcome of the SMP. We have met with some of these organisations on a one-to-one basis to explain how the SMP might affect them and to obtain more detailed local knowledge about the SMP area. We have also held meetings for key stakeholders to inform them that we are revising the first SMP and asking for their input into this process. We have been in touch with other people and organisations who live and work along this coastline through public drop-in events and articles in local newsletters.

We have produced a report summarising the public consultation period. This includes details of the drop-in events, the meetings we held during the consultation period and the publicity we produced about it. The consultation report reproduces all the comments we received during the four month consultation period and contains an analysis of those comments. Appendix B of the SMP contains a summary of these comments, how we have responded to them and how they have influenced the final SMP.

### 1.3.3 Overview of SMP development process

The development of SMPs follows the principles and processes set out in the Shoreline Management Plan guidance issued by Defra in March 2006. This guidance identifies six stages:



The publication of this Shoreline Management Plan marks the end of stage 5. The plan will then be sent by the partner organisations to all businesses, organisations and local communities. Appendix A contains more detailed information about the SMP development process.

The intent is to continue the partnership approach through which we have developed this SMP, at the level of elected members, officers and stakeholders and to link this with the existing East Anglia Coastal Group (EACG). By organising regular progress meetings, this partnership can monitor and drive the implementation of the SMP through the action plan (see section 5). This will allow an ongoing process of shoreline management to continue in the future in the run-up to the next SMP review in five to 10 years' time.

## 1.4 Principles for shoreline management of north Norfolk

The SMP has been developed based on a set of principles agreed by all the organisations involved in the process. Some of these principles can, by their nature, conflict. This is one of the main challenges of shoreline management. It is unlikely, perhaps impossible, to achieve all these principles fully. Instead, the SMP aims to provide the best achievable balance between the principles in the short, medium and long term. As a whole, this set of principles represents the balance of values the SMP aims to achieve. The order of the principles does not indicate any priority or relative importance.

1. To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations.
2. To ensure that local policy decisions do not adversely affect wider natural coastal processes.
3. Work with coastal change to take account of uncertainty about the future in the timing of policies.
4. To consider social and economic wellbeing and allow communities and individuals to adapt to coastal change.
5. To consider the effects of coastal change on local industries (tourism, agriculture, fisheries, etc).
6. To take account of the value of the North Norfolk coast area to wider society.
7. To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences.
8. To contribute to maintaining and enhancing protected sites and species, subject to natural change.
9. To support maintenance and enhancement of biodiversity in the wider coastal countryside.
10. To contribute to maintaining and enhancing the character of the coastal landscape.
11. To have regard for the historic environment and its value for the heritage, culture and economy of the area.

## **1.5 Compliance with procedures**

This SMP complies with the Strategic Environmental Assessment (SEA) directive (2001/42/EEC), the Habitats directive (92/43/EEC) and the Water Framework directive (2000/60/EEC), as detailed below.

This SMP has been developed alongside, and integrated with, a SEA process and Habitats regulation assessment (called Appropriate Assessment in this document). These processes have supported the development of this SMP and have been an iterative process throughout the SMP process. The outputs of these are provided in appendix L (SEA environmental report) and appendix M (Appropriate Assessment). Also, the inclusion of general sustainability criteria has been demonstrated through a signposting exercise based on the sustainability appraisal (SA) process. This is included in appendix J.

Compliance with the Water Framework directive is demonstrated through a Water Framework Directive assessment, provided in appendix K.

## **1.6 Structure of the Shoreline Management Plan**

The Shoreline Management Plan is divided into a number of parts. There is the main SMP document (this document), which includes a set of accompanying appendices. There is also a separate non-technical summary.

This document (the main SMP document) is aimed at a wide audience, typically an elected member of a relevant authority or an interested member of the public. The document is intended to be as concise as possible without leaving out important details. The aim is to justify the plan and policies and to identify what they mean. As a result, the information in the main document is only about the final plan as agreed and confirmed. Information about other policies considered during the SMP process is included in the relevant appendices.

The structure of this document is as follows:

- Chapter 2 presents a summary of the technical background of the SMP and refers to a set of technical appendices for more details.
- Chapter 3 provides a high-level description of the plan and policies, the overall reasoning behind it and its implications.
- Chapter 4 provides more details about the plan in the form of maps and tables. It includes the confirmed policies for the north Norfolk coast.
- Chapter 5 contains the action plan. This is an overview of the specific activities that the partner organisations have agreed to implement the plan and policies.

The non-technical summary is a concise and more accessible version of the main document. For this reason, it only contains information that is included in the main document and not in any of the appendices. The non-technical summary is aimed at a wider audience than the main document and is intended to be understood by the general public.

The Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) are stand-alone documents based on their respective guidance. They are included as appendices L and M and have been developed in discussion with the Environment Agency, Natural England and English Heritage.

## **2 Basis for plan development**

This section describes the background of the Shoreline Management Plan. Management of the shoreline combines technical elements with 'softer' elements. The SMP aims to use coastal processes and management to achieve the best possible balance between all relevant uses of the land and the environment. This section starts by describing the technical side (in section 2.1), and then describes land use and the environment, of the north Norfolk shoreline (in section 2.2).

### **2.1 Coastal processes and flood and erosion risk management**

#### **2.1.1 Introduction**

The north Norfolk coastline stretches over 75 kilometres, or about 42 kilometres as the crow flies. It faces the North Sea with tidal patterns that are the main (but not exclusive) control of sedimentary processes that lead to the coastline's distinctive physical features. The general drift along the coast is towards the west created by weak but frequent storm events. There are reversals in the drift caused by seasonal variations and north east storm surges.

There are three major control points along the frontage: Gore Point (associated with the River Hun outfall), Scolt Head Island and Blakeney Point. The coast has therefore been divided into three units referred to as super-frontages. These super-frontages are mainly independent, but there are important interactions within them. They are therefore the right units for broadly assessing coastal processes and are also relevant for developing policy.

The interaction with the neighbouring SMP for the Wash (to the west of this SMP) is limited. The general direction of sediment transport is towards the west, from the north Norfolk coast past Hunstanton into the Wash. The interaction with the neighbouring Kelling to Lowestoft SMP (to the east of this SMP) is also limited because the boundary was chosen to coincide with a drift divide. There is, however, sediment transport across this divide. The exact processes are uncertain, but there is probably transport in both directions, depending on sediment type, tidal flow direction and storm events.

### **Text box 2.1: Key coastal processes in north Norfolk**

This text box introduces and explains some of the key coastal processes in the North Norfolk SMP area. These have played an important role in developing the plan.

#### **Tidal prism:**

This is the volume of water that flows in and out of a tidal channel during a complete cycle of high and low tide. For tidal channels behind a spit (such as Blakeney Spit) or a barrier island (such as Scolt Head), the tidal prism is determined by the area covered between high and low tide. The tide brings in silt which settles where the flow stops, causing siltation. Increasing the tidal prism by moving flood defences further inland means that more water flows through the channels and most of the silt will be carried into the newly-created intertidal area. If designed properly, the increased flow will make the existing channel larger and reduce siltation there.

#### **Formation of bays:**

Bays along the open coast form because of varying geology. They typically have a curved (parabolic) shape between headlands as a result of the way that waves interact with changes in depth ('wave refraction'). Headlands can be hard or soft, natural or artificial. Headlands are control points for the shape of the bay. Changes in their location will change the shoreline in the bay. In north Norfolk, the bays are controlled by the outer tidal estuaries of the small rivers that flow into the sea, for example at the ends of Scolt Head Island and Blakeney Spit.

Appendix C gives more information about coastal processes.



Figure 2.1: Super-frontages in the North Norfolk SMP area



The three super-frontages are discussed below.

- Super-frontage 1: from Old Hunstanton dunes (SMP boundary) to Thornham, at the western end of Brancaster bay. Within this super-frontage the processes along the shoreline take place from east to west. The ebb estuary of River Hun influences Gore Point which in turn can be seen as a control point for the 'bay' formed by the Old Hunstanton dunes. The tidal prism is currently restricted by the reclaimed land between Thornham and Holme-next-the-Sea.



**Photo 2.1: Old Hunstanton dunes**

- Super-frontage 2: from the western end of Brancaster bay to the eastern end of Stiffkey bay. Scolt Head Island is the main physical feature in this unit. Its two ends are control points for the bays on either side - Brancaster bay and Holkham bay. In the long term, there is a chance that Scolt Head Island will continue to roll back towards land and may even reattach to the land. This would have a big influence on the area directly behind Scolt Head Island and also on the neighbouring bays. The tidal prism is currently restricted by various reclaimed areas behind the barrier coast. Warham and Stiffkey marshes east of Wells-next-the-Sea form a typical 'open coast' and are not greatly affected by how the neighbouring frontages are managed.



**Photo 2.2: Stiffkey channel / marshes**

- Super-frontage 3: from the western end of Blakeney Spit, near Stiffkey, to the eastern end of the Cley to Salhouse shingle ridge at Kelling Hard (SMP boundary). Blakeney Spit is the main feature and, as for Scolt Head Island, it is possible that the current process of rollback will eventually cause its western tip to reattach to the land. The eastern end is characterised by the Cley to Salhouse shingle ridge in front of brackish marshes. The tidal prism is currently restricted by various reclaimed areas behind the barrier coast.



**Photo 2.3: Blakeney Spit ridge**

Some of the coastline is not defended where the land rises gradually from the shore to higher ground. Other sections, particularly reclaimed land, are defended by vegetated embankments and by partly-managed dunes. There are several small settlements fronted by hard defences. Seaward of these are areas of intertidal saltmarsh and mudflats defined by the control points of Gore Point, Scolt Head Island and Blakeney Spit.

A full assessment of the coastal processes in the north Norfolk area is in appendix C and a brief summary is provided in the following sections.

### 2.1.2 Geological development

Underlying chalk and glacial tills are the foundations of the area. Chalk underlies the whole of the north Norfolk coast area but it is only seen at the surface in two sections of the coastline: Hunstanton cliffs and a wave-cut platform from Weybourne to Cromer (all just outside the SMP area). There is a long west to east valley that runs parallel to the shore that is located along the back marsh of the existing coast. This valley is thought to have been caused by faulting of the chalk. It dips from Holme-next-the-Sea to Salthouse and then runs offshore.



**Photo 2.4: Kelling Hard looking away from the start of the chalk cliffs**

The repeated advance and retreat of glaciers and ice sheets (known as ice ages) that have happened during the last two million years (Pleistocene) has been instrumental in forming the modern landscape of north Norfolk. The old cliff line that runs along the edge of the hinterland rises above the present day high water mark (HWM). It marks the likely high sea level during the last warm period following a cold glacial period, known as the Ipswichian, (130,000 to 125,000 years before present).

The ice sheets left behind great thicknesses of tills, sands and gravels. These deposits lie over the chalk bedrock and beneath the Holocene sediments deposited over the last 11,000 years. Individual clay tills vary from two to five metres thick. Many were laid down during the last glacial period when the front of the Devensian ice sheet lay along the coast. These tills extend seaward of the existing coastline. They are thought to have provided coarse-grained sediment for Holocene coastal deposits and may still do so.

There are some exposures of this glacial till above the intertidal zone that form till islands known as 'eyes' (Cley Eye, Blakeney Eye, Little Eye and Gramborough Hill).

Early Holocene geomorphology was dominated by low sea levels of 16 metres below current ordnance datum and characterised by river processes. This resulted in freshwater peats being formed locally between 7,000 and 6,000 years before present. A key feature of this was a layer of mudflat sediment up to 15 metres thick. Then saltmarsh developed on top of the mudflat layer as the area became more waterlogged with increased salinity. During this period, the barriers moved towards the land at around one metre a year in response to sea level rise with little loss of intertidal zone. However, Andrews et al. (1999) have proposed that the Holocene sediment prism, the area over which sediment processes affect the coastline through transport, is now half its original size. This paper also proposes that the barriers of Scolt Head Island and Blakeney Spit are relatively young, being further out to sea than others, with Scolt Head developing as a spit from Holkham and Blakeney Spit developing as a response to land reclamation.

### 2.1.3 Recent development

Many of the settlements along the north Norfolk coast have developed from small fishing settlements. Records for Cley-next-the-Sea date back to the Middle Ages when St. Mary's church was built during the 13<sup>th</sup> century. Next door, Blakeney was once a medieval port and had been ranked as the fourth most important port in England. However, the port began to lose its importance into the 17<sup>th</sup> century as land reclamation dominated the shoreline and reduced the navigability of the channels. Further along, the settlement of Holkham was created by the Vikings with the name 'Holkham' translating as 'hollow' or 'cavity' in old English. The settlement is now dominated by the Palladian Holkham Hall where Lord Coke lives.

Reclamation began in the United Kingdom during the 1500s. Some areas in north Norfolk were the first to be reclaimed from the sea for agricultural use, using dykes and ditches. Two of the main documented reclamations were at Cley-next-the-Sea during the 17<sup>th</sup> century. Before these reclamations, Cley had been a trading port but it ended up one mile inland after the reclamation. There was also a significant area of saltmarsh reclaimed at Burnham Overy. This process began in 1639 and was completed in 1859 with the building of the Wells sea wall extending from south to north along the harbour channel.

It is thought that the reclamation of saltmarsh for agriculture was one of the main drivers for the growth of Blakeney Spit (and Scolt Head Island) at the eastern end of the frontage. The reclamation generated a series of barriers by limiting drift along the shoreline and restricting sediment transport rates perpendicular to the shore. This is how the coastline we know today has developed.

#### 2.1.4 Contemporary processes and geomorphology

The north Norfolk coastline has varying tidal ranges and tidal levels across the frontage. The tidal range at Hunstanton is nearly 6.5 metres whereas at Cromer, just east of the SMP area, it is only 4.4 metres.

The wave climate of north Norfolk is characterised by higher wave heights at Cley to the east than at Scolt Head in the middle of the frontage. The Environment Agency Norfolk Area monitoring programme shows that at Cley, the wave height approaching the shingle ridge seems to be similar to the offshore wave height, while the waves at the seaward edge of Scolt Head are only around 80 per cent of the offshore wave height. This represents an average over the survey. The wave heights at Scolt Head could be greater than those at Cley during specific events. The north north east wave directions generated through storm events show a wide variety of offshore directions. This highlights the difficulty in determining wave climate information for this stretch of coastline.

Sediment transport rates have been modelled from the 1970s to recent times with improving technologies. The basic method generates information through a time series of wave heights, periods and directions, transport rates along the shoreline and drift rates. The rates calculated range from 160,000 cubic metres a year ( $\text{m}^3/\text{yr}$ ) at Weybourne to 600,000  $\text{m}^3/\text{yr}$  at Blakeney and 190,000  $\text{m}^3/\text{yr}$  for Scolt Head. Some of these results could be disputed due to uncertainties in the modelling but it gives an overview of the processes occurring. Research into sediment budgets (the difference between sediment inflow and outflow of a given area over a period) from the University of Newcastle (1998) has concluded that the north Norfolk coastline has a positive sediment budget. This means that the amount of sediment arriving at the frontage is greater than that being lost, so overall the total amount of sediment along the coast is gradually increasing.

Barrier beaches on the north Norfolk coast are of different types and sizes with gravel ridges and sand dunes. These are gradually moving towards land at about one metre a year (on average, although in reality there is a large movement once every few years). In some cases, new ridges are being created on their seaward side implying a more complex process. The movement of these barriers towards land happens mainly during storms due to waves transporting material to their landward edge. Some barriers are also developing along the shoreline with the western ends of Blakeney Spit and Scolt Head moving towards the west by up to 3.5 metres a year. In the case of Blakeney Point, local observations have indicated that there is a cyclic system of longshore growth and decay of the barrier (about every 40 years) driven by storm surges from the north that transport material back to the south east. It is likely that there is a drift divide near Kelling, the eastern boundary of the SMP area. However, its location is not fixed and there is

likely to be some transport in both directions between the two SMP areas. It is currently not known what the effects are of the changing position of the drift divide.



**Photo 2.5: Cley to Salthouse shingle ridge**

The sand dune systems are generally single ridges colonised by *Ammophila*, a grass accustomed to sand environments. In some places there is some fore-dune development. Holkham dunes have recently seen a large amount of development of the fore-dunes with the mature dune ridges being colonised by extensive flora. The dunes at Blakeney Point and Scolt Head are eroding as they are forced to roll back by wave action.

There are seven tidal deltas along the coast: Gore Point, Thornham, Titchwell, Brancaster Staithe, Burnham Overy, Wells harbour and Morston / Blakeney. The intertidal areas of these deltas reduce wave energy but the effect depends on the tidal currents from the inlets relative to the transport rate along the shoreline. So a change in the tidal exchange of the inlet can have an effect on the delta and the neighbouring shoreline.

The north Norfolk coast has around 2,200 hectares of saltmarsh ranging from pioneer through to upper saltmarsh. This size is significant at a European scale. The rollback of barriers is causing a gradual overall loss of saltmarsh area as the inland edge is fixed at the higher ground. This loss has been offset by saltmarsh developing in the areas behind newly-formed barriers, such as at Holkham Gap in the 1990s. At present there is no evidence to expect a loss of intertidal habitats. However, there is significant uncertainty about the longer term which means that coastal squeeze could occur in the future. The Appropriate Assessment (appendix M) looks at how this could affect the designated habitats. Around 50 per cent of the original saltmarsh area has been reclaimed in the last 300 years. Most of these reclaimed areas are used as grazing marsh. They are of great ecological importance due to

their salinity gradient created by saline seepage and freshwater springs, but they are also among the most fragile habitats of the north Norfolk coastline.

### 2.1.5 Coastal flood and erosion management

#### Flood and erosion defences

Over half the defences along the north Norfolk coastline are earth embankments, commonly known as sea banks. Around 15 per cent of defences are classed as natural defences, either sand dunes or shingle ridges. Several of these defences protect private sections of land such as golf courses and nature reserves. Others are there to protect settlements from flooding. The quaysides of Wells-next-the-Sea and Blakeney are also classed as hard defences. Table 2.1 summarises the number of residential and commercial properties and historic assets that the defences currently protect. Appendix F contains full tables for all epochs, including separate numbers for residential and commercial properties.



**Photo 2.6: Morston flood embankment**

There are a few sections of undefended land where there is enough land between high and low water to reduce the effect of waves. These areas are also limited by the gradually-rising ground level.

The condition of flood and coastal defences is regularly checked by those who manage them. Most of the defences along the north Norfolk coast are assessed to be in 'good' or 'fair' condition, which is typical for defences of this type. The condition can be used to estimate the residual life of an individual defence in the extreme scenario that the defence would no longer be managed (a 'no active intervention' scenario). This information is needed to determine the effect that shoreline management has. A table showing the results of this assessment is in section 2 of appendix F.

**Table 2.1 Properties and historic assets protected by flood defences**

<b>Flood cell</b>	<b>Properties</b>	<b>Scheduled monuments</b>	<b>Listed buildings</b>	<b>Conservation areas</b>
Hunstanton to Holme	77	0	14	0
Thornham	2	0	0	0
Titchwell to Brancaster	20	0	0	0
Brancaster golf club	1	0	0	0
Brancaster and Brancaster Staithe	63	1	2	1
Burnham Deepdale and Burnham Norton	26	0	1	0
River Burn valley	38	2	13	0
Burnham Overy Staithe	22	0	4	1
Overy marshes	86	1	22	0
Wells quay	62	0	20	1
Wells east	151	0	26	1
Stiffkey to Morston	59	1	21	0
Blakeney quay	27	1	197	1
Blakeney fresh marshes	0	1	4	0
River Glaven valley	164	1	20	1
Cley and Salthouse marshes	20	0	202	1

The main conclusion of the assessment is that, under a scenario of no active intervention, assuming no further management of the defences, almost all defences would stop functioning within 20 years. Only the embankment at Wells is predicted to last until after 2025.

Figure 2.2 shows the estimated defence failure for the existing defences for each epoch under a no active intervention scenario, as well as where there



are 'natural' defences. These are defences such as sand dunes and the shingle ridge between Cley and Salthouse.

A similar analysis has also been carried out for the scenario where current maintenance is continued into the future (without raising or improving the defences) (see appendix F, section F.2.10). This indicates that the current defences could continue to perform their function for another 40 to 80 years. At that point, major improvement works would be needed to raise the height and refurbish the structure. There is significant uncertainty about some of the methods and data used. The action plan identifies the need to improve our understanding in the coming years to inform future SMP reviews.

#### Coastal monitoring

The Environment Agency's Anglian Shoreline Management Group has been carrying out coastal monitoring since 1991. The Anglian Coastal Monitoring Programme contains the following activities:

- Beach profile monitoring - one kilometre strategic surveys twice a year along the whole coast.
- Bathymetric monitoring undertaken along the whole coast on a rolling programme.
- Spot heights at Holme dunes surveyed on a five-metre grid at six specific locations along the dunes. Strategic profiles are taken at around 150 to 300 metre intervals.
- Cley shingle bank monitoring – topographic surveys twice a year along beach transects. Also, transects every 250 metres from Blakeney chapel to the Quag.
- Wells harbour bathymetric monitoring started in January 2010. This is at 100 metre intervals from the harbour to the lifeboat station.

The Environment Agency collates the data and carries out regular trend analysis. The SMP has used this information to predict the development of the shoreline in the coming 100 years, as explained in appendices C and F.

The Environment Agency is carrying out the National Coastal Erosion Risk Mapping (NCERM) project, which aims to map the risk of erosion for the whole of the coastline of England and Wales. As the NCERM project does not cover areas that are mainly at risk of flooding, it is not relevant for the North Norfolk SMP.

North Norfolk Shoreline Management Plan 2  
Super Frontages Overview

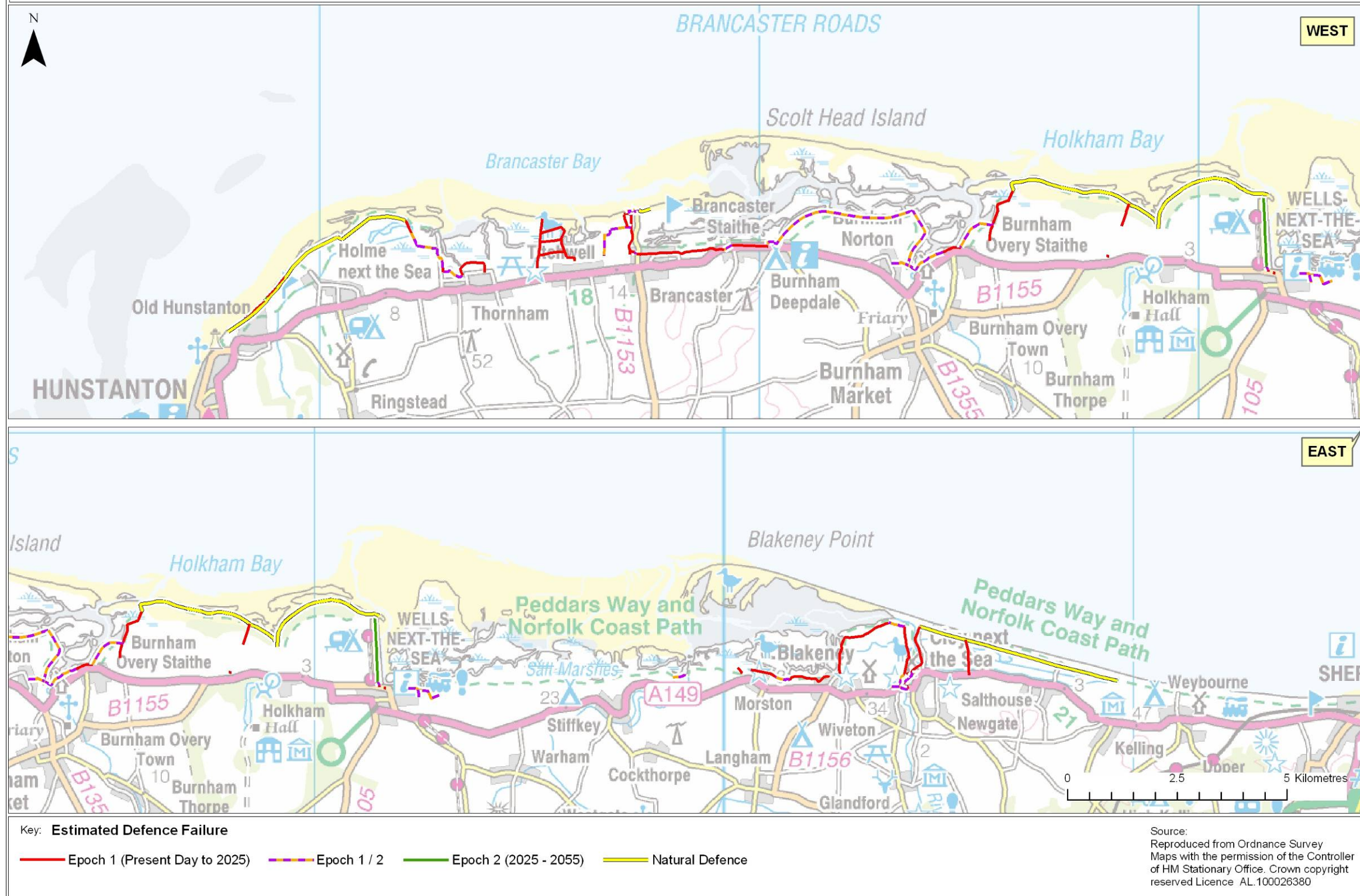


Figure 2.2: Estimated time of defence failure under no active intervention scenario

### Historic tidal flooding

Flood defences reduce the likelihood of flooding, but they cannot prevent it completely. In the recent past there have been examples of storm events that have led to damage and breach of the defences along the north Norfolk coast. The most significant event was on 31 January and 1 February 1953. This event was the greatest storm surge recorded for the North Sea, with the surge height reaching nearly three metres at King's Lynn. Coastal defences from Yorkshire down to the Thames were breached. Table 2.2 summarises the main historic events affecting the SMP area caused by flooding from the sea.

**Table 2.2 Historic flood events in the SMP area**

<b>Date</b>	<b>Description</b>	<b>Areas affected</b>	<b>Consequences</b>
28 November 1897	High tide and surge	North Norfolk coast	Major coastal flood event with properties flooded at Cley-next-the-Sea
1949	High tide and surge	Brancaster, Salthouse	Properties flooded, sea breached defences and turned area into saltmarsh
31 Jan to 1 Feb 1953	Exceptionally high tide – combination of spring tide and a full north-westerly gale – North Sea surge	Entire coastline. Regional disaster	Major coastal flood event with loss of life and large numbers of properties flooded
3 to 4 Jan 1976	High tide and surge	Cley-next-the-Sea, Salthouse	Large coastal event with many properties flooded
11 Jan 1978	Tide reached 4.91 metres at Wells	Wells-next-the-Sea, Salthouse, Cley-next-the-Sea and Holme-next-the-Sea	50 properties flooded in Wells and sea defences destroyed
12 Dec 1991	Surge tide. Maximum surge was 2.0 to 2.5 metres	North Norfolk coast	Properties damaged

<b>Date</b>	<b>Description</b>	<b>Areas affected</b>	<b>Consequences</b>
20 to 21 Feb 1993	Tidal surge event	Cley-next-the-Sea, Wells-next-the-Sea	Overtopping of Cley to Salthouse shingle ridge, marshes and properties flooded
19 Feb 1996	Tidal event	Salthouse, Cley-next-the-Sea	Overtopping of shingle ridge and marshes flooded for two weeks
1996	Tidal event	Holme-next-the-Sea	Two to three metres of dune loss at The Firs frontage
14 to 15 Dec 2003	Surge tide of up to 1.75 metres. Gale force winds	Holme-next-the-Sea, Brancaster, Cley-Salthouse	Sea defences overtopped and damaged and beach loss. Overtopping of Cley to Salthouse shingle ridge and marshes flooded
1 to 2 Nov 2006	Surge tide. 1 in 13 return period	Cley-next-the-Sea	Overtopping of Cley to Salthouse shingle ridge and marshes flooded
17 to 21 March 2007	Surge tides with strong winds	Brancaster, Blakeney, Wells-next-the-Sea	Road flooding

#### Flood warning and forecasting

The main source of flooding in the North Norfolk SMP area is from the sea. This results from a combination of high tides and stormy conditions. If low atmospheric pressure coincides with a high tide, a tidal surge may happen. This can cause serious flooding, as was the case in 1953.

Other sources of flooding are rivers, surface water, sewers, groundwater and reservoirs. There are no reservoirs along the north Norfolk coast and there is

little risk of flooding from groundwater. The North Norfolk Catchment Flood Management Plan (CFMP) looks at flooding from rivers, surface water and sewers and has developed policies to manage these.

The North Norfolk SMP area is split into 13 flood warning areas. The Environment Agency can therefore send targeted warnings to individual communities, rather than to the whole coastline as used to happen. Table 2.2 lists the flood warning areas between Old Hunstanton and Kelling Hard.

**Table 2.3 Flood warning areas**

<b>Flood warning area code</b>	<b>Flood warning area name</b>
054FWCDV2A1	North Norfolk coast at Old Hunstanton
054FWCDV2A2	North Norfolk coast at Thornham
054FWCDV2A3	North Norfolk coast at Brancaster
054FWCDV2A4	North Norfolk coast at Brancaster Staithe
054FWCDV2A5	North Norfolk coast at Burnham
054FWCDV2A6	North Norfolk coast at Burnham Overy Staithe and Holkham
054FWCDV2A7	North Norfolk coast at Wells quay
054FWCDV2A8	North Norfolk coast at Stiffkey
054FWCDV2A9	North Norfolk coast at Morston
054FWCDV2A10	North Norfolk coast at Blakeney
054FWCDV2A11	North Norfolk coast at Cley-next-the-Sea
054FWCDV2A12	North Norfolk coast at Salthouse
054FWCDV2A13	North Norfolk coast at Wells-next-the-Sea

Most homes and businesses that are in a tidal flood zone along the north Norfolk coast are automatically registered to receive flood warnings by telephone. The areas in the North Norfolk SMP area that are most vulnerable to tidal surges are the quay at Wells-next-the-Sea and properties at the eastern end of Cley-next-the-Sea. The SMP's action plan contains an action to set up specific triggers for taking action to manage flood risk to

properties and infrastructure behind the Cley to Salthouse shingle ridge, including vulnerable properties in Cley.

Figure 3.1 (section 3.2) shows the predicted change in tidal flood risk area up to 2105 as a result of predicted sea level rise. The number of properties that could become at risk of flooding from the sea over this time could almost double from around 800 now to about 1,500 in 2105 (see the property and infrastructure sub-section of section 3.2). The action plan therefore contains a SMP-wide action to make sure that the occupiers of any new properties in the extended tidal flood plain are contacted about joining the Floodline warnings direct service.

#### Emergency planning

Following the summer 2007 floods, the Environment Agency and the Met Office have been looking at ways to combine their expertise to provide the most complete picture of national flood risk, from developing weather through to the actual flood event itself.

As a result, the Flood Forecasting Centre has been set up as a joint partnership to improve their ability to respond to flooding events by providing national forecasting. The Centre, which operates 24 hours a day, 365 days a year, will give emergency responders longer notice and more targeted information to prepare for flooding.

Under the Civil Contingencies Act 2004, Local Resilience Forums were created based on police authority areas. The Norfolk Resilience Forum (NRF) has representatives from all the main emergency response organisations including local authorities, blue light services and the Environment Agency. These groups are responsible for planning the response and recovery to potential hazards in Norfolk, including flooding. The NRF ensures that all relevant organisations work closely together to respond to, and recover from, emergencies and can react quickly and effectively in the event of a flood.

The SMP's action plan contains actions to update the emergency plans for all communities along the north Norfolk coast to make sure they are prepared for extreme events in the future.

#### 2.1.6 Future external development

Sea level has risen between one and two millimetres a year since 1900 (as illustrated in Figure 2.3). However, there is great uncertainty about the future rate. One certain fact is that global temperatures are rising and this is leading to the thermal expansion of water and the melting of land ice. Combined, these two effects are likely to lead to an increasing rise in global sea levels. Rates of sea level rise along the north Norfolk coast are uncertain, but it is essential that this SMP takes into account the possibility of

increasing sea level, regardless of the cause. This is known as applying the precautionary principle.

Figure 2.3 illustrates sea level rise at four locations around England. The plots show an average rise in sea levels over the past 100 years of one to two millimetres a year. The two locations on the east coast show up to a 200 millimetre rise, with a smaller increase in Newlyn, Cornwall.

Figure 2.4 shows the same information for Lowestoft, which is closer to the SMP area. The record is shorter, but shows a similar trend. The recorded rise is over 100 millimetres in the last 50 years.

Defra guidance provides estimates for sea level rise up to 2105. These are the values that have been used for all SMPs in assessing future shoreline response. The Defra guidance values for the east of England are in

Table 2.4 and illustrated in Figure 2.5. The values suggest a total sea level rise of 1.1 metres by the end of epoch 3 (2105).

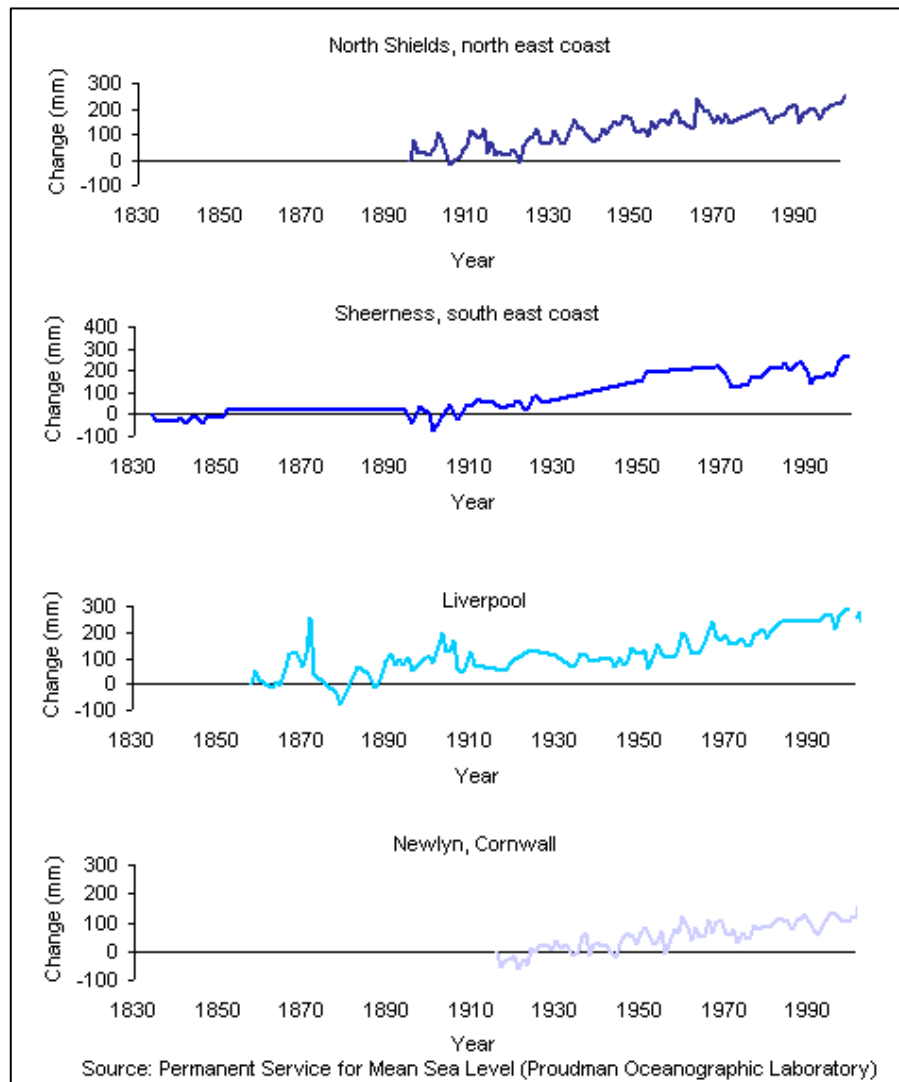
The UK Climate Impacts Programme published an update of its projections in 2009 (UKCP09). This emphasised the importance of the issue and also highlighted the uncertainty about the actual rates by presenting a range of possible futures. The rates used in the SMPs fall within the range that UKCP09 predicts. In the SMP, we have assessed the effect of this uncertainty through sensitivity analysis (see appendix E, section E4.3).

As well as sea level rise, there is the possibility that climate change will bring about increased storminess. In general, this would lead to greater wave heights and an increased threat of flooding. These greater wave heights may lead to increased rollback of the dune systems and the shingle ridge. They may also drive more sediment into the backshore areas due to waves holding more energy and being able to carry more sediment.

The key to taking into account the effects of sea level rise, and the great uncertainties associated with the values, will be to establish 'no regret' decisions for the shorter term, but at the same time emphasising the need to start preparing for change.

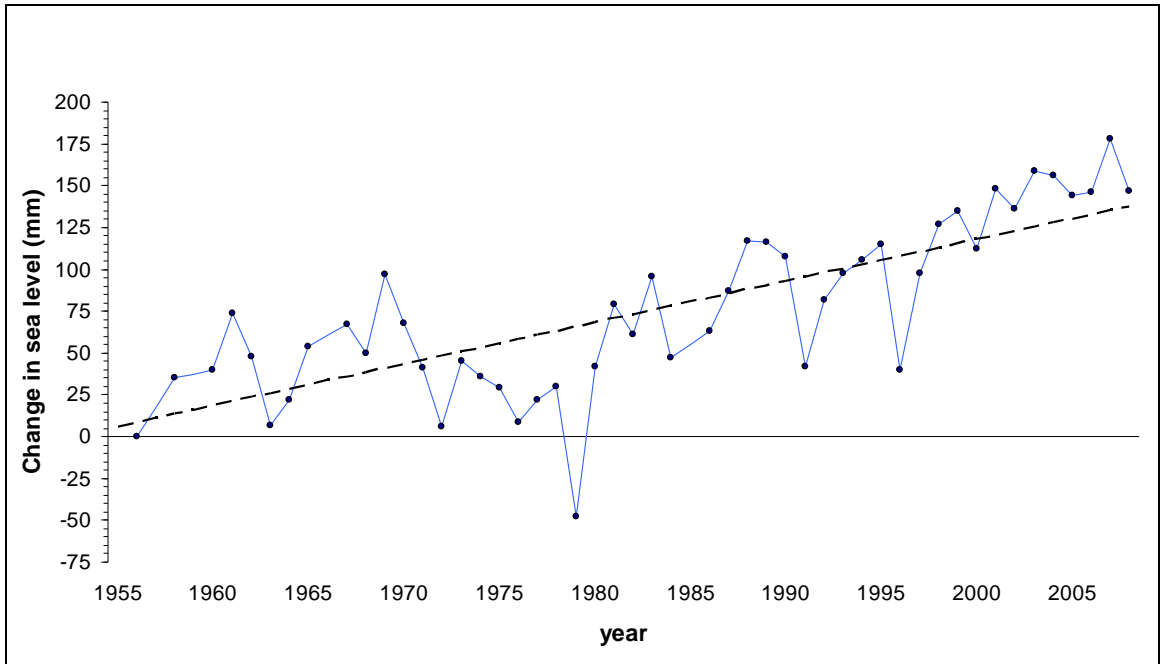
With the increasing drive for renewable energy, and the current construction of large wind farms, it is also important to consider the potential effect of those developments on the geomorphology and overall coastal processes along the north Norfolk shoreline. Recent research has shown that offshore wind farms only have an effect around the foundations of the structures with some temporary effects during actual building and the laying of cables. There are no known cumulative effects on coastal or seabed processes. For offshore dredging, before a license can be given, the effects on sediment processes, hydrodynamics and water quality are assessed. If any effects

were to be felt along the coastline, dredging would not be allowed to take place.



**Figure 2.3: Recorded sea level rise**

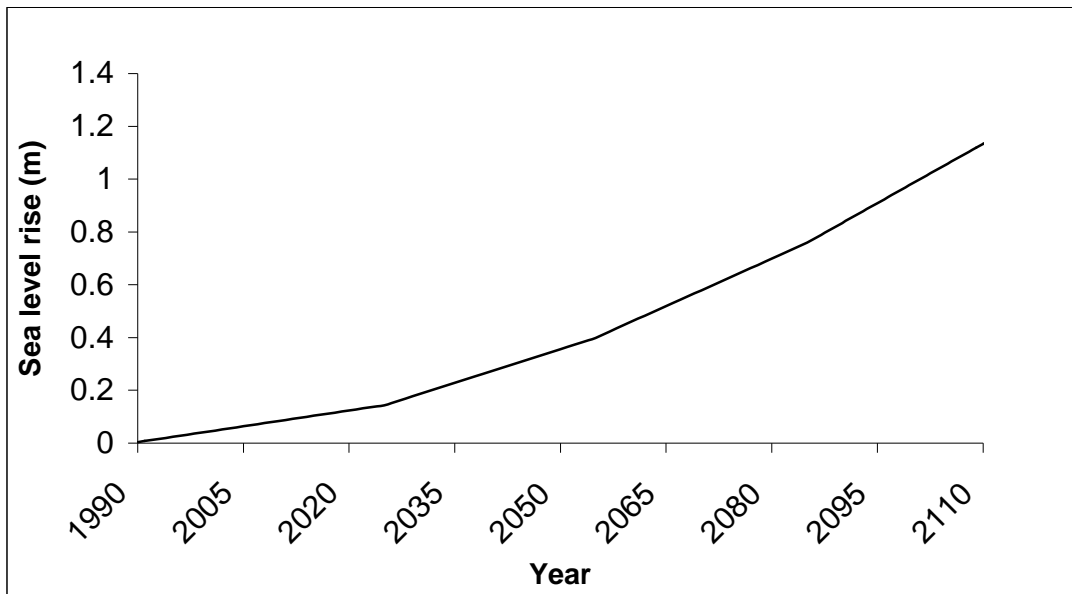




**Figure 2.4: Recorded sea level rise at Lowestoft**

**Table 2.4 Defra (2006) sea level rise guidance for the east of England**

Time period	Net sea level rise (mmyr <sup>-1</sup> )	Total sea level rise (mm)	Cumulative sea level rise (mm)
<b>Epoch 1</b> (2009 to 2025)	4.0	64	64
<b>Epoch 2</b> (2025 to 2055)	8.5	255	319
<b>Epoch 3a</b> (2055 to 2085)	12.0	360	679
<b>Epoch 3b</b> (2085 to 2105)	15.0	450	1,129



**Figure 2.5: Expected sea level rise over the period 1990 to 2115 for the east of England**

## 2.2 Land use and environment

### 2.2.1 Introduction

This section is based on the three super-frontages introduced in section 2.1.1.

Land use and environment are described for both the coastal strip and hinterland. The coastal strip is defined as the area directly at risk from erosion or flooding. In the North Norfolk SMP area, this is the tidal flood zone as shown on figure 1.2. This roughly coincides with the area seaward of the A149. The hinterland generally refers to the area inland of the coastal strip, but the SMP only considers features that could be affected by shoreline management.

The text is illustrated by cross-sections. These cross-sections are intended to provide clarity when looking at each super-frontage. As stated in the text, the coast is a complex area with multiple layers of physical, ecological, social and economic values. The interaction between communities/society and these values can be extremely complicated and the cross-sections aim to provide an insight into these relationships. They should be viewed with the corresponding text as an easy way to see the values that are considered to be important along this coast.

The full theme review, on which this section is based, is in appendix D. The theme review identified features relevant to the SMP, as well as benefits and

issues associated with them, so specific objectives could be determined for that feature.

### 2.2.2 Super-frontage 1 - Old Hunstanton to Thornham

This super-frontage is characterised by reclaimed marshland behind a sand dune system running from Old Hunstanton through to Holme-next-the-Sea.

The coastal strip is defined by the tidal flood zone. This includes parts of the settlements of Old Hunstanton, Holme-next-the-Sea and Thornham and the A149 near Old Hunstanton.

#### Coastal strip

Super-frontage 1 includes the small settlements of Old Hunstanton, Holme-next-the-Sea and Thornham. These are located between the A149 coast road and the coast. There are some houses at risk of tidal flooding in all these settlements. The golf course at Old Hunstanton is behind the sand dune system and there are about 200 beach huts. The settlement of Holme-next-the-Sea is situated behind dune systems on low-lying land and the properties at Thornham are behind an intertidal area of saltmarsh. The Norfolk coast path runs along this frontage. Surrounding the settlements is grade 2 and 3 agricultural land and rural countryside.

Holme dunes and parts of Holme marshes are included in the North Norfolk and Wash Ramsar sites, Wash and North Norfolk Special Protection Area (SPA), Wash and North Norfolk Coast Special Area of Conservation (SAC), the Wash and North Norfolk Site of Special Scientific Interest (SSSI) and the Holme Dunes National Nature Reserve. The area has several classes of UKBAP habitat. Moving into the Holme coastal strip, there are coastal saline lagoons behind the sand dunes of the intertidal area. The saline lagoons and grey dunes (colonised dune systems) are European Annex I priority habitats. This is a list of European habitats of key importance and limited distribution based on bio-geographical regions. These habitats back onto the River Hun tidal delta that runs through the land behind Holme dunes and outfalls into Thornham harbour channel.

The foreshore along this frontage has provided extensive evidence of significant bronze age sites as well as activities of international importance that had been preserved in the foreshore deposits and have been revealed following erosion. Also, nationally important Saxon fish traps that indicate extensive coastal activity along this shore all combine to provide evidence of the intensity of use and potential for archaeological finds to be revealed as a result of erosion along this shoreline. The historic environment along the shore is dominated by post-medieval settlements, though earlier period sites and finds also occur, with greater presence from the Roman period onwards and regionally important medieval sites. Hunstanton Park lies in this zone and is designated a grade II historic park and garden. Furthermore, World

War two sites and features dominate the coastline that, as a group, form a regionally important complex of sites, though some have been removed. These include pillboxes, anti-tank blocks and defensive banks. The medieval settlement of Old Hunstanton lies behind the coastal zone and is centred on the conservation area. There are no designated features or features of greater than local importance in the shore and coastal edge.

The historic landscape is characterised by the unmanaged and leisure/recreation features along the foreshore. There is a managed landscape of drainage channels and defences originating in the 19th century that lies in front of 18th century and later woodland plantations, with piecemeal Parliamentary enclosures centred on the medieval settlements at Holme-next-the-Sea and Thornham.



**Photo 2.7: River Hun outfall**

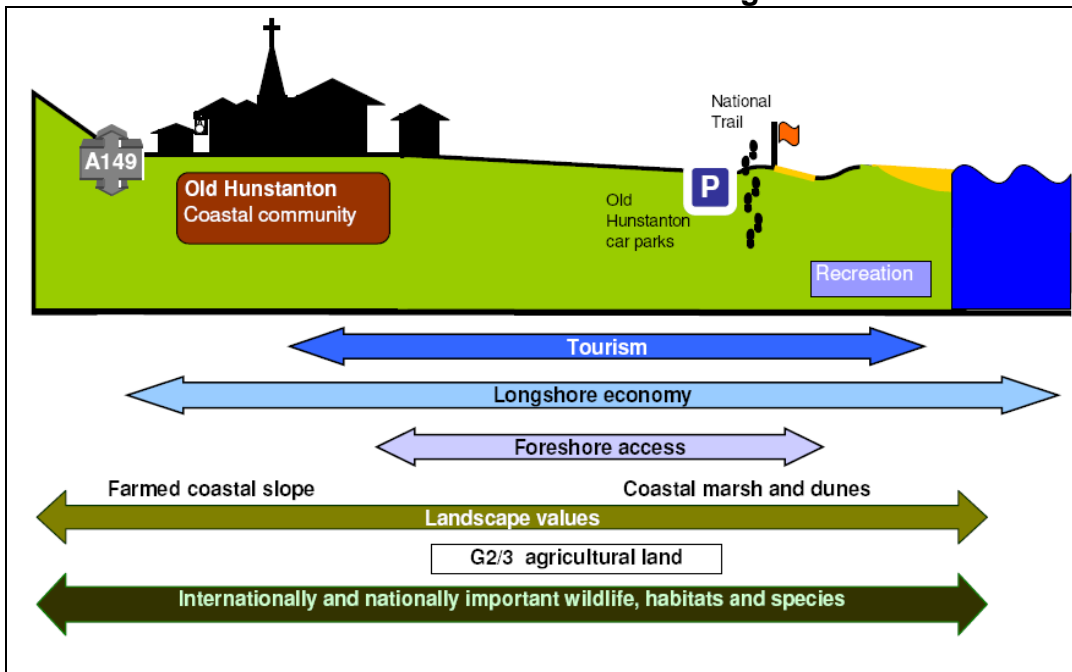
This section of coast also has a small campsite area in front of the A149. The Norfolk Wildlife Trust nature reserve is in Holme dunes at Gore Point and is a recreational and tourism feature. The beaches between Gore Point and Old Hunstanton (including their access) are also important for recreation and tourism.

### Hinterland

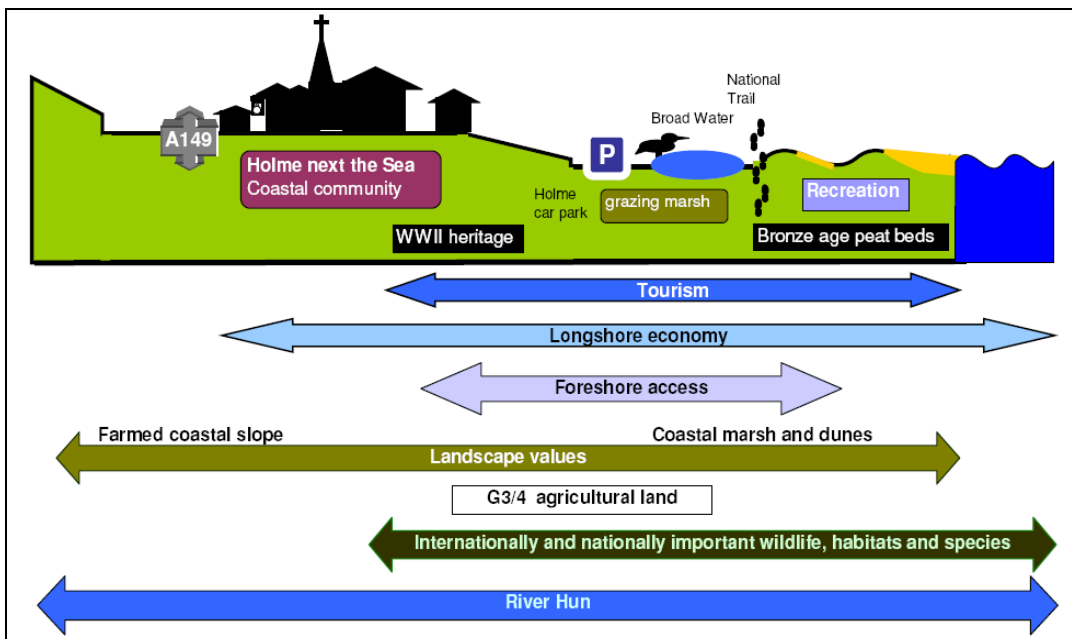
The hinterland of this super-frontage is higher ground that is used mainly as parkland, woodland and arable agricultural land. The area contains several historic features including numerous listed buildings and Hunstanton Hall registered park and garden, including Hunstanton Park Esker (a geological SSSI), St Peter's Church tower (scheduled monument) and a Roman signal station (scheduled monument). There are a large number of listed buildings centred on the settlement of Ringstead.

Cross-sections

**Cross-section 1: Old Hunstanton to Hunstanton golf course**



**Cross-section 2: Hunstanton golf course to Thornham harbour channel**



Future external development

For this super-frontage there are no major land use developments planned that will be relevant for shoreline management.

### 2.2.3 Super-frontage 2 - Thornham to Stiffkey

This is the largest super-frontage in the SMP area. It includes Scolt Head Island and areas to the west and east for which Scolt Head Island determines the coastal processes. The landscape is dominated by intertidal saltmarsh and mudflats. There are long stretches of sand dunes at Brancaster and Holkham.

The coastal strip is defined by the tidal flood zone. It includes parts of the settlements of Brancaster, Brancaster Staithe, Burnham Deepdale, Burnham Norton, Burnham Overy town, Burnham Overy Staithe, Holkham and Wells-next-the-Sea and the A149 at several locations.

#### Coastal strip

This super-frontage has a wide variety of land uses and environmental areas. With the exception of Deepdale marshes and Holkham marshes, the entire super-frontage is part of the North Norfolk Ramsar site, SPA, SAC and SSSI. Most of the area is also part of the Holkham National Nature Reserve (NNR) and it contains several classes of UKBAP habitat. The inland boundary of the designated area roughly coincides with the tidal flood zone boundary, apart from the low-lying defended area east of Wells, which is not designated. The sites are designated partly for intertidal interests (dunes, saltmarsh and mudflat) and partly for freshwater or brackish interests (grazing marshes and saline lagoons). One feature of the environmental use with an important socio-economic element is the RSPB reserve at Titchwell, for which the defences are currently being realigned (to be completed in 2011). The intertidal zone consists of sand dunes at Brancaster and Holkham and saltmarsh in the areas of Titchwell, Scolt Head Island and Stiffkey. There is an expanse of mudflat and saltmarsh interlaced with channels behind Scolt Head Island.

The area is important for its historic assets. The most significant features are:

- Conservation areas at Brancaster, Burnham Norton, Burnham Overy Mill, Burnham Overy Staithe, Holkham and Wells-next-the-Sea.
- One grade I listed building, one grade II\* listed building and 45 grade II listed buildings in the various settlements.
- Bronze age peat beds at Titchwell and Brancaster.
- Brancaster Roman fort (scheduled monument).
- A late Palaeolithic/Mesolithic site on Titchwell beach.
- Holkham iron age fort (a scheduled monument that contains possibly earlier prehistoric features).
- The Carmelite friary at St Mary's (scheduled monument).
- Medieval harbour structures at Wells.
- Post-medieval reclamation banks at Titchwell, Brancaster, the Burnhams, Holkham and Wells-next-the-Sea.

- Scattered World War two sites and features that comprise a regionally important complex of sites.
- World War two defences at Titchwell and Brancaster.

The settlements of Brancaster, Brancaster Staithe, Burnham Deepdale, Burnham Norton, Burnham Overy town, Burnham Overy Staithe, Holkham and Wells-next-the-Sea include some houses at risk of coastal flooding. However, most of the houses in these settlements are on higher ground. Many of the settlements and reclaimed grazing marsh in this super-frontage are protected by vegetated earth embankments. Warham marshes to the east of Wells-next-the-Sea is a low-lying protected area that is used for agriculture. It has a surface water drainage function for Wells (storing excess rainfall during high tides until low tide allows the water to drain to the sea). This area is not designated for its habitats. Deepdale marsh is partly used for agriculture and part of this has recently been converted to freshwater habitat.

There are two small harbours behind Scolt Head Island at Brancaster and Burnham Overy Staithe where the River Burn outfalls. There is a sailing club at Brancaster Staithe and both harbours are used for recreation and commercial fishing. Wells harbour is the largest harbour in the SMP area. It is used as a base for commercial and recreational navigation. The Norfolk coast path follows the crest of the earth embankments in many places.



**Photo 2.8: Burnham Overy Staithe**

In terms of tourism land uses of the coastal strip, there are several car parks at beach access points along the coast. The Holkham estate has a large camping and caravan area towards the eastern edge of the estate. Titchwell RSPB reserve has a popular visitor centre and there are many amenities providing food and recreational activities along the coastline. The Royal West Norfolk golf course at Brancaster is an important recreational asset with

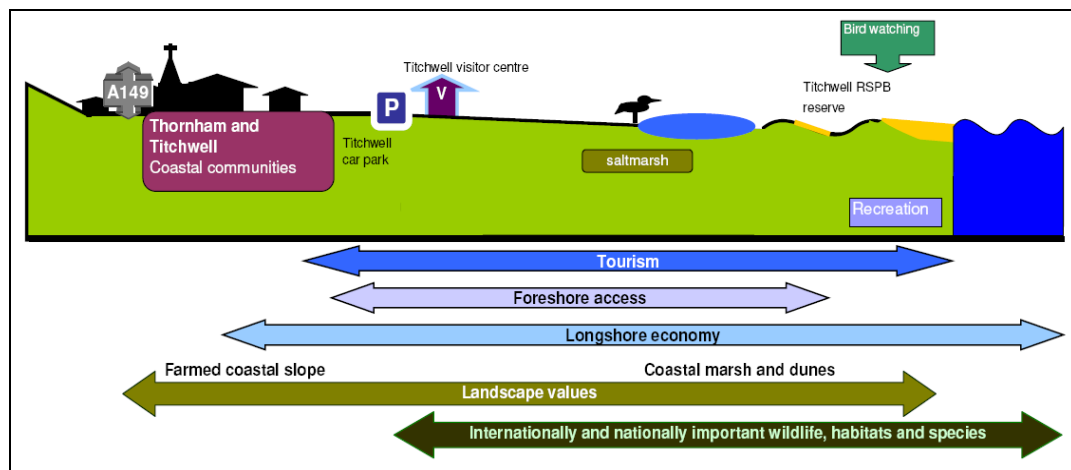
its own flood and coastal defences. Other important activities include wildfowling on common rights land and bird watching.

### Hinterland

The hinterland contains several small settlements surrounded by parkland, woodland and agricultural land. Holkham Hall and its park back onto Holkham bay consisting of parkland, woodland and orchards. These are a registered park and garden. There are various historic sites including two barrows that are scheduled monuments, as well as Creake Abbey (a scheduled monument) and numerous listed buildings including churches in the area of Burnham Market, Burnham Thorpe, North Creake and also in and adjacent to the Holkham Hall estate. The light railway runs from Wells inland to Walsingham.

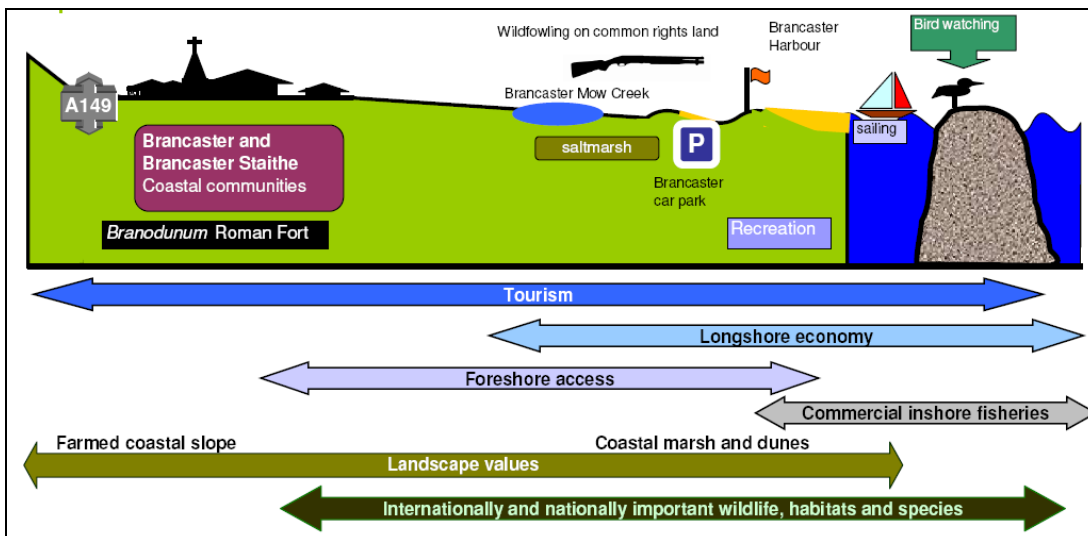
### Cross-sections

#### **Cross-section 3: Thornham and Titchwell**

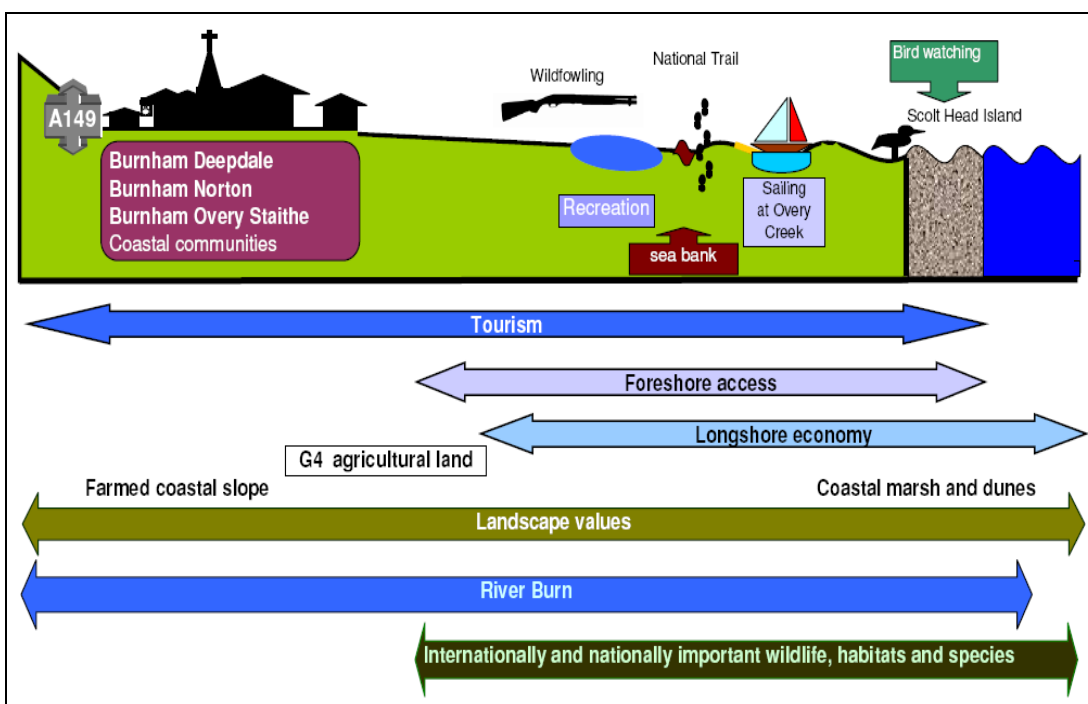




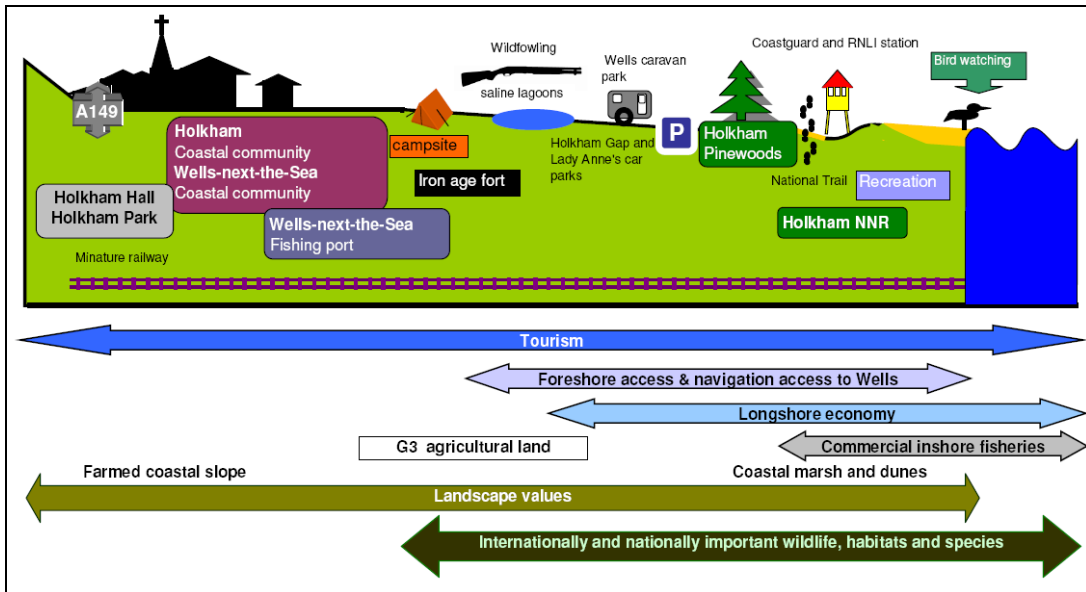
### Cross-section 4: Brancaster to Brancaster Staithe



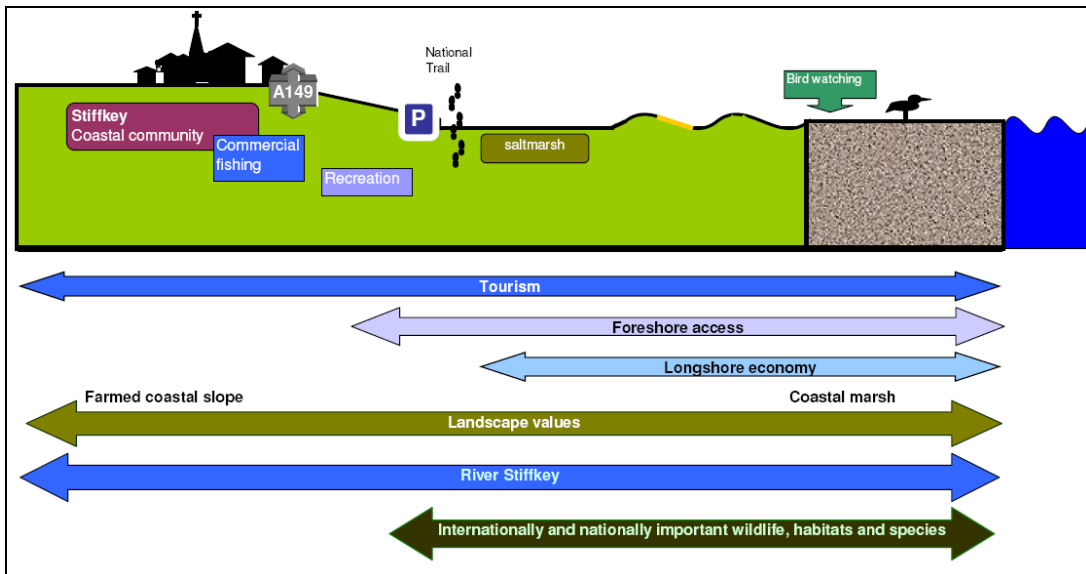
### Cross-section 5: Scolt Head Island



## Cross-section 6: Holkham bay and Wells harbour



## Cross-section 7: Stiffkey and Warham marshes



### Future external development

There are a number of expected or planned future developments that are relevant for shoreline management.

There is currently a managed realignment project underway in the RSPB reserve at Titchwell. This involves building a new defence line (the Parrinder wall, to be completed in autumn 2011), strengthening the west wall to increase flood protection and allow continued access to the bird hides and beach (completed in autumn 2010) and finally breaching the existing northern bank in autumn 2011. The RSPB has designed the planned realignment for a

50-year period, after which they expect another realignment further inland will be needed in response to coastal processes.

As a result of local wind farm developments, the increased use of Wells harbour for transport of wind farm personnel was assessed through an Environmental Impact Assessment. The works to deepen the channel began in late 2009 and building of the outer jetty area started in early 2010.

#### 2.2.4 Super-frontage 3 - Stiffkey to Kelling Hard

This frontage consists of Blakeney Spit and the Cley to Salthouse shingle ridge.

The coastal strip is defined by the tidal flood zone. This includes parts of the settlements of Stiffkey, Morston, Blakeney, Cley-next-the-Sea, Wiveton and Salthouse and the A149 at several locations.

##### **Coastal strip**

Blakeney Spit provides shelter to the settlements of Morston, Blakeney and Cley-next-the-Sea. These are small harbours with Blakeney being slightly larger than the other two. They are used for recreation, boat trips and fishing which are the main social and economic activities in the settlements. Siltation of the creeks that provide access to Blakeney is becoming an important issue.

There is access to the intertidal area from the car parks at Morston and Blakeney. There is a visitor centre for Blakeney Spit at Morston run by the National Trust. The Norfolk coast path follows the crest of the earth embankments in many places and the Cley to Salthouse shingle ridge. There is a Norfolk Wildlife Trust visitor centre along the A149 at Cley and bird watching is an important recreational activity across this frontage.



**Photo 2.9: Blakeney spit beach**

The shoreline of the spit to the east is fronted by a shingle ridge and backed by grazing marshland. Also there are saline lagoons behind the shingle ridge that are of high environmental value and are actively managed to keep them in good condition.

All of this area is part of the North Norfolk Ramsar site, North Norfolk SPA, North Norfolk SAC and North Norfolk SSSI and it has several classes of UKBAP habitat. The inland boundary of this area roughly coincides with the tidal flood zone. Blakeney Spit has 'grey' dunes and is designated as Blakeney National Nature Reserve from Cley Eye through to beyond the end of the spit. Some of the reclaimed area is used for arable agriculture and grazing marsh. East of Morston there is an area of low-lying protected land that is currently used for agriculture and is not designated for its habitats.

The most important historic assets are:

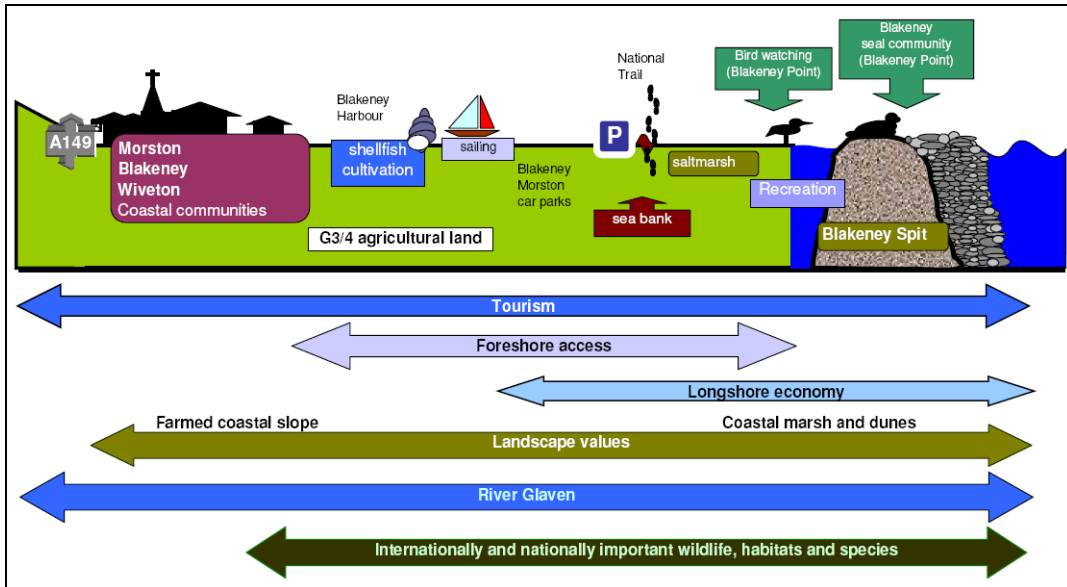
- Blakeney-Wiveton-Cley conservation area, Morston conservation area and Stiffkey conservation area.
- St John's church, Stiffkey, a grade I listed building.
- Stiffkey Park, a grade II historic park and garden.
- Numerous listed buildings in Morston, Blakeney and Cley-next-the-Sea.
- A nationally important Neolithic site around the site of Blakeney chapel (scheduled monument and listed building).
- A possible Elizabethan fort in Cley saltmarshes.
- Post-medieval reclamation banks at Blakeney, Cley-next-the-Sea and Salthouse.
- A regionally important complex of World War two defences and structures, particularly around Cley-next-the-Sea.

#### Hinterland

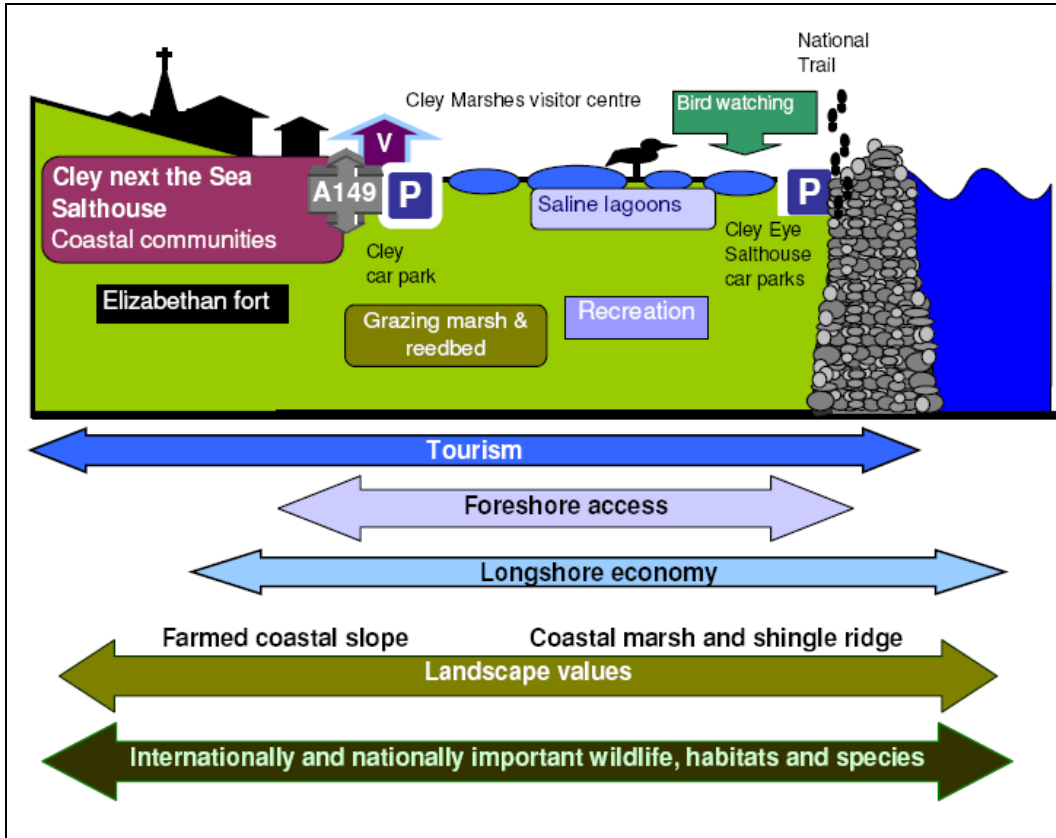
Several small settlements make up the hinterland of super-frontage 3 and there is a large area of arable agriculture. Further back on higher land there are numerous scheduled monuments (including an iron age hill fort, medieval settlement and moated manor site) in the Warham area, as well as bowl barrows on Blakeney downs, a World War two site at Langham airfield and Cockthorpe village cross. These are supplemented by a large number of listed buildings centred on Stiffkey, Warham, Wighton, Cockthorpe, Binham and Langham.

Cross-sections

**Cross-section 8: Blakeney Spit**



**Cross-section 9: Cley and Salthouse**



### Future external development

The function of Cley marshes is likely to modify over time due to the effects of climate change. The marshes are currently used as grazing marsh and provide important (protected) habitats. Both of these depend on the level and gradient of salinity. It is possible that the salinity of the marsh will increase, making it unsuitable for grazing and changing the habitats. The marshes will continue to have a role as a flood defence for properties at Cley-next-the-Sea and Salthouse and sections of the A149.

## **2.3 Role of shoreline management**

### 2.3.1 Introduction

This section aims to illustrate how shoreline management can influence the position and nature of the north Norfolk shoreline and the activities and values around it. This is done by setting out two extreme possibilities for shoreline management and assessing the effects of these scenarios on the shoreline in terms of the development of the land and level of flood risk. These two extreme scenarios are 'no active intervention' (NAI) and 'with present management' (WPM). The NAI scenario assumes that the defences are no longer maintained and will therefore fail gradually over time. NAI does not, however, involve removing the existing defences. This means that, for a time, the defences will provide some residual protection while they are failing. The other extreme scenario is WPM which assumes that all current front-line defences are maintained to provide the same level of protection as they do now (as described in section 2.1.5). This includes keeping up with the effects of climate change.

As with section 2.2, the role of shoreline management will be discussed for each super-frontage. There is more detail in appendix F, including structured 'baseline scenario statement' tables for the NAI and WPM scenarios for the three super-frontages. Figure F4.1 in appendix F shows the current tidal flood risk area and how we expect this to increase with predicted sea level rise.

The analysis builds on the findings of SMP1, the results of the Environment Agency's Coastal Monitoring Programme since 1991 and a range of studies in recent years, including Futurecoast, the Southern North Sea Sediment Transport Study (SNS2) and the North Norfolk Coastal Habitat Management Plan (CHaMP). It is, however, essential to make clear that there is an element of uncertainty in all aspects of the analysis. The text highlights specific gaps in knowledge because they need to be addressed in developing the plan.

### 2.3.2 Super-frontage 1 - Old Hunstanton to Thornham

#### With present management

Present shoreline management consists of holding the line for the whole super-frontage. The defences consist of gabions and groynes at Old Hunstanton dunes, vegetated dunes with soft defences for Holme dunes and a sea bank to the west and in front of Thornham.

In the short term (epoch 1), accretion is likely to continue on the foreshore and the dune system will remain in a similar position. For Thornham sea bank, where the outer estuary is free to realign, there would be continued erosion. As a result, the shoreline would begin to lose its shape and become misaligned with Old Hunstanton and the dune system. Greater pressure would be put on the frontage at Gore Point.

Sea level rise may cause some changes in the medium term. The epoch 1 pattern of accretion would be outpaced by sea level rise and result in erosion of the foreshore. A continued process of dune rollback would mean some of the dune line would need to be reinforced with a new hard defence, leading to a more fixed dune system with a narrower beach. The existing sea bank at Thornham would need increased maintenance to continue providing its current standard of protection. The River Hun tidal delta is likely to move towards land and westward. This may create a new headland.

In the longer term (epoch 3) there is a lot of uncertainty as to what will happen. Increased sea levels would result in greater erosion of the foreshore and a reduction in beach levels. Defences would need to be strengthened to sustain the standard of protection under higher water levels and waves, further fixing the dunes and leading to loss of beach width. If the Thornham harbour channel experiences increased siltation, the foreshore may become higher and so reduce the pressure on the defences.

#### No active intervention

Short-term development for the shoreline under a scenario of NAI is similar to WPM. Accretion is likely to continue on the foreshore and the natural coast will remain in a similar position. It is likely that most of the earth embankments and the River Hun tidal outfall would fail in the short term, leading to tidal flooding and natural development of the river mouth. There would be continued erosion along the frontage with the dunes being overtopped and rolling back. The previously-reclaimed areas would be flooded, which would affect sections of the A149 and a number of properties in Old Hunstanton and Holme-next-the-Sea. Due to dune rollback, the beach huts at Old Hunstanton would be at risk from coastal erosion during epoch 1.

In the medium term (epoch 2) coastal response is dominated by the changes caused by sea level rise together with the expected failure of Thornham sea bank. The associated increase in tidal prism would strengthen the outer

estuary which would in turn reduce pressure on Gore Point. Unconstrained, the River Hun tidal delta would move towards the west and the river would naturally meander towards the sea. This would lead to natural saltmarsh developing on the back-shore areas near Thornham. The natural dunes at Holme would continue to roll back. There would be gradual realignment of the dune system at Old Hunstanton. The dunes would still provide some flood protection, but there would be increased risk of overtopping and breach during extreme events which would affect the settlements of Holme-next-the-Sea, Old Hunstanton and even Thornham. At Holme, around 20 properties could be affected in epoch 2, including the village church and public house. In Thornham, about 10 properties would be affected. The Broadwater Road to Holme Nature Reserve would be at risk from erosion during epoch 2.

Epoch 3 would experience similar coastal responses to epoch 2 with dune rollback, increased flooding of the back-shore up to the higher ground and a greater risk of erosion. There would be erosion risk for some properties along the Golf Club Road and the clubhouse at Old Hunstanton. As mentioned in epoch 2, Broadwater Road is likely to be cut off in epoch 3, restricting access to The Firs. Sections of the coastal footpath would also be cut off by coastal erosion. The River Hun would continue to meander towards the sea and migrate towards the west over the formerly-reclaimed areas.

### Summary

The key differences between the two baseline scenarios (and therefore the potential drivers for SMP policy decisions) are:

- WPM would continue to defend settlements and isolated properties, the A149 and the agricultural land. NAI would lead to an uncontrolled increase in flood risk and ultimately these features would become undefended, mainly during epoch 1.
- WPM would initially protect the status of the saline lagoons and freshwater habitats, while NAI wouldn't. On the other hand, the increase in tidal prism under NAI is likely to strengthen the outer estuary of the River Hun which would reduce pressure on the grey dunes at Gore Point and possibly also on the dunes at Old Hunstanton. NAI would also lead to creation of intertidal habitat locally.
- WPM would not allow natural development of Holme and Old Hunstanton dunes, while NAI would. More natural dunes may still provide flood protection in the long term, but this is uncertain.
- The increase in tidal prism under NAI could strengthen the channel to Thornham as more water would flow through the channel and deposit silt in the currently-defended areas. A totally unmanaged development is likely to limit any benefits for navigation.
- WPM would continue to protect the golf course in Old Hunstanton dunes and the beach huts, but in the medium term the beach is likely to erode.



On the other hand, NAI would be likely to require the golf course and the beach huts to adapt, but is more likely to sustain the beach.

### 2.3.3 Super-frontage 2 - Thornham to Stiffkey

#### With present management

Present shoreline management consists of a mixture of approaches:

- No active intervention (west and east of Titchwell, Scolt Head Island, most of the dunes in front of Brancaster, most of Stiffkey bay).
- Holding existing sea banks that protect reclaimed land (Titchwell reserve which is being realigned, Brancaster grazing marsh, Deepdale and Norton marsh, Overy marsh, Wells east and west banks).
- Holding existing sea banks and quays in front of settlements (Brancaster, Brancaster Staithe, Burnham Overy Staithe, Wells quay).
- Rock revetment and soft defences that protect the golf club's clubhouse and course at Brancaster.
- River outfall (River Burn).
- Vegetated dunes with soft defences at Holkham dunes.

In the short term a scenario of WPM is expected to continue the processes occurring now. For Scolt Head Island, sediment will continue to build up behind the island as it moves towards the west and south. This would cause a reduction in the flow of the tidal delta at Brancaster harbour channel and reduce the sediment pushing to the westward end of Scolt Head. There would be continued rollback of the dune system at Brancaster and accretion across the foreshore. The dune system at Holkham would also roll back in the short term with some erosion of the beach profile. This pattern of erosion would continue to the east with erosion of lower sandflats at Stiffkey but with accretion of the upper saltmarsh and mudflats as sea levels continue to rise. The defences remaining would ensure that all defended frontages are protected from flood events and erosion.

In the medium term, increased management would be needed in response to rising sea levels. undefended areas of the coastline around Brancaster would continue to roll back. Scolt Head Island would move nearer to the land and begin to squeeze the sheltered areas leading to siltation of Norton Creek. Exposed defences may need improving to sustain their existing standard of defence against the effects of climate change. However, in the sheltered areas, siltation would increase the foreshore area and could counteract the effects of climate change. Holkham dunes may need intervention to reduce flood risk with increased erosion, especially for the western bay. Wells harbour channel would need maintenance dredging to sustain the navigability of the channel. The accretion of saltmarsh and mudflat at Stiffkey in epoch 1 would switch to erosion as the system rolls back.



**Photo 2.10: Low tide at Holkham Gap**

The long term (epoch 3) effects are uncertain. There are two possible large-scale developments in the long term. Either Scolt Head Island continues to roll back and attaches to the land or the increased rate of sea level rise reverses the current process that will cause Scolt Head to remain detached. This is uncertain but, under the WPM scenario, the continued limitation in tidal prism increases the likelihood of the island attaching to the land.

If the rollback continues, the current role of Scolt Head as a control for both Brancaster bay and Holkham bay would end. Towards the west, the golf club would become exposed and could develop into a headland that acts as a control point for Brancaster bay and limit the increase in pressure on the RSPB reserve's defences at Titchwell. Towards the east, the rollback of Scolt Head Island would increase pressure on Holkham dunes. Locally, the creeks behind Scolt Head would silt up more.

However, if Scolt Head Island were not to reattach, it would continue to be the main control point for the frontage. It would continue to control the shape of both Brancaster bay and Holkham bay, limiting the increase in pressure on the golf club and Titchwell RSPB reserve and on Holkham dunes.

#### No active intervention

In the short term under a scenario of NAI, the defences would gradually decline. It is likely that all the defences, apart from the Wells embankment, would fail by the end of epoch 1. The creeks would continue to silt up. Epoch 1 would see an increase in saltmarsh and mudflat development. Sand dune systems would roll back at present rates. As a result of the weakening of defences, flood risk would increase for properties at Brancaster and Brancaster Staithe, Burnham Deepdale, Burnham Norton, River Burn valley, Burnham Overy Staithe, Burnham Norton and Stiffkey and for sections of the

A149 at Burnham Overy Staithe, Holkham, Wells and Stiffkey. There would be increased erosion risk for Wells coastguard look-out, the RNLI lifeboat house and Wells beach huts (east of Holkham bay).

During the medium term, there are some key physical features that could modify the way in which the coastline responds. All the defences would have failed during this epoch. The shoreline at Brancaster and Titchwell would have realigned towards its natural position. After failure of the defences of Brancaster grazing marsh, the tidal prism at Mow Creek would increase and, as the silt gets transported into the currently-defended area, this could result in improved navigability of Brancaster harbour. Defence failure would affect several properties at both Brancaster and Brancaster Staithe and the Royal West Norfolk golf club would be at risk from erosion as the dunes continue to roll back. Failure of defences behind Scolt Head Island would increase the tidal prism which could support the Brancaster and Burnham harbour channels. An unmanaged approach would allow the River Burn to develop a natural migration across the marshes. However, this would result in greater tidal flood risk at Burnham Norton and Burnham Market. Scolt Head itself could move westward and towards land, which would increase pressure on the golf course and also on the RSPB reserve at Titchwell. The extent and timing of Scolt Head's movement is uncertain.



**Photo 2.11: High tide at Holkham Gap**

The Holkham Meals could become a barrier island with an intertidal area behind the dunes. The Burnham channel would be able to take a meandering route out to sea and cause the tidal delta to move towards the west. The new tidal prism developed by the failure of defences could significantly increase the pressure acting on Burnham. At Wells, total defence failure would lead to flooding of the backshore to the east of Wells and to the area behind the Wells flood embankment. There would be up to 50

properties at risk from flooding in Wells, including the Wells community church. The River Stiffkey outfall to the east would also be able to meander in a natural course out to sea. Properties in Stiffkey would become undefended. Locally, there would be erosion of lower sandflats with some remaining vertical accretion of upper saltmarsh during the retreat of the shoreline towards land.

Long term (epoch 3) changes are uncertain for this scenario as well. The NAI scenario could still lead to the same two large-scale developments. Either Scolt Head Island attaches to the mainland or it could remain detached. The effects of both possible developments are described above for the WPM scenario. However, the increase in tidal prism as a result of the failure of defences under NAI increases the likelihood that Scolt Head will remain detached, with the associated reduction in pressure on the neighbouring bays and increased likelihood of the channels remaining functional.

Further to the east in Holkham bay, the epoch 2 scenario may progress with Holkham Meals possibly disappearing due to the increased pressure resulting from Scolt Head potentially reattaching, although there would be sedimentation behind the old line and saltmarsh formation. This would be associated with the loss of Holkham Gap car park, Wells boating lake and Wells Beach Road car park and caravan site. Wells-next-the-Sea would have a flood risk similar to epoch 2 as much of the town is naturally higher than the tidal flood zone. The marshes beyond Holkham bay would be swamped by a normal tide with saltmarsh erosion through coastal squeeze against the old cliff line and rising sea levels.

### Summary

The key differences between the two baseline scenarios (and therefore the potential drivers for SMP policy decisions) are:

- WPM would continue to defend settlements and isolated properties, the A149, the recreational features and the agricultural land. NAI would lead to an uncontrolled increase in flood risk and ultimately these features would become undefended, mainly during epoch 1.
- WPM would initially protect the status of the freshwater habitats, while NAI wouldn't. On the other hand, the increase in tidal prism under NAI would increase the likelihood that Scolt Head Island would remain detached from the land, with the associated local benefits for navigation and habitats and the benefits along the shoreline of limiting pressure on the shoreline in Brancaster bay and Holkham bay. NAI would also lead to creation of intertidal habitat locally.
- WPM would not allow natural development of Holkham dunes, while NAI would. More natural dunes may still provide flood protection, but this is uncertain.

### 2.3.4 Super-frontage 3 - Stiffkey to Kelling Hard

#### With present management

Present shoreline management consists of a mixture of approaches:

- No active intervention (west of Morston, Blakeney Spit).
- Holding existing sea banks that protect reclaimed land (east of Morston, Blakeney Freshes, Cley west bank).
- Holding existing sea banks and quays in front of settlements (Morston, Blakeney quay, Cley).
- Maintaining river outfalls (River Stiffkey and River Glaven).
- Shingle ridge with no management except in response to events that cause unacceptable risk.

The short term for this super-frontage under the scenario of WPM is not very different from the present situation. Blakeney Spit would see continued rollback at the western end of the spit with rates of about one metre a year. There may be less rollback due to the positioning of an underwater ridge offshore that could give some protection to the shoreline from wave attack. The rollback would be accompanied by growth towards the west leading to a narrower mouth of the Blakeney channel. The Cley to Salhouse shingle ridge would also continue to roll back at the same rate as Blakeney Spit. There would be some increase in overtopping and flooding of the marshes during extreme events but the drainage system would keep removing saline flood water.

The coastal response for the medium term (epoch 2) would be similar to the short term. The western end of the spit would continue to roll back and move towards the west. The smaller area behind Blakeney Spit, together with sea level rise, would lead to a reduced tidal prism and so a reduced flow. Increased protection along the embankments and improvements to the drainage system would be needed to keep providing the same standard despite climate change.

As for the area behind Scott Head Island, there are two possible large-scale developments in the long term. Either Blakeney Spit continues to roll back and attaches to the land or the increased rate of sea level rise reverses the current process which will cause the spit to stay detached. This is uncertain, but under the WPM scenario, the continued limitation of tidal prism makes it more likely that the spit will attach to the land. One thing that adds to the long-term development of the spit is the complex behaviour of the mouth of the channel and the western end of the spit. The gradual growth towards the west and retraction to the east seems to progress in cycles during storm events that may occur about every 40 years.

If the rollback of Blakeney Spit continues, the River Glaven and Blakeney channels are likely to silt up. The effects on the area behind the shingle ridge would continue from epoch 2 with movement towards the land. Siltation of the area behind the spit could limit the increasing pressure on the defences due to sea level rise. Also, the role of Blakeney Spit as a control for Stiffkey bay would reduce, leading to increased pressure on the shoreline.

However, if Blakeney Spit were not to reattach it would continue to be the main control point for the neighbouring frontage and the existing system of creeks and intertidal areas would continue.

#### No active intervention

For the short term the situation would be similar to that of the WPM scenario because the defences would continue to function during epoch 1. The main difference is that under NAI, the drainage system for Cley marshes is likely to fail, leading to increased salinity.



**Photo 2.12: Overtopping at Salthouse (April 2007)**

Increased flooding of the previously-reclaimed areas after the defences have failed in the medium term (epoch 2) would increase the tidal exchange behind the spit. This flooding would begin the process of saltmarsh development. There would be further rollback of the shingle ridge. Following the loss of Salthouse car park, the amenities at Cley (coastguard look-out and the Cley Eye Nature Reserve) would be at risk during epoch 2.

Long term (epoch 3) changes are uncertain for this scenario as well. The NAI scenario could still lead to the same two large-scale developments. Either Blakeney Spit attaches to the mainland or it could remain detached. The effects of both possible developments are described above for the WPM scenario. However, the increase in tidal prism because the defences would have failed under NAI increases the likelihood that Blakeney Spit would

remain detached, with the associated increased likelihood of the channels remaining functional.

### Summary

The key differences between the two baseline scenarios (and therefore the potential drivers for SMP policy decisions) are:

- WPM would continue to defend settlements and isolated properties, the A149 and the agricultural land. NAI would lead to an uncontrolled increase in flood risk and ultimately these features would become undefended, mainly during epoch 1.
- WPM would initially protect the status of the freshwater habitats, while NAI wouldn't. On the other hand, the increase in tidal prism under NAI would make it more likely that Blakeney Spit would remain detached from the land, with the associated local benefits for navigation and habitats and the benefits of limiting pressure on the shoreline in Stiffkey bay. NAI would also lead to creation of intertidal habitat locally.

## **2.4 Sustainable shoreline management: finding the right balance**

### 2.4.1 The 'big decisions' for North Norfolk Shoreline Management Plan

The earlier sections show that the north Norfolk coast has a unique and complex set of values and land uses. Of those, many are directly related to the shoreline and how it is managed. Particular ways of managing the shoreline may benefit some of these values and land uses but damage others. The aim of this SMP is to develop a plan that achieves the right balance between all these values. This is reflected in the principles that were agreed among all partner organisations to guide the development of the SMP (see section 1.4).

Section 2.3 identifies for each super-frontage the values and land uses that can be influenced by shoreline management. These findings illustrate the 'big decisions' that the SMP has to make. The two scenarios from section 2.3 are extremes, so in reality there is often an opportunity to develop a win-win plan that benefits all values and land uses. However, there are also cases where hard decisions have to be made because the interests are conflicting. For such cases, the plan must aim to provide enough time for people, businesses, other organisations and the environment to adapt to the predicted change.

For the north Norfolk coast, the 'big decisions' for shoreline management can be summed up by the following four questions:

1. Continuing to defend reclaimed land and its land use (tourism, freshwater habitats, agriculture, historic assets) can have significant benefits for the **communities** along the north Norfolk coast. However, the analysis of coastal

processes suggests that an increase in tidal exchange behind the barrier islands and spits would help sustain the channels and enhance the outer estuaries and their roles as control points for the bays. This would benefit flood and erosion management throughout the area, as well as supporting the use of the channels for tourism and fisheries. **What is the right balance between land use behind defences and activities in the tidal areas, and how can shoreline management support this?**

**2. How do we prefer to see the natural environment developing over the next 100 years, including its response and adaptation to sea level rise and natural processes and how can shoreline management support this? In particular, what is the right balance between defended brackish and freshwater habitats and undefended (inter)tidal habitats?**

3. As sea level rises the pressure on the flood defences will increase and in the future national funding may not be available for continued flood risk management. **Can we increase the role of natural processes and reduce the dependence of the north Norfolk coast on man-made intervention?**

4. The north Norfolk coast is a complex area that is sensitive to a number of **uncertainties**, especially the response of the shoreline to sea level rise and to any change in how it is managed. **How do we make sure that the plan is both robust and flexible in the face of these uncertainties and that it is based on measures that don't have large negative effects for all realistic future scenarios ('no-regret' measures)?**

#### 2.4.2 Moving forward to solutions

The first three questions indicate that, at a high level, there is a choice between two possible futures for the north Norfolk coast:

- Continue to maintain all defences where they are now. This will support current use of the defended land but may lead to an unsustainable situation in the course of the next 100 years.
- Change the way in which we manage the defences in some areas. This will increase natural processes and is likely to enhance the natural flood defence function of the dunes and saltmarshes, support socio-economic use of the channels and potentially make coastal habitats more resilient to sea level rise. This will mean that some currently-defended land must adapt.

Building new defences and reclaiming new land is not seen as a realistic option. The benefits for the north Norfolk coast would be limited and it could have a detrimental effect on the coastal processes. This means that 'advance the line' (one of the four policies introduced in section 1.1) is not a realistic option anywhere in the SMP area. It also means that currently undefended frontages will remain undefended into the future.



For the frontages that are currently defended, the scenarios of 'with present management' and 'no active intervention' described in section 2.3 give some indication of the effects of these two potential futures. However, it is not realistic to implement these scenarios for the whole of the SMP area and for all epochs, for the following reasons:

- In reality, the plan will not consist of a 'blanket' choice of one extreme or the other. Based on assessing local values and specific interactions along the shoreline, the plan should provide the best solution for each frontage, while taking account of its interaction with neighbouring frontages.
- Any change in management from the current approach would have to happen gradually. Firstly, this is because people, businesses, organisations and the environment will need time to adapt to any change. Secondly, an abrupt change of management would not be justified in the light of the large uncertainties about shoreline response. This means that any change of management with significant detrimental effects can only happen in the medium or long term and needs to be preceded by a managed process of adaptation, and in some cases by monitoring or assessment.
- The no active intervention scenario is often not realistic for frontages with flood defences because it leads to an unmanaged situation. Along the north Norfolk coast, where there are clear positive drivers but also disadvantages to making changes, a managed approach through managed realignment is much more realistic. This also allows continued flood protection for all settlements while still working with natural processes.

These considerations have steered the development of the Shoreline Management Plan. At the scale of the three super-frontages, options to sustain the use of currently-defended land have been compared with options to increase natural processes gradually while continuing to protect settlements and provide time for adaptation.

Within these overall options for each super-frontage, some frontages also need a specific decision for that location. For dunes and shingle ridges with a flood defence function, this looks at the desired level of management to sustain this function. For embankments that protect a narrow strip of land and for quaysides, there is only a limited effect along the shoreline, so the SMP needs to decide whether continued defence management is sustainable.

The Shoreline Management Plan suggests policies based on a full appraisal of these options against a wide range of criteria that are directly related to the principles listed in section 1.4. The main aim of the appraisal has been to assess and clarify the effect that each option would have on each of the principles. These effects were visualised by a traffic light system (see policy

statements in section 4) and presented to the partner organisations. They have then weighed all the positive and negative effects to develop a shoreline management plan that achieves the best balance between the agreed principles.

The full process of developing and appraising options is described in appendix A, with references to more details in the other appendices. This main SMP report focuses on the final plan as agreed and confirmed following public consultation. Section 3 describes the plan and what it means, while section 4 describes the specifics of the plan for each policy development zone (PDZ). PDZs are 'decision making units'. Their size varies depending on the scale of the issues that shoreline management needs to take into account.

### **3 General description of the plan**

#### **3.1 Overview of the plan**

The overall plan for the north Norfolk coast is to increase natural processes gradually while continuing to provide flood defence where this is technically possible and economically viable.

The intended gradual shift towards natural processes will make shoreline management more sustainable and resilient. For most of the currently-defended shoreline, the SMP intends to continue to provide flood defence. For some of these frontages this involves keeping the defences where they are now. For some of the natural defences the intent is to find out if a more natural system could provide the protection needed. Finally, for some of the low-lying defended areas, the SMP intends to move the defence line further inland in the medium or long term, or to investigate the benefits of doing this.

The plan provides time to adapt to these (potential) local changes of management and to obtain the knowledge needed to confirm the plan for the medium and long term. The SMP's action plan contains a specific programme of actions (monitoring, consultation and assessments) that are needed to support further decision making in future SMPs.

As indicated in section 1.1, implementing the policies will depend on funding being available. This is the case both for the intent to keep defending the houses and infrastructure and for the intent to increase natural processes.

##### Hold the line for reclaimed areas

For a number of the low-lying defended areas along the north Norfolk coast, the SMP intends to sustain current land use by continuing to hold the line. This is the case for all the river outfalls (River Hun, River Burn, River Stiffkey and River Glaven), Titchwell RSPB reserve, Brancaster golf club, the tourism facilities and beach access at Holkham and Wells-next-the-Sea, the agricultural land and freshwater habitats at Holme marshes, Warham marshes and around Morston. For some of these areas, it is possible that continued flood defence over the long term is not sustainable where the defences are now. This means that, in the future, a different approach may have to be considered to sustain communities and infrastructure. Moving the defences further inland in these areas would have a range of potential benefits and negative effects, with associated uncertainties. The SMP's action plan is set up to obtain the knowledge needed to support future decisions.

##### Potential managed realignment for reclaimed areas

For some of the other low-lying defended areas, the SMP's policy for the medium and long term is conditional on the outcomes of monitoring and assessments in the coming years: either to maintain the defences where they

are now or move them further inland. Whichever policy is chosen, the SMP intends to maintain flood defence to all houses and important infrastructure. This is the case for Brancaster grazing marsh (medium term), Burnham and Norton marshes (long term), Overy marshes (long term) and Cley west bank (long term).

### **Text box 3.1: Pros and cons of managed realignment**

Moving defences further inland could have a range of benefits, but there are also negative effects and uncertainties. The increase in tidal prism is likely to strengthen the outer estuaries. This will reduce pressure on the shoreline in neighbouring frontages and strengthen the natural flood protection role of the dunes. Realignments would also move the flood defences to a more sustainable sheltered position. This would reduce reliance on human intervention, particularly if climate change increases the pressure on the sea banks. Realignments would create more intertidal habitat and improve navigability of the channels up to the harbours. However, this would come partly at the expense of existing freshwater habitats and agricultural land use and there are other potential negative effects (see the policy statements in section 4 for more details).

In summary, realignments will create a more natural shoreline for the north Norfolk coast and reduce reliance on human intervention. This is likely to sustain the area's characteristic interaction with the sea against the pressures of climate change. It would, however, come at the expense of current land use in some of the historically reclaimed areas, which are also characteristic for the area. In the coming years shoreline management and land use planning will have to work hand in hand to generate the understanding needed to make long-term decisions against the background of climate change, future socio-economic needs and constraints, flood defence sustainability and associated uncertainty.

Where the SMP proposes moving flood defences, the partner authorities would like to implement this policy with full landowner agreement. This also means that landowners would be allowed to hold their own defence line if they choose and if they demonstrate that this will not have adverse effects on the wider coastline or the environment. New guidance has been developed at a national level (asset maintenance policy) and practical local guidance is available to landowners wishing to maintain their own defences in the SMP area. Should everyone wish to hold the line there may be consequences for the erosion and subsequent loss of intertidal habitats through coastal squeeze. The Environment Agency is tasked with finding replacement habitat on behalf of landowners wishing to hold the line where coastal squeeze is an issue and has established the Regional Habitat Creation Programme to do this.

For Blakeney Freshes there is a firm intent to carry out managed realignment in the medium term. The SMP aims to set in motion the process of scheme appraisal and development, including finding replacement habitat.

#### Hold the line for quaysides and settlements

For all embankments that protect narrow strips of land and for all quaysides, the plan is to sustain current land use by continuing to hold the line. The only exception is the sea bank in front of Thornham. This only protects a small area of agricultural land, so further management as a flood defence cannot be justified.

#### Continue flood defence with minimum intervention for natural defences

For dunes with a flood defence function, the plan is to sustain this with the minimum amount of intervention necessary, aiming to increase the influence of natural processes. This applies to Old Hunstanton dunes, Holme dunes and Holkham dunes.

For the shingle ridge between Cley and Salthouse, the plan is to continue the management approach that was agreed between the Environment Agency and Natural England in 2006. The intent is to allow the shingle ridge to continue to develop naturally, while defining specific triggers for flood risk management intervention.

It is important to note that implementing the SMP policies will depend on funding being available. This may be from the national flood and coastal erosion risk management budget, but it could also come from other national sources or from local and/or third-party funding.

### **3.2 Implications of the plan**

The SMP has been developed to achieve the best possible balance between all the different functions, values and features along the north Norfolk coast. The overview of the plan in section 3.1 touches on the most relevant implications. This section describes the implications for each aspect.

The Strategic Environmental Assessment (SEA) process (see appendix L) that accompanies and supports the SMP intends to make sure that environmental and social/economic issues relating to the coast are central to developing and evaluating policy. The SMP itself is also set up to do this, but the SEA provides a structured, targeted and specific evaluation of the key environmental and social/economic implications of the plan on an established suite of receptors. The evaluation in this section is consistent with that undertaken during the SEA process but uses the categories identified in the SMP guidance.

### Properties and infrastructure

The plan intends to continue to provide flood defence for all houses that are currently at risk of flooding where this is technically possible and economically viable. The number of properties at risk is limited and they are mainly around the lower-lying fringes of settlements that were established on the edge of the higher ground. At present, there are about 800 properties in the tidal flood zone and this is predicted to rise to about 1,500 by 2105 due to sea level rise (see table 2.1). This is illustrated in Figure 3.1 (note that the figure shows the flood risk area in currently-defended areas only. The intertidal areas are also prone to flooding). Appendix F contains more detailed maps. The way in which flood defence will continue to be provided depends on the type of defence and the geography. Along the frontages with potential managed realignments, this will usually mean building new flood defences in a more sustainable place further inland, typically on higher ground, creating a much wider foreshore to reduce wave attack. If the realignments are carried out, most of the realigned defences would also be shorter than the existing ones. These factors make it easier to maintain the defences, particularly as they come under increased pressure from sea level rise. In doing this, any increase in flood risk because defences are closer to houses in the tidal flood zone needs to be taken into account. For dunes with a flood defence function, the intent is to maximise the role of the natural defences, while ensuring appropriate defence levels. Some research is needed to confirm this through specific actions in the action plan.

It is expected that the land use planning system will not allow new houses to be built in the areas at risk of tidal flooding, either now or in the future. This is an important starting point of the plan. For both local authorities in the SMP area, the Local Development Framework's Core Strategy signals the intent to guide inappropriate development away from areas at risk of flooding.

The main infrastructure in the area is the A149 road that connects Hunstanton with Cromer by way of the string of settlements along the north Norfolk coast. It is very important that the transport function of the A149 is sustained (except in extreme flood events) throughout the plan period. In most cases the plan will continue to protect the A149 where it is now. However, some of the potential realignments could affect the road and in those cases the plan needs to include the provision either to move the road or build a local defence. The best solution needs to be developed through more detailed assessments (see the SMP's action plan). This potentially concerns stretches of the A149 near Old Hunstanton, Burnham Norton, Holkham, Cley-next-the-Sea and Salthouse.

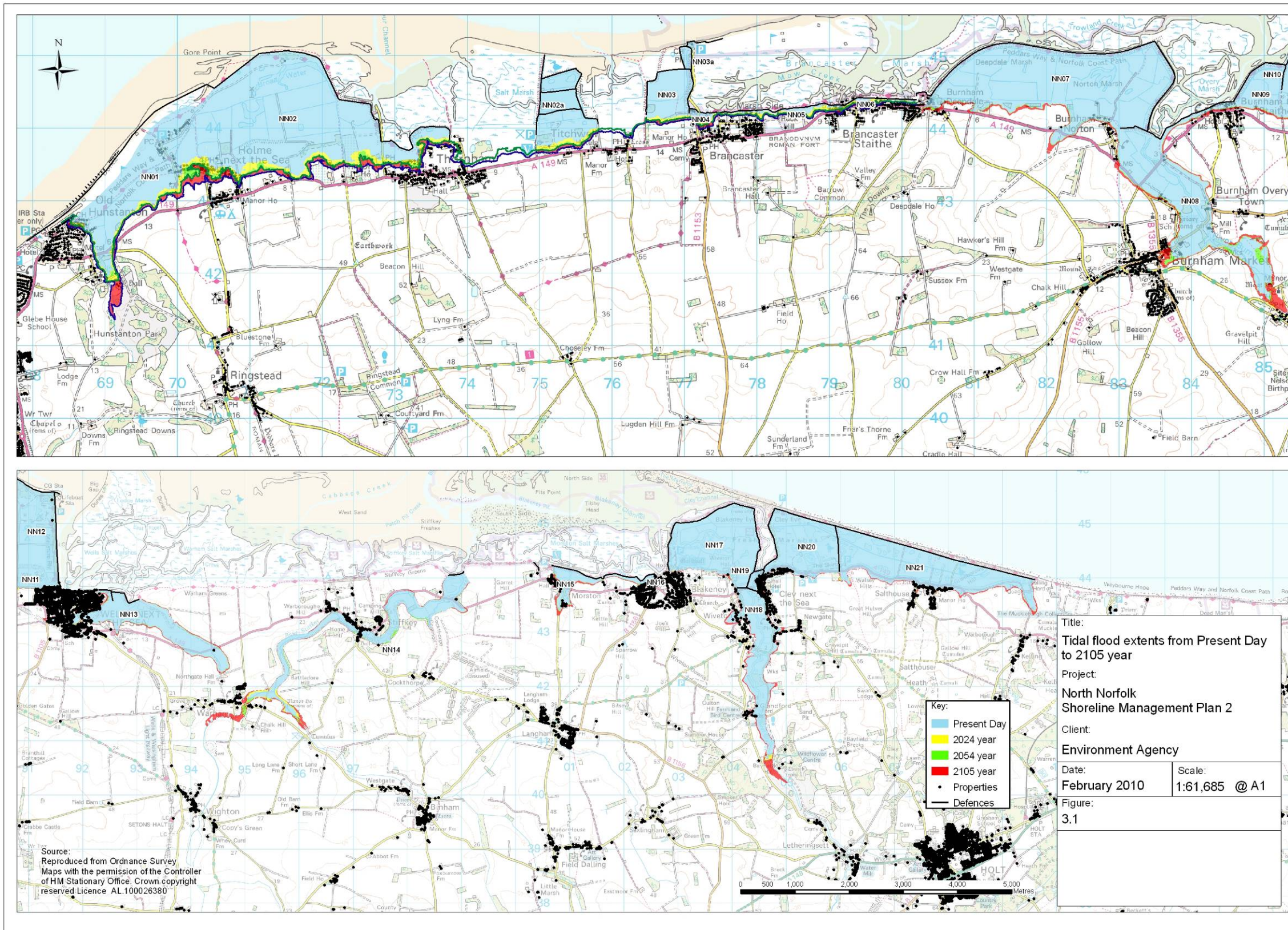
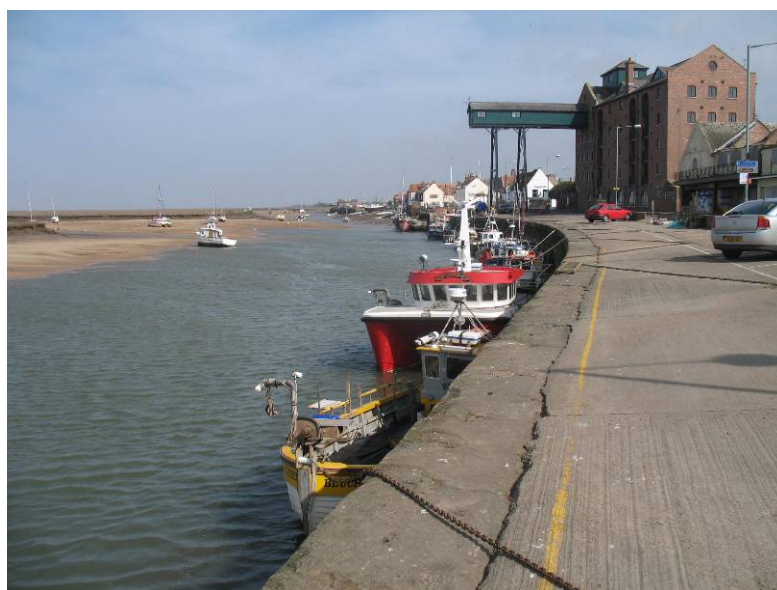


Figure 3.1: Predicted change of flood risk area in epochs 1, 2 and 3

### Communities and local economy

The plan provides continued flood defence for all settlements, but a community is much more than a collection of buildings. The communities along the north Norfolk coast owe their unique character to a rich mixture of values and features that strongly depend on the link with the intertidal and reclaimed areas and with the sea. The plan intends to continue to provide protection for some of the specific features that drive the tourism economy of the north Norfolk coast: the RSPB reserve at Titchwell, the Royal West Norfolk golf course at Brancaster, the facilities at Holkham and Wells-next-the-Sea and the access to the beach (roads and car parks). It also provides continued protection for most of the defended agricultural land, at least in the short and medium term (see 'land use' sub-section).

The plan raises the issue that, in the medium and long term, it may not be possible for shoreline management to keep sustaining both the reclaimed areas and the intertidal areas in their current state. Current understanding of shoreline behaviour shows that the intertidal area is likely to continue to silt up. Realignment of some of the historically reclaimed areas will come at the expense of their current land use, but is likely to support the value of the current intertidal areas. The action plan sets out the monitoring and assessments needed to increase our understanding about this important issue. As our understanding of future developments increases, shoreline management will have to work with land use planning to determine the right approach.



**Photo 3.1: Wells-next-the-Sea**

Several of the communities derive direct economic benefit from the coastal habitats. The north east Wash (around Old Hunstanton and Holme-next-the-Sea) and Blakeney are designated shellfish waters (under the Shellfish Waters directive). Both the currently-defended and the intertidal habitats support important bird species. Species such as bittern use the freshwater habitats, while the dark-bellied Brent goose and Eurasian wigeon need freshwater habitat for feeding and roosting and intertidal habitats for feeding.



### Land use

For the north Norfolk coast, the implications for land use concern both defended and undefended areas.

The plan intends to keep protecting all the agricultural land in the short term. In the medium term the intended realignment at Blakeney Freshes, and the potential realignment at Brancaster, would come at the expense of grazing marsh. The potential long term realignments would come at the expense of arable land. Generally, the extent of agricultural land in the defended areas is limited and it is usually grade 3 agricultural land, of which there is a lot in the area and nationally.

The plan recognises the potential threat of ongoing siltation for both navigation and fisheries. The intended realignment at Blakeney Freshes is likely to counteract siltation, as are the other potential realignments.

### Wildlife and geology

Most of the north Norfolk coast is currently protected by national and international designations. This is for its intertidal habitats and species, its freshwater and brackish habitats and species and its geological features.

In the short term, the plan sustains the existing habitats and their species. Over the medium and long term, natural processes and sea level rise are likely to reduce tidal dynamics behind the barrier island and spit. Also, where freshwater and brackish habitats are protected by natural defences (dunes and shingle ridge), increased levels of management will be needed to sustain the habitats.

The plan intends to create more intertidal habitat, although most of this depends on the outcomes of further monitoring and assessments. For some of the (potential) realignments intended for the medium and long term, creating intertidal habitat will come at the expense of currently-designated freshwater or brackish habitat (Holme marshes, Brancaster grazing marsh, Norton marsh, Overy marshes, Blakeney Freshes and Cley marshes). The Appropriate Assessment in appendix M describes the overall effects on designated sites. It is the intention of the plan to carry out monitoring and research to improve knowledge of shoreline response, including the effect on habitats. This improved knowledge is needed to confirm the intended realignments in the medium and long term.

The Regional Habitat Creation Programme (RHCP) has been developed to take account of habitat losses caused by work to manage flood risk and coastal erosion. It is tasked with ensuring that new habitats are in place before the start of new flood risk management schemes that protect people and properties. The RHCP assesses the habitat requirements and aims to create new habitat through various means, including buying land from willing landowners. The RHCP is always seeking opportunities to create various

habitats, in particular intertidal (saltmarsh and mudflat), reedbed and grazing marsh.

The Strategic Environmental Assessment (appendix L) and the Appropriate Assessment (appendix M) together contain a comprehensive assessment of the effects of the draft plan on environmental features. Section 1.5 explains how these stand-alone documents relate to the SMP.

The North Norfolk Coast SSSI is a geological site for coastal landforms, which is supported by the intended increase of natural processes. In addition, Morston Cliff SSSI is a specifically geological site. It is located in a frontage where the current and revised policy is no active intervention.

#### Water quality

The SMP policies may affect the ecological status of the water bodies in and around the north Norfolk coast as described in the Anglian River Basin Management Plan. The detailed assessment in appendix K was carried out on a precautionary basis. It shows that the (potential) managed realignment policies could have a negative effect on freshwater/brackish habitats, particularly in Cley marshes. On the other hand, the (potential) hold the line policies could prevent the transitional and coastal water bodies (together covering the open sea in front of the SMP area and almost all the intertidal area) from improving to achieve their ecological potential due to loss of foreshore. These potential effects need to be taken into account in the monitoring and assessments that the SMP's action plan proposes for the coming years. Also, the SMP's (potential) managed realignment policies may pose a risk for groundwater status in the inland freshwater bodies. This would need to be confirmed, for example by using the Environment Agency's Anglian Groundwater Model. This is included in the SMP's action plan, together with the recommendation in appendix K to review whether it is possible to make the boundaries of the water bodies and SMP coincide.

#### Landscape

The landscape of the north Norfolk coast is closely connected to the mix of values and features related to the intertidal area, the reclaimed areas and the sea that gives the area its unique character, as reflected in its designation as an Area of Outstanding Natural Beauty (AONB). The plan intends to support this character and the balance of different features.

The north Norfolk coast is also well known for its naturally wild and dynamic nature. The plan aims to promote this character by making sure that the coast can develop in a sustainable manner with the minimum use of hard engineering options. In doing so, the plan complements the AONB Management Plan which promotes the natural and dynamic nature of the north Norfolk coast.

### Historic environment

Most features of historic interest along the north Norfolk coast are in settlements and will therefore remain protected. This is also the case for a number of important features outside the settlements, in particular Brancaster (Branodunum) Roman fort, as well as two grade II\* listed buildings and six grade II listed buildings on the Wells and Blakeney quaysides.

Up to nine regionally important flood embankments (derived from 18<sup>th</sup> /19<sup>th</sup> century works), 20 World War two structures (regionally important individually or as a group of sites) and a possible 16th century fort (regionally important) could be at risk of erosion due to the MR policy along the frontage, depending on where the new defence is built. Also, the Blakeney chapel site (scheduled monument and listed building), and a Neolithic settlement site of national importance, would be at risk of erosion with the MR policy. However, excavations have already been carried out on these sites. Where actual realignment (relocation of a defence line) occurs, the number of sites likely to be affected is small. However, maintaining existing defence structures may also cause disturbance to the 18<sup>th</sup> and 19<sup>th</sup> century sea defences.

The plan intends to continue to provide flood defence for a large number of features at risk of flooding, which safeguards their value for the heritage, culture and economy of the area. As well as the historic assets and conservation areas in the settlements, this also includes a number of scheduled monuments outside the settlements, including Brancaster Roman fort, the iron age fort in Overy marshes near Holkham and a number of monuments in the tidal range of the river valleys (such as Wiveton bridge and St Mary's friary). Furthermore, two grade I listed buildings, eight grade II\* listed buildings and 84 grade II listed buildings will lie in the tidal flood zone and be at varying degrees flood risk over the next 100 years. These will therefore benefit from the defences' protection. A number of other regionally or nationally important sites would also fall in the tidal flood zone.

It should also be noted that many archaeological sites are preserved within the foreshore. Rising sea levels are likely to cause increased erosion and risk of damage to many sites, particularly the prehistoric land surfaces and component sites and Saxon fish traps along the Holme, Thornham, and Titchwell foreshores.

### Amenity and recreation

Most amenity and recreation features are covered by other aspects such as navigation, specific tourist draws, historic environment and landscape.

A particular element of amenity and recreation concerns access to the shoreline. As far as access by car is concerned, the plan will sustain all access roads. The potential medium-term realignment of Brancaster grazing marsh will involve a breach on its east side, requiring the tidal flow to cross the road. This will need structural works as part of the plan. A similar solution

may be needed for the intended long-term realignment of Cley west bank. The plan does not directly affect the shoreline car parks but, where these are behind dunes or the shingle ridge, they may need to adapt to the natural development.

The intended realignments will affect the footpaths. The realignments will be implemented by local breaches of the existing defences which will cut the Peddars Way and Norfolk coast path where it runs on top of the embankments. The footpaths are an important feature of the area and this will be reinforced by the coastal footpath provisions of the Marine and Coastal Access Act (2009). The footpaths will need to be sustained as part of any realignment projects by re-routing them. The best solution needs to be determined as part of the plan's implementation. The action plan contains actions to look at this issue in all relevant policy development zones.

## 4 Policy statements

### 4.1 Introduction











The policy statements in this section outline the policies for each policy development zone (see Figure 4.1). They are illustrated by the policy maps and accompanied by additional information that was used to appraise, select and confirm these policies.

There is one policy statement for each policy development zone. However, due to the nature of the north Norfolk coast, many of the policy decisions have included larger-scale considerations. The policy statements are therefore organised by super-frontage, as introduced in section 2.1.1. Each of these starts with an overall description of the plan for the super-frontage illustrated by the policy maps. This is then followed by the specific statements for each policy development zone, consisting of:

- overall summary of the plan
- description of the plan in the three epochs
- summary of the policies
- description of changes compared to present shoreline management
- graphical overview of key features and values
- graphical overview of effects related to the principles.

The results of the policy appraisal process are illustrated in the policy statements by schematic diagrams. A symbol was assigned to each of the principles as shown below and then shaded in green, amber or red to visualise how the plan performs against that principle. The colours have the following meaning:

- green: the plan has a positive effect on the principle
- amber: the plan has a neutral effect on the principle
- red: the plan has a negative effect on the principle
- grey: the principle does not apply to the PDZ (for example, the infrastructure symbol is grey for PDZs where there are no roads or utilities that could be affected by shoreline management).

Principle:			
	Reduce reliance on man-made defences		Allow planning system to respond to changes in shoreline management
	Ensure local policies do not affect wider coastal processes		Maintain protected sites and species
	Impact of coastal change on local industry		Maintain and enhance coastal biodiversity
	Provide time for communities to adapt to coastal change		Maintain and enhance the coastal landscape
	Value of north Norfolk to wider society		Historic environment, heritage and culture

The economic viability of each policy is reported at the level of super-frontages to reflect that economics is not the main reason for the policies. The viability is expressed through the benefit cost ratio (B-C ratio), which is the ratio of the economic benefits over the costs of the policy. These benefits are the flood damages prevented by shoreline management (calculated for residential and commercial properties only). The costs include building and maintaining the defences. Both the benefits and the costs are discounted to the present day, giving their present value (PV). This allows comparison of amounts that will occur at different times in the future. Appendix H contains detailed background information about economic viability.

Figures 4.5, 4.9, 4.13, 4.14, 4.18 and 4.19 show the potential new defence lines after managed realignment. These lines will be one of the main things to be discussed and agreed when developing the schemes. The SMP partners will do this with the full involvement of local communities and landowners and through technical, economic and environmental analysis. In some places, the maps show properties near the edge of the current flood zone where no potential new defence line has been drawn. This is because the flood zone shows a very extreme event (0.5 per cent a year chance), which is higher than the typical height of flood defences in this area (10 per cent a year chance).

#### Text box 4.1: Intent of management and policy labels

The main aim of the Shoreline Management Plan is to develop an ‘intent of management’ for the shoreline that achieves the best possible and achievable balance of all the values and features around the shoreline for the coming 100 years. This intent of management is the actual plan. It is described in a narrative and illustrated in the maps. For all SMPs nationally, the plan for each section of shoreline is then translated into one of four policy labels:

- **Hold the line (HtL)** – hold the defence where it is now.
- **Advance the line (AtL)** – build new defences seaward of the existing defence line.
- **Managed realignment (MR)** – allow the shoreline to move seaward or landward, with associated management to control or limit the effects on land use and environment. This can take various forms depending on the intent of management to be achieved. All are characterised by managing change, not only technically (by breaching and building defences) but also to land use and environment (by facilitating or ensuring adaptation).
- **No active intervention (NAI)** – no further investment in coastal defences or operations.

There can be various types of managed realignment and this is also the case for the North Norfolk SMP. This is explained for each PDZ in the intent of management but, to prevent any confusion, this SMP uses policy labels that identify various sub-types of the managed realignment policy, as follows:

Policy label	Intent of management
MR1	Maintain the flood defence function of a natural defence with minimum intervention, allowing maximum natural development
MR2	Breach the frontline defence after building a new defence further inland
MR3	Breach the frontline defence, no new inland defence

Table 4.1 gives an overview of the shoreline management policies in SMP1 and how these compare to the SMP2 policies. It is important to note that the time periods have changed: SMP1 looked 50 years ahead while SMP2 includes policies for a 100-year period.

**Table 4.1: Overview of SMP2 policies and changes compared to SMP1**

SMP1				SMP2			
Location	Policies (1995 to 2045)			Location	Policies (2010 to 2105)		
	Short term	Medium term	Long term		Short term	Medium term	Long term
Hunstanton golf course	HtL	HtL/MR	HtL/MR	Old Hunstanton dunes	HtL	MR1	MR1
Thornham to Hunstanton golf course	HtL	HtL/MR	HtL/MR	Holme dunes	MR1	MR1	MR1
				Thornham sea bank	HtL	HtL	HtL/MR2
Brancaster Staithe to Thornham	HtL	HtL/MR	MR/HtL	Thornham	NAI	NAI	NAI
				Thornham to Titchwell	NAI	NAI	NAI
				Titchwell RSPB reserve	HtL	HtL	HtL
				Titchwell village	NAI	NAI	NAI
				Brancaster grazing marsh	HtL	HtL	HtL/MR2
Royal West Norfolk golf club		HtL/MR	HtL/MR	Royal West Norfolk golf club	HtL	HtL	HtL
Gun Hill to Brancaster Staithe	HtL	HtL	HtL	Brancaster / Brancaster Staithe	HtL	HtL	HtL
	HtL	HtL	MR/HtL	Deepdale and Norton marshes	HtL	HtL	HtL/MR2
	HtL	HtL	HtL	River Burn outfall	HtL	HtL	HtL
	HtL	HtL	HtL	Overy marshes	HtL	HtL	HtL/MR2
	HtL	HtL	HtL	Burnham Overy Staithe	HtL	HtL	HtL
Wells harbour to Gun Hill	HtL	HtL	HtL	Holkham dunes	MR1	MR1	MR1
Stiffkey marshes to Wells harbour				Wells flood embankment	HtL	HtL	HtL
				Wells quay	HtL	HtL	HtL



SMP1				SMP2			
Location	Policies (1995 to 2045)			Location	Policies (2010 to 2105)		
	Short term	Medium term	Long term		Short term	Medium term	Long term
Cley coastguards to Stiffkey marshes	HtL	MR/HtL	MR/HtL	Wells east bank	HtL	HtL	HtL
				Stiffkey bay	NAI	NAI	NAI
				River Stiffkey outfall	HtL	HtL	HtL
				Morston	HtL	HtL	HtL
				Stiffkey to Morston	NAI	NAI	NAI
				Blakeney	HtL	HtL	HtL
				Blakeney Freshes marshes	HtL	MR2	HtL
River Glaven outfall	HtL	HtL	HtL				
Kelling quay to Cley coastguards	HtL	MR/HtL	MR/HtL	Cley marshes	HtL	HtL	MR2/HtL
				Cley to Salthouse	MR1	MR1	MR1

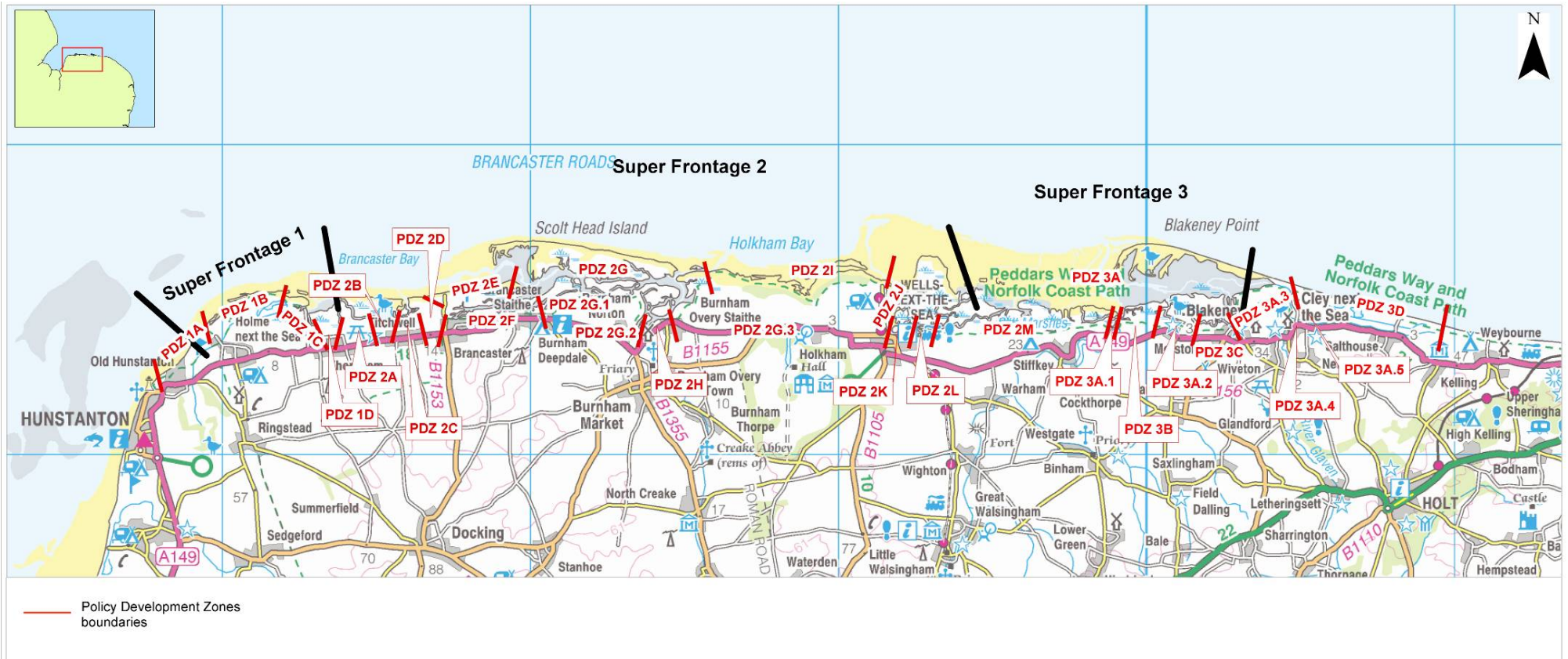


Figure 4.1: Overview of super-frontages and policy development zones

## 4.2 Super-frontage 1: Old Hunstanton to Thornham

The overall plan for the frontage from Old Hunstanton to Thornham is to investigate the possibility of gradually increasing natural processes while continuing to provide flood defence where this is technically possible and economically viable.

In the medium and long term, the plan is to investigate ways to increase the role of natural processes in providing flood defence. For Old Hunstanton dunes (PDZ1A) this could involve reducing the role of the man-made structures on the beach. For Thornham sea bank (PDZ1C), there could be a need to consider moving the defences further inland in the long term. This would have a range of negative effects on current land use and potential benefits locally and elsewhere. Monitoring and research is needed to support future decision making (see the SMP's action plan).

The sea bank in front of Thornham needs a separate decision. It only protects a small area of agricultural land. There are no significant longshore effects, so further management as a flood defence cannot be justified.

The interaction with the neighbouring SMP for the Wash is limited. Shoreline management there is unlikely to affect these frontages. However, there may be some effect from this SMP on the Wash. Policies to increase natural processes would benefit sediment supply to Hunstanton and beyond. There is a similar relation with super-frontage 2. Shoreline management there will not affect super-frontage 1, but the River Hun estuary is a control point for Titchwell bay, so its development will have some effect on the western-most PDZs in super-frontage 2, up to Titchwell.

For super-frontage 1, the total economic benefits of the policy are estimated to exceed the costs, although not by a wide margin, so the plan is marginally viable. This is the case for both policy options at Thornham sea bank (hold the line or managed realignment in epoch 3). As indicated in section 1.1, implementing the policies will depend on funding being available and in this case it is not certain that national sources will cover all the costs. The partner organisations involved in the SMP are eager to explore alternative sources of funding, for example related to the benefits the plan would create for tourism, nature conservation, access, local landowners, navigation and other local interests.

Appendix G contains more detailed background information. Figures 4.3 to 4.5 show the policies for the short, medium and long term for this super-frontage.

<b>Location reference:</b>	<b>Old Hunstanton dunes</b>
<b>Policy development zone:</b>	PDZ 1A

**POLICY STATEMENT:** Maintain the flood defence function of the dunes that currently protect around 80 properties and various historic assets in Old Hunstanton, Holme-next-the-Sea and Thornham, the A149 and other features in the tidal flood zone. The intent is also to allow the dune system to develop as naturally as possible. This is likely to sustain the beach in the medium and long term, while giving it a more dynamic character.

The SMP has identified that more knowledge is needed to confirm the intent to increase natural dune development, including the effect on the River Hun outfall. If this is confirmed (see action plan), management would be changed in the medium term. The plan could require the golf course and the beach huts to adapt in the medium and long term.

Implementing this policy depends on further confirmation (beyond the SMP) that it is technically possible and economically viable.

**SUMMARY OF POLICIES**

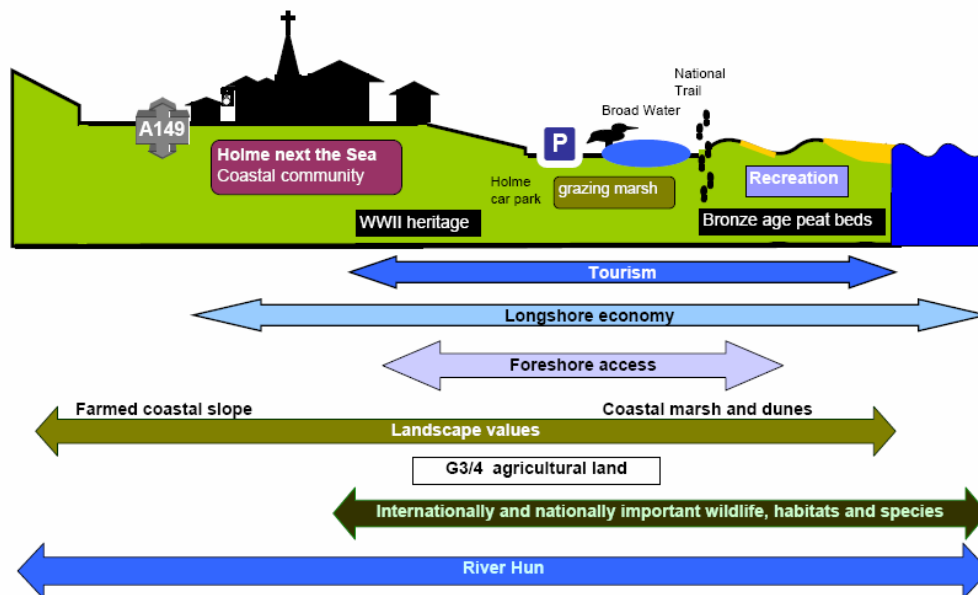
<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	Hold the line	Managed realignment (MR1)	Managed realignment (MR1)	The change of policy from epoch 2 needs confirmation based on better knowledge to be gained during epoch 1 (see action plan). If confirmed, some form of management is likely to be needed in later epochs to maintain the flood defence function of the dunes.
<b>Local management policy</b>	Continue to maintain the dunes where they are now and maintain their flood defence function.	If confirmed, the dunes will be allowed to develop naturally. If their flood defence function is reduced, work will be undertaken to restore it.		

Key: MR – Managed realignment:  
 MR1 – Maintain natural defence with minimum intervention  
 MR2 – Breach of frontline defence after building defence further inland  
 MR3 – Breach of frontline defence, no building of inland defence































## CHANGES FROM PRESENT MANAGEMENT

In epoch 1 there is no change from the current policy of holding the line. However, from epoch 2 onwards, a significant change in approach is intended as defences are removed and the dunes are allowed to develop naturally. SMP1 suggested that a policy of managed realignment of this frontage may be suitable if the dunes continue to provide flood defence to the properties in Old Hunstanton. So the policy is compatible with SMP1's intent of management for the longer term. The action plan identifies the need for stakeholder involvement and communication in implementing this potential change of approach.

## KEY FEATURES AND VALUES:



## POLICY APPRAISAL RESULTS

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Holme dunes</b>
<b>Policy development zone:</b>	PDZ 1B

**POLICY STATEMENT:** Maintain the flood defence function of the dunes that currently protect around 80 properties and various historic assets in Old Hunstanton and Holme-next-the-Sea, the A149 and other features in the tidal flood zone. The intent is to do so through minimum intervention in the natural development of the dunes, which continues the current approach. If monitoring shows that intervention is needed, the type of intervention would be chosen based on full consideration of all effects, including the effect on habitats. The effect on the River Hun and its outfall will need to be acceptable. Any effect on the complex of World War two sites (historic assets) will need to be mitigated.

The flood defence function of Holme dunes is currently under threat. The long-term plan possibly to realign Thornham sea bank (PDZ 1C) is likely to have a positive effect on Holme dunes (increasing their width and their flood defence function). This realignment at Thornham would also reduce the area that depends on Holme dunes for its flood protection.

Implementing this policy depends on further confirmation (beyond the SMP) that it is technically possible and economically viable.

**SUMMARY OF POLICIES**

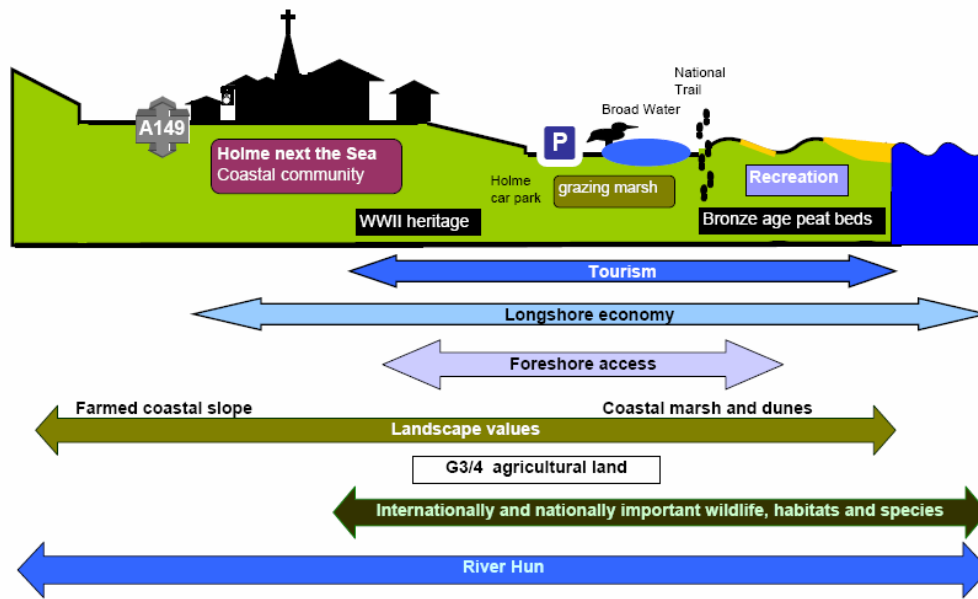
<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	Managed realignment (MR1)	Managed realignment (MR1)	Managed realignment (MR1)	The flood defence function will be maintained with the minimum amount of intervention allowing the dune system to develop as naturally as possible.
<b>Local management policy</b>	Allow the dunes to develop naturally. If their flood defence function reduces, work will be undertaken to restore it.			

Key: MR – Managed realignment:  
 MR1 – Maintain natural defence with minimum intervention  
 MR2 – Breach of frontline defence after building defence further inland  
 MR3 – Breach of frontline defence, no building of inland defence

### CHANGES FROM PRESENT MANAGEMENT































The plan continues the present management regime. The SMP1 policy for the longer term was managed realignment if Holme dunes were receding. This is compatible with the policies above. The action plan identifies the need for stakeholder involvement and communication in implementing a potential change in approach.

### KEY FEATURES AND VALUES:





## POLICY APPRAISAL RESULTS

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Thornham sea bank</b>
<b>Policy development zone:</b>	<b>PDZ 1C</b>

**POLICY STATEMENT:** Maintain flood defence to the communities of Thornham, Holme-next-the-Sea and Old Hunstanton, including all their houses, historic assets (including Thornham conservation area) and infrastructure. Also potentially to increase the tidal exchange in Thornham harbour channel by moving Thornham sea bank further inland in the long term, if supported by monitoring and research during epochs 1 and 2.

In principle the current defence line will be held. This will sustain current agricultural land use, the partly-designated freshwater habitats and the footpath that runs on top of the sea bank. However, the SMP has identified that managed realignment could have a range of benefits:

- By enhancing the outer estuary, the increase in tidal prism is likely to reduce pressure on Holme dunes and Old Hunstanton dunes and support their role as a habitat and as a natural flood defence.
- The realignment would move the defences to a more sustainable sheltered position. This would reduce the risk of flooding to the people of Old Hunstanton, Holme-next-the-Sea and Thornham (around 80 properties are currently in the tidal flood zone, including 14 listed buildings) and reduce reliance on man-made defences. This could become particularly relevant as climate change starts to increase the pressure on the sea bank. Based on the current condition and height of the sea bank, major improvement works would be needed around 2075 (see section 2.1.5). This may not be economically viable or technically possible if sea level rise predictions happen in the future. There may therefore have to be a change in flood risk management policy.
- The realignments would create intertidal habitat and are likely to benefit the ecological integrity of the area by sustaining the channels and supporting Holme dunes.
- The increase in tidal exchange is likely to scour out the harbour channel and deposit most of the incoming silt in the currently-defended area. Navigation to Thornham is currently very limited, but this could be enhanced which could create social and economic benefits.

On the other hand, a realignment would have negative effects on agricultural land use, freshwater habitats and the footpath. The increased channel flows may have local negative effects on structures. A number of archaeological sites may become at risk of erosion. The setting of Thornham conservation area could also be affected by a realignment, requiring sensitive design. In addition, some of the potential benefits are uncertain.

The SMP has therefore identified that more knowledge is needed to assess the effects of this potential realignment and support a firm long-term decision in future SMPs. The SMP's action plan contains a programme of actions

(monitoring, consultation and assessments, including a review of historic attempts to increase the tidal prism in Thornham harbour) to investigate the potential positive and negative effects described above. Based on this, the next SMP will review the medium- and long-term policies for this PDZ.

Figure 4.2 shows where the new defences could be built following the potential managed realignment in epoch 3. Implementing any of the policies below depends on further confirmation (beyond the SMP) that they are technically possible and economically viable.

**SUMMARY OF POLICIES**

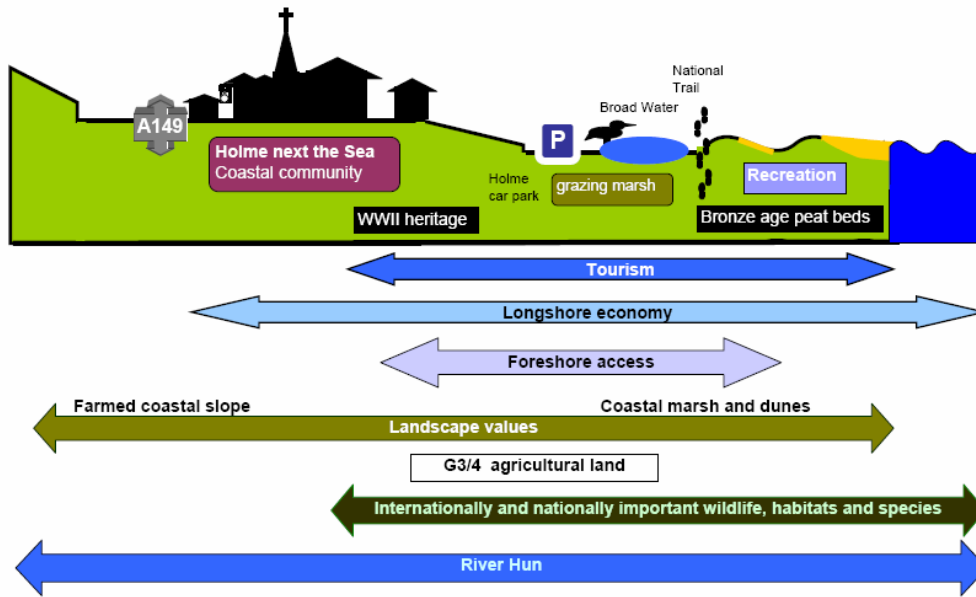
<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line or managed realignment (MR2)	The policy for epoch 3 is conditional. It depends on the results of monitoring and research during epochs 1 and 2 (see action plan). In both scenarios there will be defences to sustain the communities of Thornham, Holme-next-the-Sea and Old Hunstanton.
<b>Local management policy</b>	Maintain defences where they are now. Carry out monitoring and assessments to investigate potential realignment in the future.		Maintain defences where they are now unless increased knowledge leads to preference for moving them further inland.	

Key: MR – Managed realignment:  
 MR1 – Maintain natural defence with minimum intervention  
 MR2 – Breach of frontline defence after building defence further inland  
 MR3 – Breach of frontline defence, no building of inland defence

**CHANGES FROM PRESENT MANAGEMENT**

SMP1 did not specify a policy for the sea bank. It suggested that a policy of managed realignment may be suitable for the whole of this super-frontage if the dunes stop providing their flood defence function. So the policy of maintaining the defences where they are now, and the intent to investigate whether moving them further inland would achieve the expected results in the medium- or long-term, can be considered compatible with SMP1. The action plan identifies the need for stakeholder involvement and communication in implementing this potential change.

**KEY FEATURES AND VALUES:**

































**POLICY APPRAISAL RESULTS:**

With hold the line in epoch 3

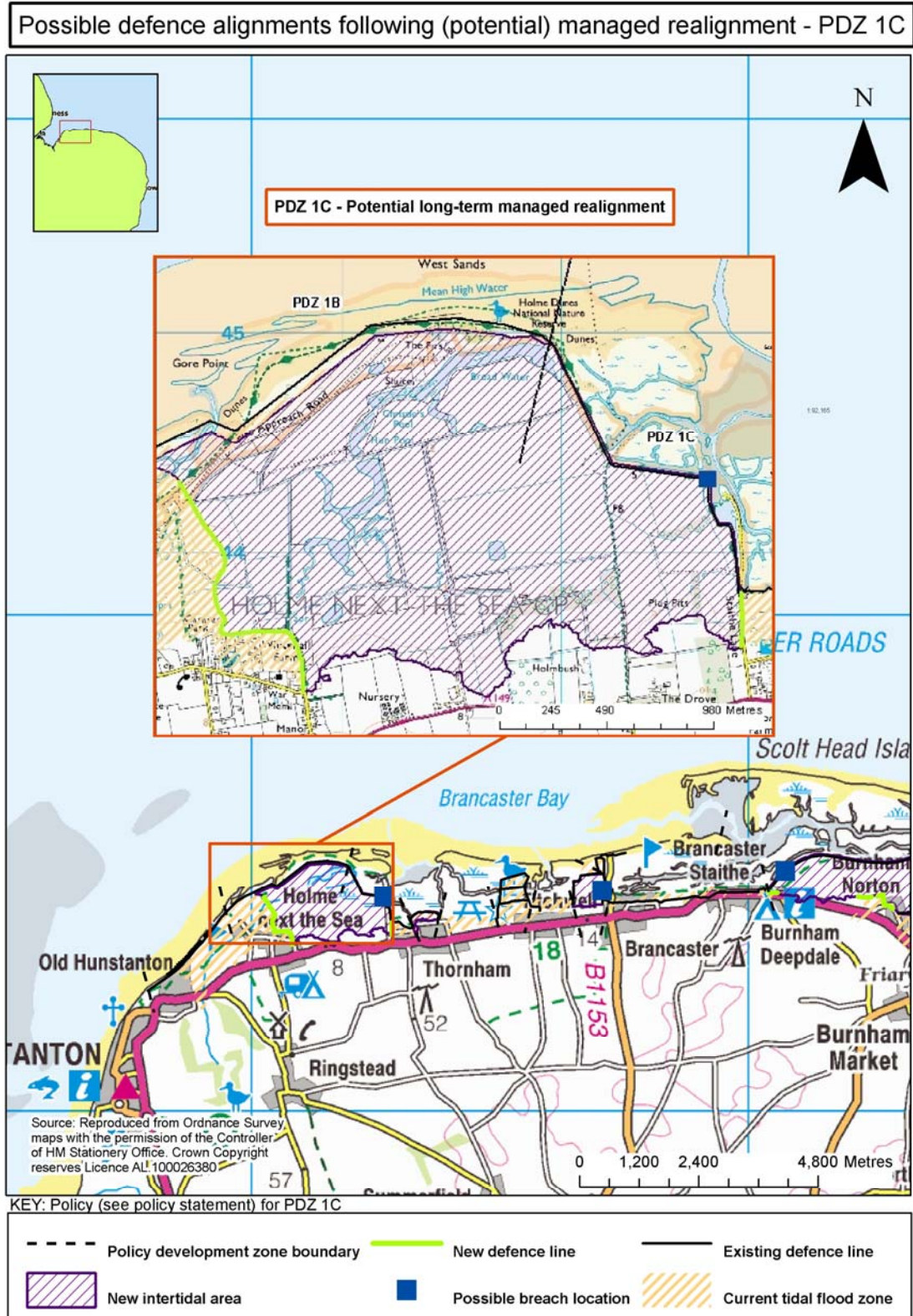
Epoch 1					
Epoch 2					
Epoch 3					

With managed realignment in epoch 3

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

**Figure 4.2: Indicative defence alignments following (potential) managed realignment- PDZ1C**



<b>Location reference:</b>	<b>Thornham</b>
<b>Policy Development Zone:</b>	<b>PDZ 1D</b>

**POLICY STATEMENT:** Stop maintaining the existing bank as a flood defence because it does not protect any properties. This would gradually convert the currently-defended land (which is relatively high) to intertidal habitat. This would have no significant effect on neighbouring frontages.

In time, one property and part of Thornham conservation area may become at risk of flooding due to sea level rise. There may then be a need for adaptation or local defence. The effects of the plan on the footpath that runs along the top of the bank need to be managed.

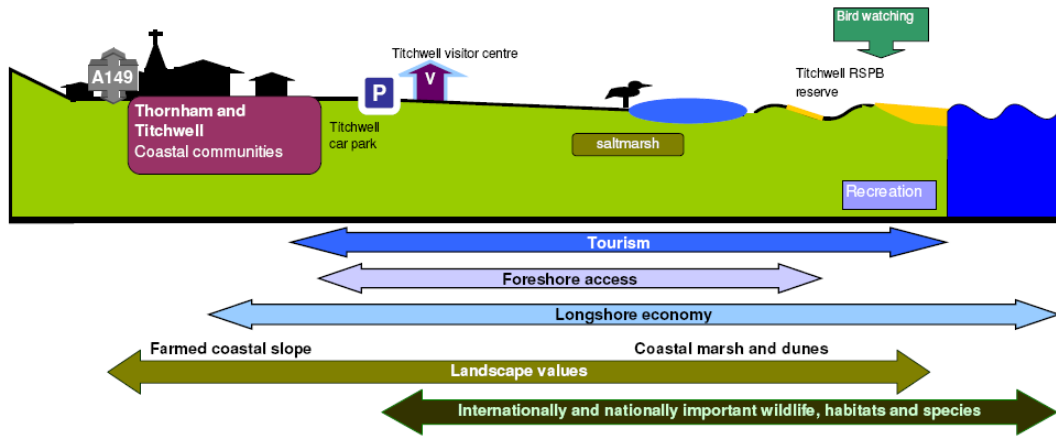
**SUMMARY OF SPECIFIC POLICIES**

<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	No active intervention	No active intervention	No active intervention	Stop maintaining the sea bank. The effects on the footpath need to be managed. In epoch 3, adaptation or local defence may be needed for a small number of properties.
<b>Local management policy</b>	Stop maintaining the sea bank but sustain footpath.	Continue to allow natural development but sustain footpath.	Continue to allow natural development but sustain footpath. Possible need for local adaptation or defence if any properties become at risk.	

**CHANGES FROM PRESENT MANAGEMENT**

SMP1 provided no specific policy for this PDZ, although the overall policy for the wider frontage was hold the line. However, in practice the bank is already being managed with a very low priority, reflecting its limited role. The policy therefore confirms and formalises current practice. The action plan identifies the need for stakeholder involvement and communication in implementing this change.

**KEY FEATURES AND VALUES:**

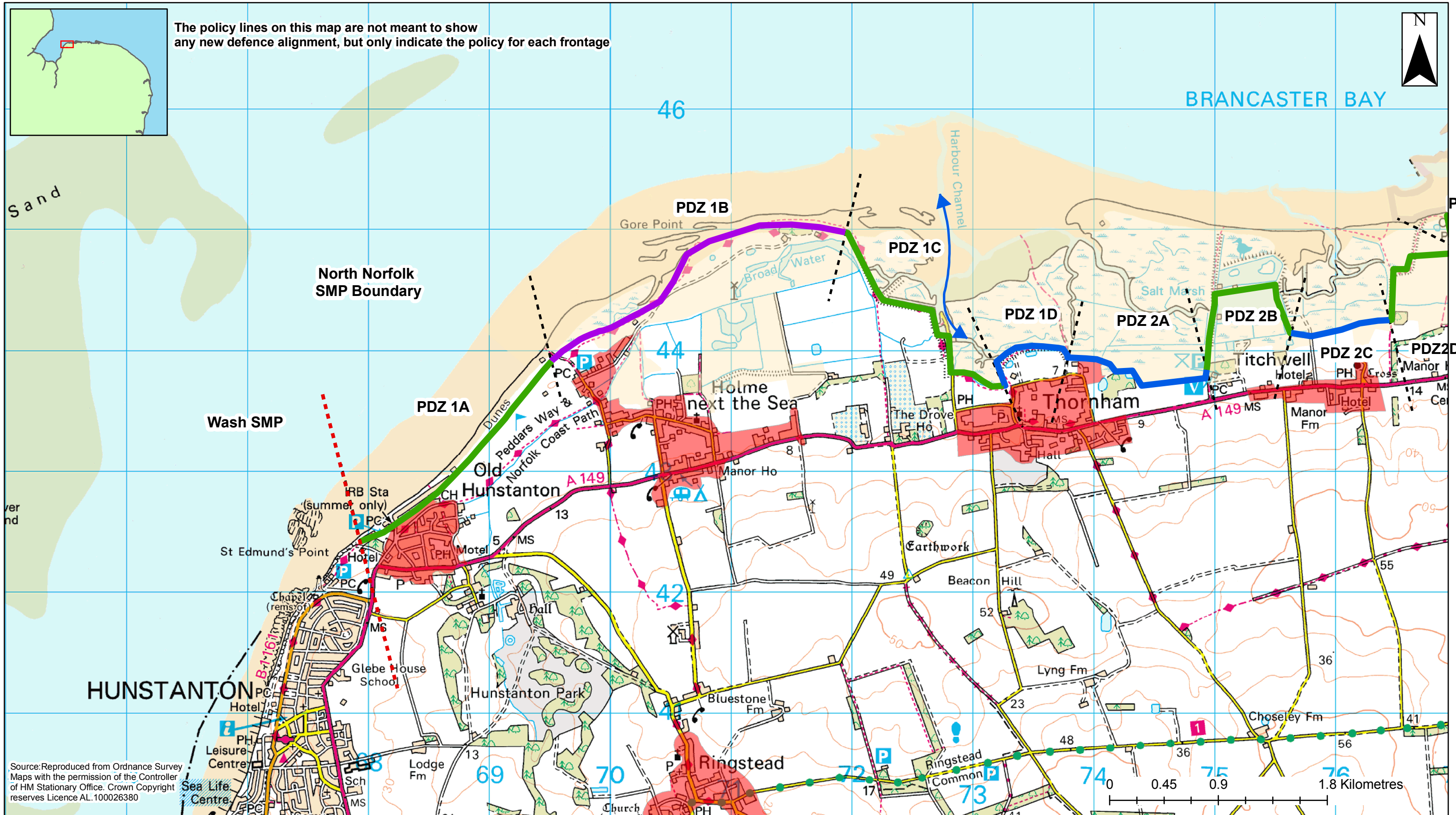


**POLICY APPRAISAL RESULTS:**

Epoch 1					
Epoch 2					
Epoch 3					

See page 75 for a key to the symbols.



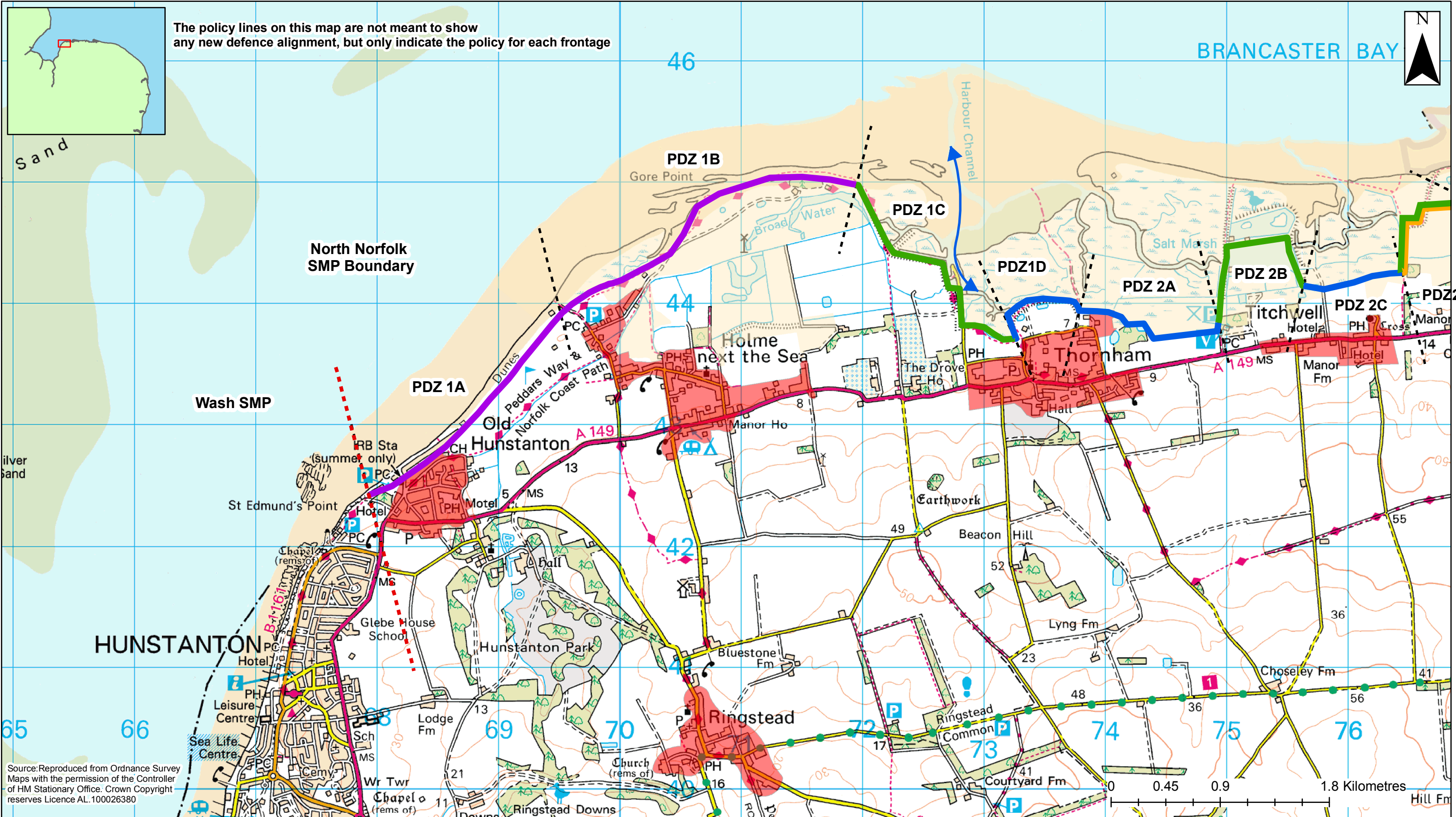


The policy lines on this map are not meant to show any new defence alignment, but only indicate the policy for each frontage

Source: Reproduced from Ordnance Survey Maps with the permission of the Controller of HM Stationary Office. Crown Copyright reserves Licence AL.100026380

**KEY: Policy (full details see relevant policy statement)**

----- Policy Development Zone boundaries	←→ Indicative navigation routes	■ Settlements	■ International designations	■ No active intervention	All other Symbols are based on the background OS maps
— Hold the line			— Limited intervention (Managed realignment type 1/2)	----- SMP area boundary	



**KEY: Policy (full details see relevant policy statement)**

Policy Development Zone boundaries	Indicative navigation routes	Settlements	International designations	No active intervention	All other Symbols are based on the background OS maps
Hold the line	Conditional policy - Hold the line or Landward realignment (Managed realignment type 3)	Limited intervention (Managed realignment type 1/2)	SMP area boundary		

Source: Reproduced from Ordnance Survey Maps with the permission of the Controller of HM Stationary Office. Crown Copyright reserves Licence AL.100026380



### 4.3 Super-frontage 2: Thornham to Stiffkey

The overall plan for this frontage is to investigate the possibility of gradually increasing natural processes while continuing to provide flood defence where this is technically possible and economically viable. Where there is no active management now, the plan is to allow natural development to continue.

In the medium- and long-term, the plan is to investigate ways to sustain or increase the role of natural processes in providing flood defence. The key to this is the role of Scolt Head Island as a control for Brancaster bay to its west and Holkham bay to its east. There is a chance that Scolt Head Island will roll back in the long-term and re-attach to the land. If this is confirmed, moving the defences behind the island further inland could have a role in preventing it, as well as other potential benefits locally and elsewhere. It could also have negative effects on existing land use. The SMP has identified that more knowledge needs to be gained in the short- and medium-term to support a firm medium- and long-term decision in future SMPs. The action plan therefore contains actions to achieve this.

The SMP intends to hold the current defences where they are now at the River Burn outfall, Burnham Overy Staithe, Wells flood (west) embankment, Wells quay and Wells east bank. The intent is also to allow the private defence owners in the area (the RSPB at Titchwell, the Royal West Norfolk golf club at Brancaster and those at Brancaster and Brancaster Staithe) to hold the current defences. For Titchwell this takes account of current work to move one of the defences further inland. Currently-undefended frontages in Brancaster bay and Stiffkey bay will remain undefended. In the medium- and long-term there may be a need to consider moving Wells east bank further inland, which would have a range of negative effects (existing land use, need to adapt drainage) and potential benefits (defence sustainability, habitat creation, navigation). Monitoring and research is needed to support future decisions (see action plan).

Interaction with neighbouring super-frontages is limited. Super-frontage 1 to the west could have some effect on the western-most PDZs in Titchwell bay (see section 4.2). There is no significant interaction with super-frontage 3 to the east.

For super-frontage 2, the total economic benefits of the policy are estimated to be about the same as the costs if all the existing defence lines are held. If the defences are realigned, the benefits are estimated to exceed the costs, but only by a very small margin. As indicated in section 1.1, implementing the policies will depend on funding being available. In this case it is not certain that national sources will cover all the costs. The partners involved in the SMP are eager to explore alternative sources of funding, for example related to the benefits the plan would create for tourism, nature conservation, access, local landowners, navigation and other local interests.

Appendix G contains more detailed background information. Figures 4.9 to 4.14 show the short, medium and long term policies for this super-frontage.

<b>Location reference:</b>	<b>Thornham to Titchwell</b>
<b>Policy development zone:</b>	<b>PDZ 2A</b>

**POLICY STATEMENT:** Continue the current situation where the frontage is allowed to develop naturally. Currently it is not defended and it is unlikely that there will be any reasons for introducing defences in the future. The potential effects of flooding and erosion on 15 locally important historic assets needs to be monitored.

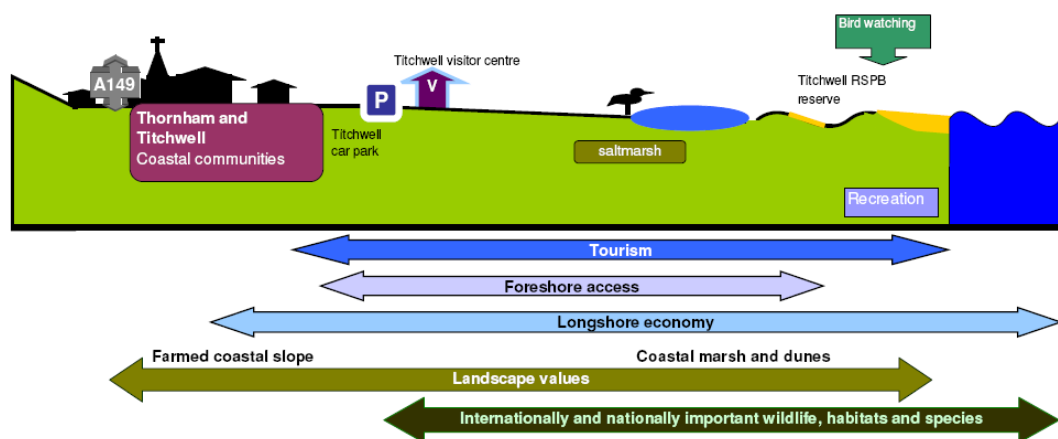
**SUMMARY OF POLICIES**

Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	No active intervention	No active intervention	No active intervention	No change from current policy of allowing the coast to develop naturally.
<b>Local management policy</b>	Continue to allow the frontage to develop naturally.			































**CHANGES FROM PRESENT MANAGEMENT**

No change from existing policy of no active intervention.

**KEY FEATURES AND VALUES:**



**POLICY APPRAISAL RESULTS**

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Titchwell RSPB reserve</b>
<b>Policy development zone:</b>	<b>PDZ 2B</b>

**POLICY STATEMENT:** Allow the scheme of managed realignment currently underway to be completed. Then allow the private defence owner (RSPB) to maintain the new defence line. The defences are privately funded and there are no obvious negative effects from this policy. The RSPB has designed the realignment for a 50-year period, after which they expect that realignment further inland will be needed in response to coastal processes.

The potential effects of flooding and erosion on 10 locally important historic assets needs to be monitored.

If the RSPB chooses to stop maintaining the defences in the future, this would in time have local effects on land use and habitats. The wider effect along the shoreline would be limited because of where the reserve is located in the middle of Brancaster bay.

Implementing this policy depends on further confirmation (beyond the SMP) that it is technically possible and economically viable.

**SUMMARY OF POLICIES**

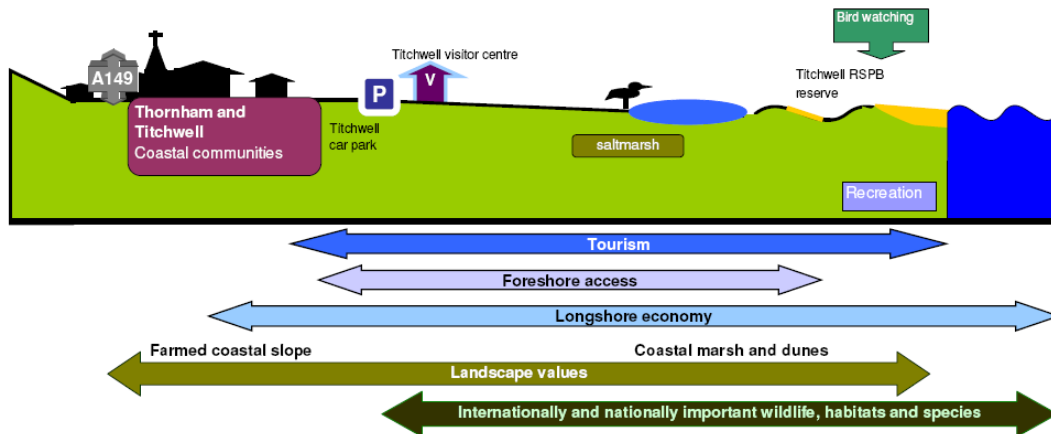
<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Allow the private owner to hold the line after completing the current realignment scheme.
<b>Local management policy</b>	Allow private owner to maintain the defences at their new position.			

**CHANGES FROM PRESENT MANAGEMENT**

The policy is consistent with the SMP1 policy. This was to hold the line in the short term, followed by realignment when maintenance becomes unsustainable.



## KEY FEATURES AND VALUES:



## POLICY APPRAISAL RESULTS

Epoch 1					
Epoch 2					
Epoch 3					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Titchwell village</b>
<b>Policy development zone:</b>	PDZ 2C

**POLICY STATEMENT:** Maintain the current situation where the frontage is allowed to develop naturally. Currently it is not defended and it is unlikely that there will be any reasons for introducing defences in the future.

The potential effects of flooding and erosion on 11 locally important and one regionally important (Roman) historic asset need to be monitored.

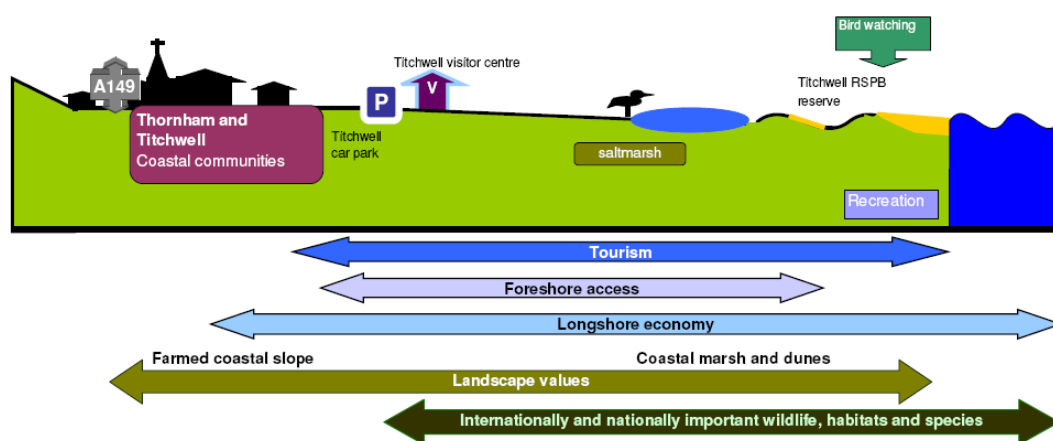
**SUMMARY OF POLICIES**

Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	No active intervention	No active intervention	No active intervention	No change from current policy of allowing the coast to develop naturally.
<b>Local management policy</b>	Continue to allow the frontage to develop naturally.			































**CHANGES FROM PRESENT MANAGEMENT**

No change from existing policy of no active intervention.

**KEY FEATURES AND VALUES:**



## POLICY APPRAISAL RESULTS

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Reclaimed grazing marsh at Brancaster</b>
<b>Policy development zone:</b>	PDZ 2D

**POLICY STATEMENT:** Support sustainable habitats in the currently-defended area. In the short term this means holding the defences where they are now which protects important freshwater habitats. In the medium and long term, the plan is to investigate the option to carry out managed realignment and make all or part of the area intertidal.

The SMP has identified that a breach of the defence on the eastern side of the grazing marsh could have other benefits as well as creating intertidal habitats:

- It would increase the tidal prism behind Scolt Head Island and through Mow Creek. This could enhance the outer estuary at the western end of Scolt Head, reduce the likelihood that the barrier island will re-attach to the land and so reduce pressure on the shoreline in Brancaster bay.
- The realignment would reduce reliance on human intervention, particularly if climate change increases the pressure on the sea bank. Based on the current condition and height of the sea bank, major improvement works would be needed around 2075 (see section 2.1.5). This may not be economically viable or technically possible if sea level rise predictions happen in the future. There may therefore have to be a change in flood risk management policy.
- The increase in tidal exchange as a result of moving the defences further inland is likely to scour out Mow Creek's channel and deposit most of the silt in the currently-defended area. This would create social and economic benefits for fisheries and tourism.

On the other hand, moving the defences further inland would have negative effects on the designated freshwater habitats, current agricultural land use and 10 locally important historic assets. Access to the beach and the golf course will have to be maintained, the footpaths on top of the existing sea banks will need to be moved and any effect on the setting of Brancaster conservation area will need to be avoided by sensitive design. Finally, the increased channel flows may have local negative effects on structures and some of the potential benefits are uncertain.

The SMP has therefore identified that more knowledge is needed to support a firm medium- and long-term decision in future SMPs. The action plan therefore contains a programme of actions (monitoring, consultation and assessments) to investigate the potential positive and negative effects described above. Based on this, the next SMP will review the medium- and long-term policies for this PDZ.

Figure 4.6 shows where the new defences could be built following the potential managed realignment either in epoch 2 or epoch 3. Implementing

any of the policies below depends on further confirmation (beyond the SMP) that they are technically possible and economically viable.

#### SUMMARY OF POLICIES

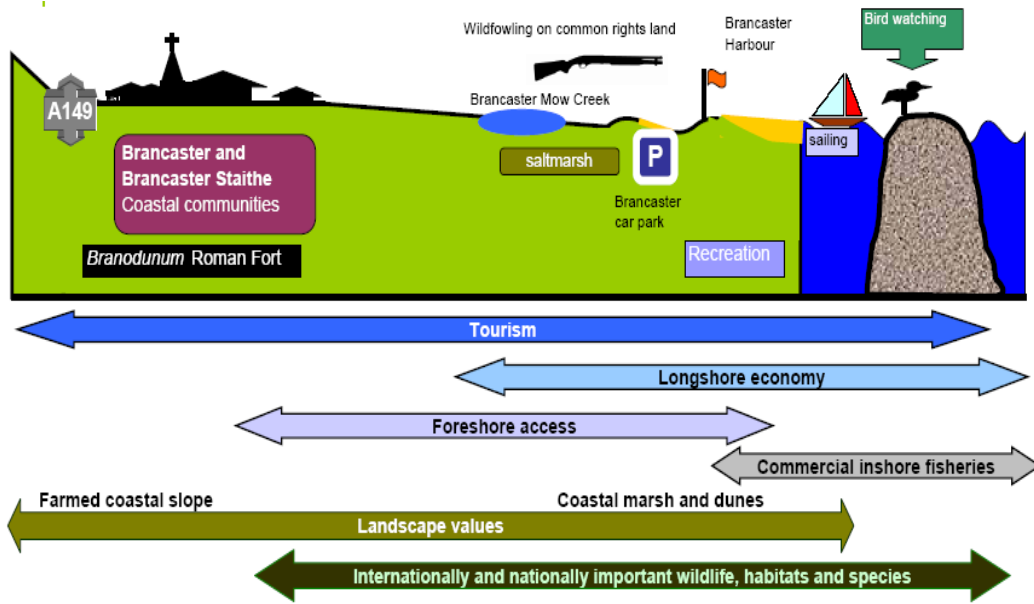
Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	Hold the line	Hold the line or managed realignment (MR3)	Hold the line or managed realignment (MR3)	The policy for epoch 2 is conditional. It depends on the results of monitoring and research during epoch 1 to investigate the effects of realigning the defences. The policy in epoch 3 depends on the confirmed policy for epoch 2.
<b>Local management policy</b>	Maintain defences where they are now, allowing time for monitoring and assessments to investigate realignment in the future.	If confirmed, partly remove existing defences. Maintain access to the beach and golf club. If not confirmed, maintain the defences where they are now.	Depends on what happens in epoch 2. Either continue to maintain defences where they are now, move them further inland or allow the frontage to develop naturally. Maintain access to the beach and golf club.	

Key: MR – Managed realignment:  
 MR1 – Maintain natural defence with minimum intervention  
 MR2 – Breach of frontline defence after building defence further inland  
 MR3 – Breach of frontline defence, no building of inland defence

#### CHANGES FROM PRESENT MANAGEMENT

In epoch 1 there is no substantial change from the existing policy of hold the line. However, from epoch 2 onwards, the whole frontage may be realigned. The SMP1 policy was realignment in the longer term so the SMP2 policy is compatible with this. The action plan identifies the need for stakeholder involvement and communication in implementing this potential change.

**KEY FEATURES AND VALUES:**

































**POLICY APPRAISAL RESULTS:**

With hold the line in epochs 2 and 3

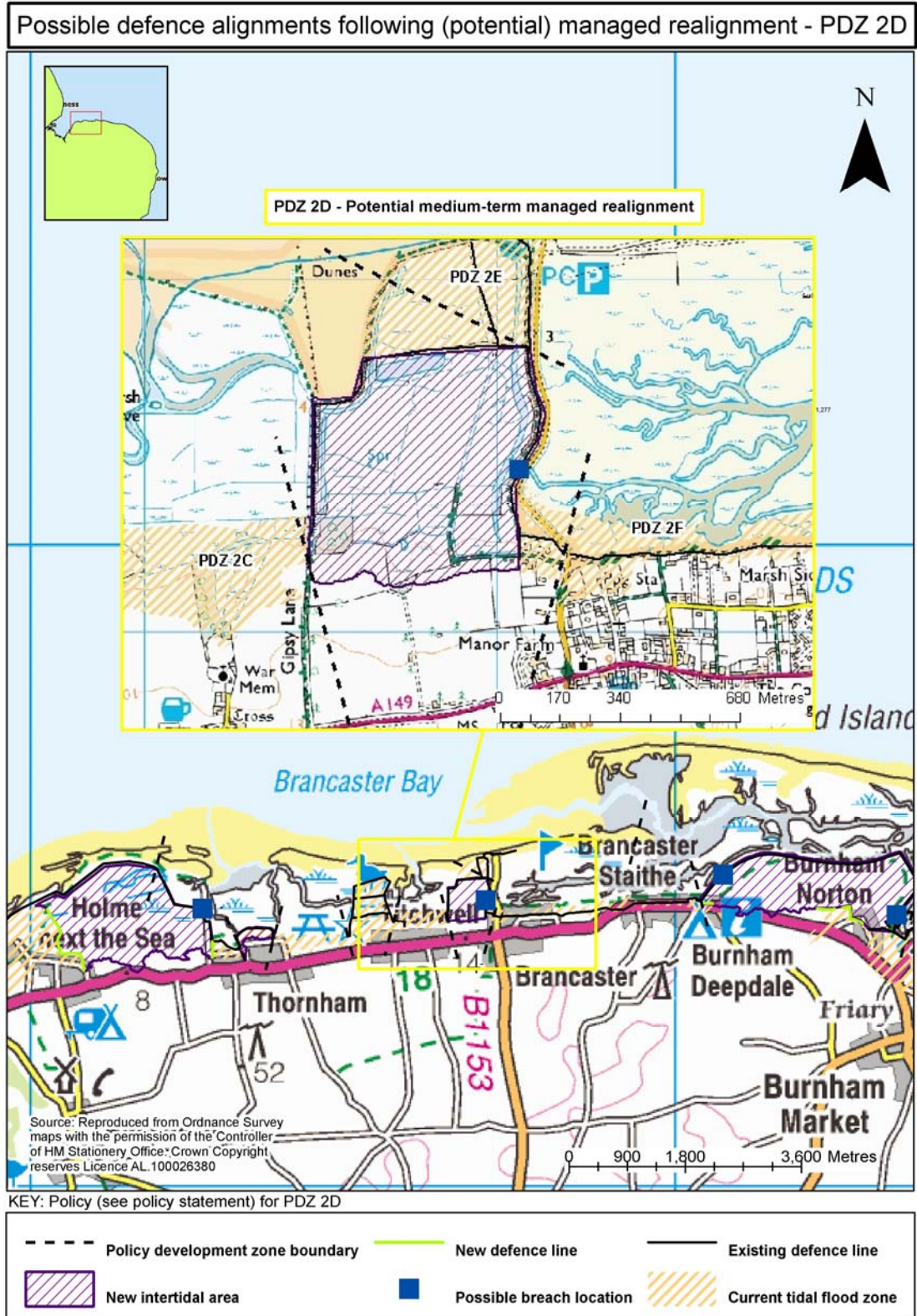
Epoch 1					
Epoch 2					
Epoch 3					

With managed realignment in epoch 2

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

**Figure 4.6: Indicative defence alignments following (potential) managed realignment – PDZ2D**





<b>Location reference:</b>	<b>Royal West Norfolk golf club</b>
<b>Policy development zone:</b>	<b>PDZ 2E</b>

**POLICY STATEMENT:** Allow the private owner to hold the existing line of defences of the clubhouse and golf course. The defences are privately funded and the defence owner intends to continue holding the line. The negative effects from this policy (continued reliance on man-made defences and reduced dynamism of coastal processes which could affect habitats) are limited and local.

Over the longer term, it is possible that the defences will become less sheltered by Scolt Head Island. They may then start having a positive effect along the shoreline by reducing pressure on areas to the west.

If the golf club chooses to stop maintaining the defences in the future, this would in time have local effects on land use and habitats. It could also cause significant large-scale changes in Brancaster bay and behind Scolt Head Island.

Implementing this policy depends on further confirmation (beyond the SMP) that it is technically possible and economically viable.

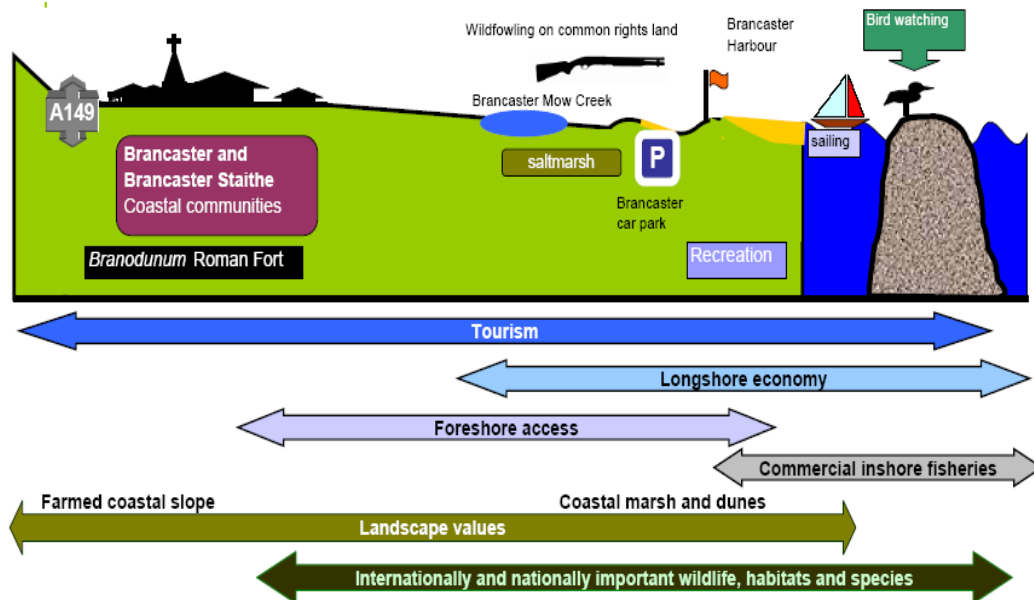
**SUMMARY OF POLICIES**

<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Allow the private owner to maintain the defences where they are now. The dunes will remain undefended.
<b>Local management policy</b>	Allow private owner to maintain the defences where they are now. The currently undefended dunes remain undefended.			

**CHANGES FROM PRESENT MANAGEMENT**

No change from the existing policy of hold the line for currently-defended sections and no active intervention for currently undefended sections.

## KEY FEATURES AND VALUES:



## POLICY APPRAISAL RESULTS:

Epoch 1					
Epoch 2					
Epoch 3					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Brancaster and Brancaster Staithe</b>
<b>Policy development zone:</b>	PDZ 2F

**POLICY STATEMENT:** Allow the current private owners to hold the existing line of defences where they are now. This will not reduce reliance on man-made defences, but it will sustain the communities of Brancaster and Brancaster Staithe, including around 65 properties, a range of historic assets, the harbour and Brancaster Staithe sailing club. Any effect on the setting of Brancaster conservation area will need to be avoided by sensitive design.

There are a number of private defence owners along this frontage who are responsible for maintaining their part of the defences. The action plan contains an action to find out their intentions for doing this into the future. If there is a possibility that some or all of these private owners are unwilling or unable to continue to maintain these defences to an appropriate standard, it is possible that the Environment Agency or a third party may consider intervening to make sure that these communities continue to be protected.

Implementing this policy depends on further confirmation (beyond the SMP) that it is technically possible and economically viable.

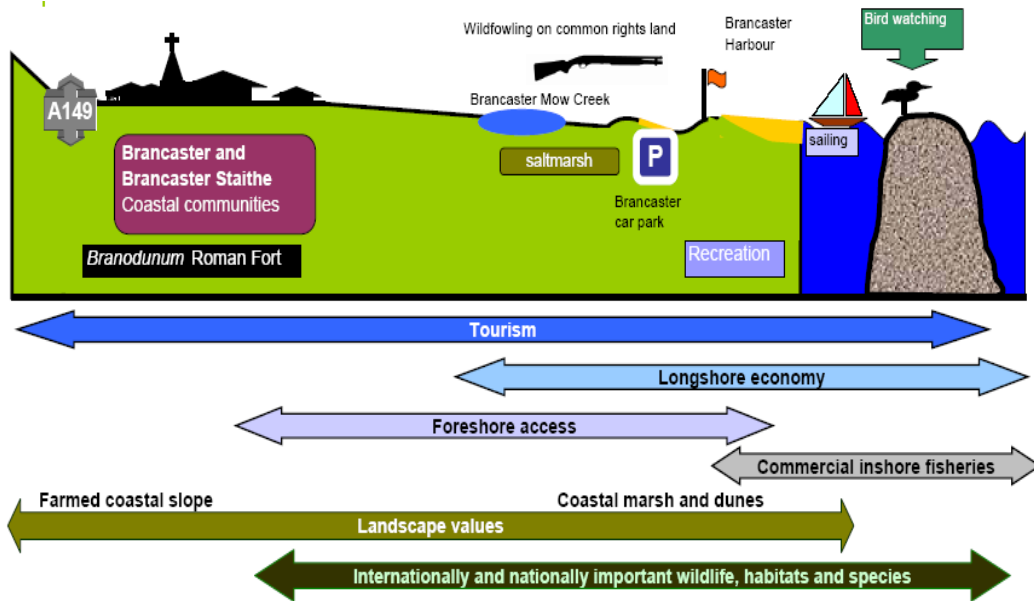
**SUMMARY OF POLICIES**

<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Allow private owners to maintain the defences where they are now to sustain the communities of Brancaster and Brancaster Staithe.
<b>Local management policy</b>	Allow private owners to maintain the defences where they are now.			

**CHANGES FROM PRESENT MANAGEMENT**

No change from existing policy of hold the line.

**KEY FEATURES AND VALUES:**



**POLICY APPRAISAL RESULTS:**

Epoch 1					
Epoch 2					
Epoch 3					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Reclaimed areas behind Scolt Head Island</b>
<b>Policy development zone:</b>	PDZ 2G

**POLICY STATEMENT:** Maintain flood defence to all communities and their houses, historic assets and infrastructure. Also potentially to increase tidal exchange by moving the defences at the reclaimed Deepdale, Norton and Overy marshes further inland in the long term, if supported by monitoring and research during epochs 1 and 2 .

In principle the current defence line will be held. This will sustain current agricultural land use, the partly-designated freshwater habitats, the footpath that runs on top of the sea bank and a range of designated and non-designated historic assets. However, the SMP has identified that managed realignment could have a range of benefits:

- By enhancing the outer estuaries, the increase in tidal prism is likely to strengthen the role of Scolt Head Island as a control point for Brancaster bay and Holkham bay and support the role of the dunes and saltmarshes as a habitat and as a natural flood defence.
- The realignments would move the defences to more sustainable sheltered positions. This would reduce the risk of flooding to the Burnhams (where around 65 properties are currently in the tidal flood zone) and to Holkham and west Wells (where around 85 properties are currently in the tidal flood zone). This would reduce reliance on human intervention. This could become particularly relevant as climate change starts to increase the pressure on the sea banks. Based on the current condition and height of the sea banks, major improvement works would be needed around 2075 (see section 2.1.5). This may not be economically viable or technically possible if sea level rise predictions happen in the future. There may therefore have to be a change in flood risk management policy.
- The realignments would create intertidal habitat and are likely to benefit the ecological integrity of the area by sustaining the channels and supporting the dunes in the neighbouring bays.
- The increase in tidal exchange is likely to scour out the channels behind Scolt Head Island and deposit most of the silt in the currently-defended areas. This would support navigation in the tidal channels and the outer estuaries. Navigation is an important activity in the area, so this would create social and economic benefits.

On the other hand, moving the defences further inland would have negative effects on agricultural land use, freshwater habitats and the footpath and the increased channel flows may have local negative effects on structures. A number of archaeological sites may become at risk of erosion and the setting of Burnham Norton, Holkham and Wells-next-the-Sea conservation areas could be affected by a realignment, requiring sensitive design. In addition, some of the potential benefits are uncertain.

The SMP has therefore identified that more knowledge is needed to assess the effects of these potential realignments and support a firm long-term decision in future SMPs. The SMP's action plan contains a programme of actions (monitoring, consultation and assessments) to investigate the potential positive and negative effects described above. Based on this, the next SMP will review the medium- and long-term policies for this PDZ.

The intent is to maintain the tidal flood defence function of the River Burn outfall.

Figures 4.7 and 4.8 show where the new defences could be built following the potential managed realignments in epoch 3 at Deepdale and Norton marshes and at Overy marsh. Implementing any of the policies below depends on further confirmation (beyond the SMP) that they are technically possible and economically viable.

#### SUMMARY OF POLICIES

##### PDZ2G.1 – Deepdale and Norton marshes

Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line or managed realignment (MR2)	The policy for epoch 3 is conditional. It depends on the results of monitoring and research during epochs 1 and 2 into the effects of realignment. In both scenarios defences will continue to sustain the communities of Burnham Deepdale and Burnham Norton.
<b>Local management policy</b>	Maintain defences where they are now. Carry out monitoring and assessments to investigate potential realignment in the future.		Maintain defences where they are now unless increased knowledge leads to preference to move them further inland.	

Key: MR – Managed realignment:  
 MR1 – Maintain natural defence with minimum intervention  
 MR2 – Breach of frontline defence after building defence further inland  
 MR3 – Breach of frontline defence, no building of inland defence

PDZ2G.2 – River Burn outfall

Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Maintain the defences where they are now to sustain the communities in the River Burn valley.
<b>Local management policy</b>	Maintain the defences where they are now.			

PDZ2G.3 – Overy marshes

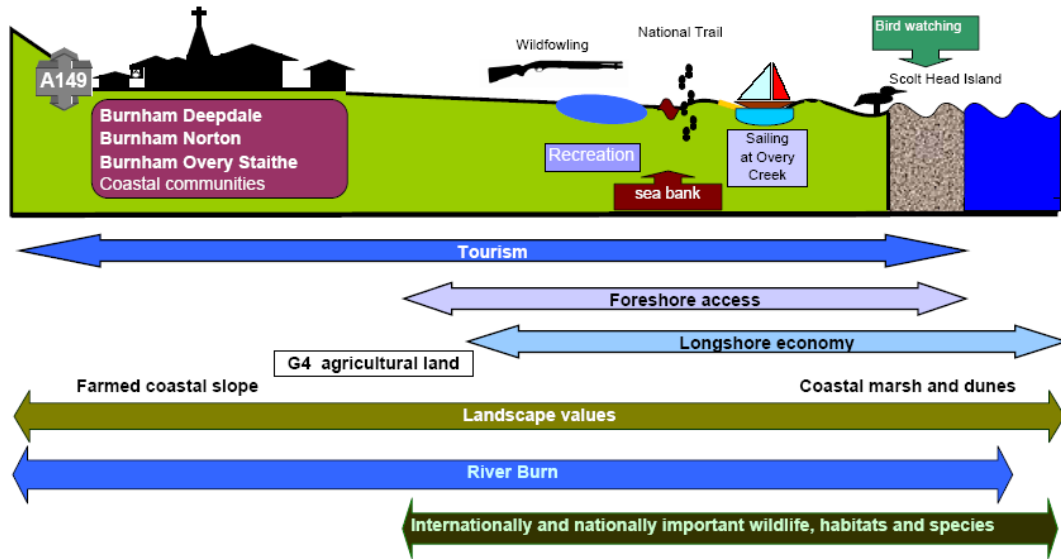
Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line or managed realignment (MR2)	The policy for epoch 3 is conditional. It depends on the results of monitoring and research during epochs 1 and 2 into the effects of realignment. In both scenarios defences will continue to sustain the communities of Burnham Overy Staithe, Holkham and Wells-next-the-Sea.
<b>Local management policy</b>	Maintain defences where they are now. Carry out monitoring and assessments to investigate potential realignment in the future.		Maintain defences where they are now unless increased knowledge leads to preference to move them further inland.	

Key: MR – Managed realignment:  
 MR1 – Maintain natural defence with minimum intervention  
 MR2 – Breach of frontline defence after building defence further inland  
 MR3 – Breach of frontline defence, no building of inland defence

**CHANGES FROM PRESENT MANAGEMENT**

In epochs 1 and 2 there is no substantial change from the existing hold the line policy. However, in epoch 3 there may be a significant change to present management if the frontage were substantially realigned. For Deepdale and Norton marshes, the policy is compatible with SMP1's long-term policy of managed realignment. For Overy marshes, the policy is a significant change from SMP1's policy of hold the line for all epochs. For the River Burn outfall there is no change. The action plan identifies the need for stakeholder involvement and communication in implementing any significant policy changes.

**KEY FEATURES AND VALUES:**

































**POLICY APPRAISAL RESULTS:**

With hold the line in epoch 3

Epoch 1					
Epoch 2					
Epoch 3					

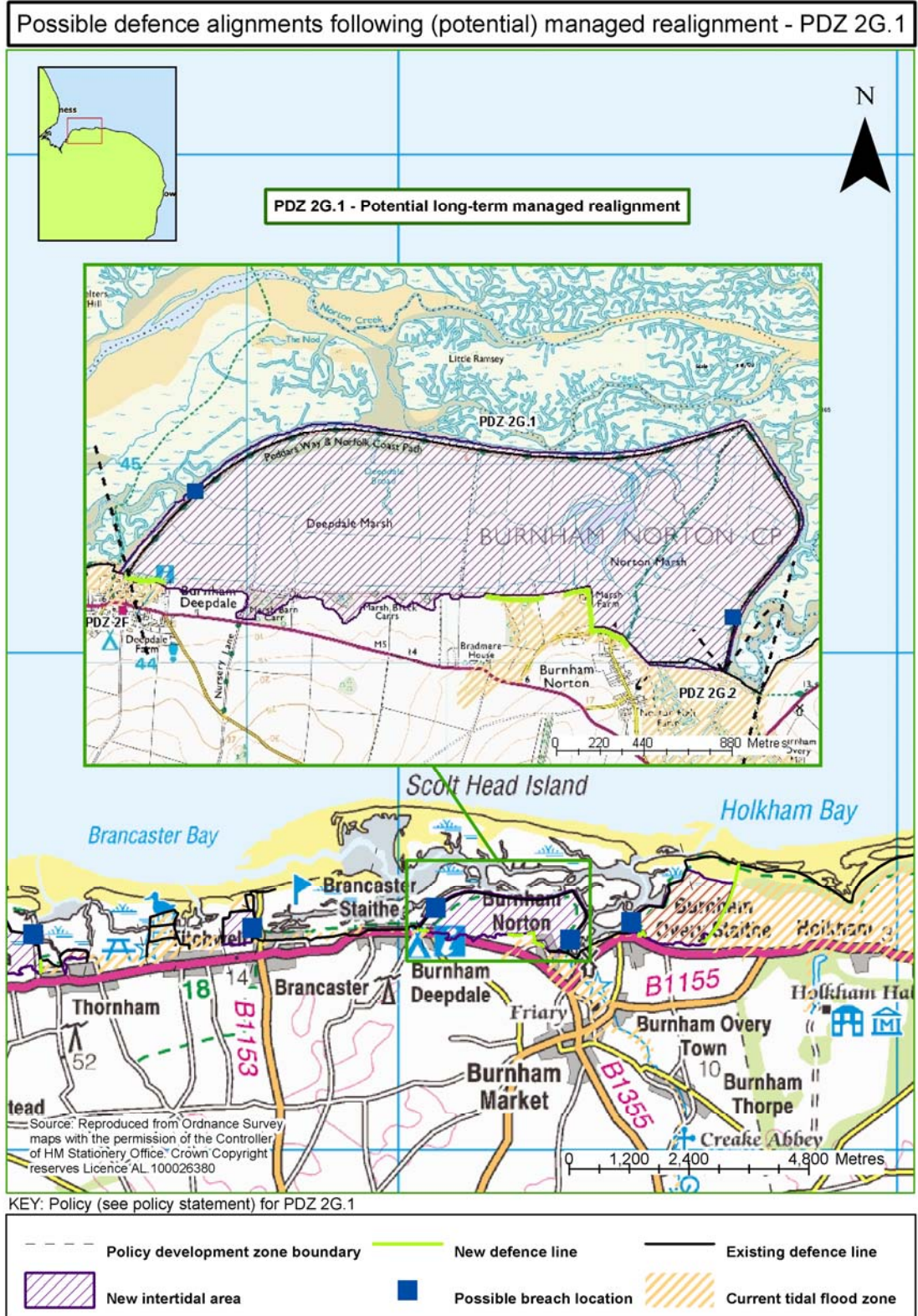


With managed realignments in epoch 3

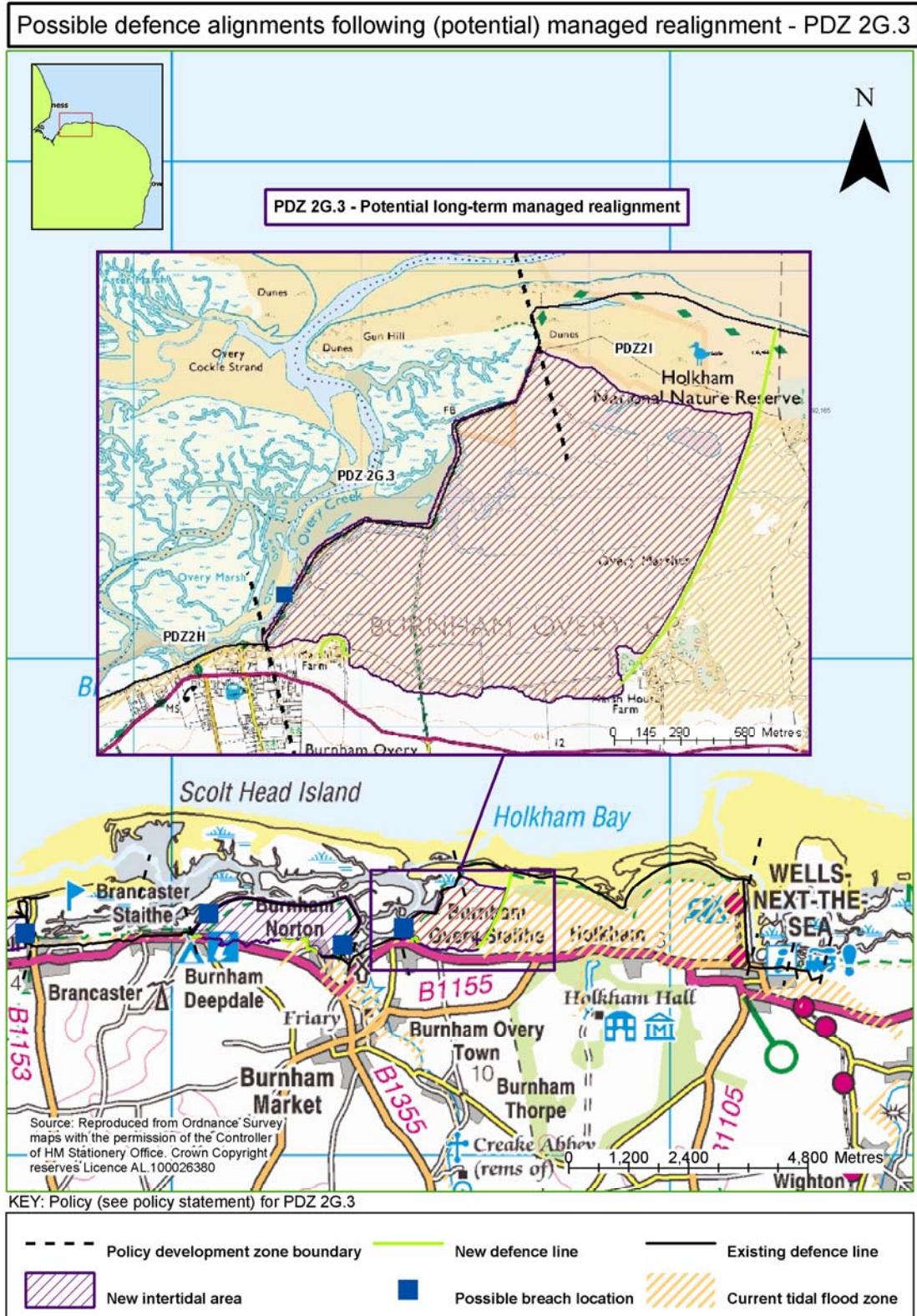
Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

**Figure 4.7: Indicative defence alignments following (potential) managed realignment – PDZ2G.1**



**Figure 4.8: Indicative defence alignments following (potential) managed realignment – PDZ2G.3**



<b>Location reference:</b>	<b>Burnham Overy Staithe</b>
<b>Policy development zone:</b>	PDZ 2H

**POLICY STATEMENT:** Maintain the defences where they are now. This will not reduce reliance on man-made defences, but it will sustain the community of Burnham Overy Staithe, including around 20 properties and historic assets. Any effect on the setting of Burnham Overy Staithe conservation area and its listed buildings will need to be avoided by sensitive design.

Implementing this policy depends on further confirmation (beyond the SMP) that it is technically possible and economically viable.

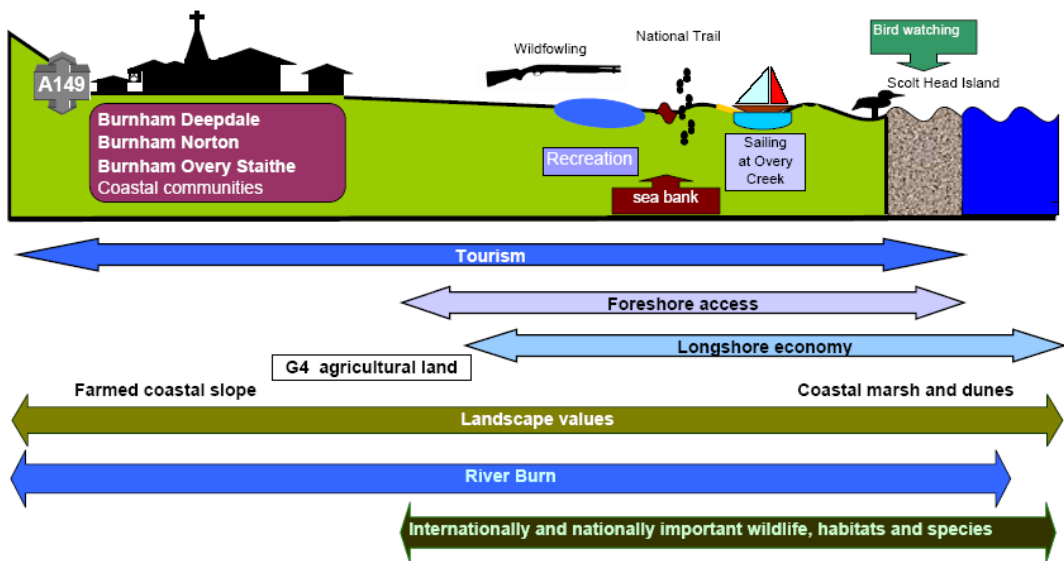
**SUMMARY OF POLICIES**

Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Maintain the defences where they are now to sustain the community of Burnham Overy Staithe.
<b>Local management policy</b>	Maintain the defences where they are now.			































**CHANGES FROM PRESENT MANAGEMENT**

No change from existing policy of hold the line.

**KEY FEATURES AND VALUES:**



**POLICY APPRAISAL RESULTS:**

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Holkham dunes</b>
<b>Policy development zone:</b>	PDZ 2I

**POLICY STATEMENT:** Maintain the flood defence function of the dunes that currently protect around 85 properties and historic assets in Holkham and Wells-next-the-Sea, the A149 and other features in the tidal flood zone. The intent is to do this through minimum intervention in the natural development of the dunes. This continues the current approach which is being progressed under a hold the line policy. If monitoring shows that intervention is needed, the type of intervention would be chosen based on full consideration of all effects, including on habitats.

The long-term intent possibly to realign part of Overy marshes (see PDZ 2G) is likely to have a positive effect on Holkham dunes (strengthening their width and so their flood defence function). This realignment would also reduce the area that depends on Holkham dunes for its flood protection.

Implementing this policy depends on further confirmation (beyond the SMP) that it is technically possible and economically viable.

#### SUMMARY OF POLICIES

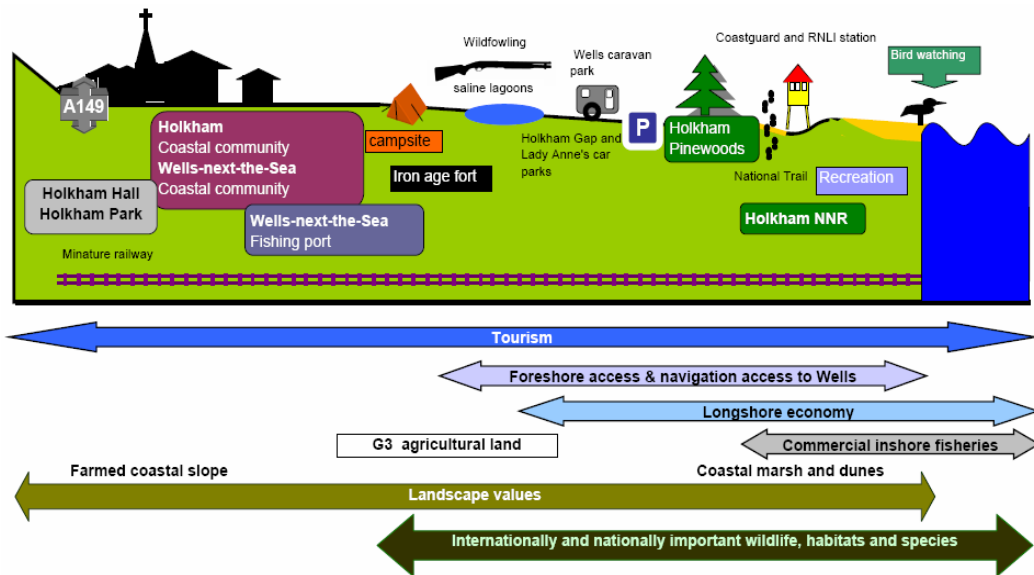
<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	Managed realignment (MR1)	Managed realignment (MR1)	Managed realignment (MR1)	The flood defence function will be maintained through minimum intervention allowing the dune system to evolve as naturally as possible.
<b>Local management policy</b>	Allow the dunes to develop naturally. If their flood defence function reduces, work will be undertaken to maintain it (including maintaining the existing groynes and revetment).			Intervention may be needed to maintain flood defence to properties in Holkham and Wells-next-the-Sea. The existing groyne field and revetment protecting significant social and economic assets will be maintained.

Key: MR – Managed realignment:  
 MR1 – Maintain natural defence with minimum intervention  
 MR2 – Breach of frontline defence after building defence further inland  
 MR3 – Breach of frontline defence, no building of inland defence

#### CHANGES FROM PRESENT MANAGEMENT

No substantial change from existing policy of hold the line. Like SMP1, the intent of SMP2 is to sustain the flood defence function of Holkham dunes, but SMP1 did not include statements about the role of natural dune development and intervention. The policies are therefore compatible with the SMP1 policy of hold the line.

## KEY FEATURES AND VALUES:



## POLICY APPRAISAL RESULTS

Epoch 1					
Epoch 2					
Epoch 3					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Wells flood embankment</b>
<b>Policy development zone:</b>	PDZ 2J

**POLICY STATEMENT:** Maintain the defences where they are now. This will not reduce reliance on man-made defences, but it will sustain current land use (tourism, beach access, agriculture, historic assets and freshwater habitats) and around 85 properties and historic assets in Holkham and Wells-next-the-Sea that are currently protected by the embankment. The intent is also to maintain the gabions to sustain the use of the RNLI lifeboat station.

Implementing this policy depends on further confirmation (beyond the SMP) that it is technically possible and economically viable.

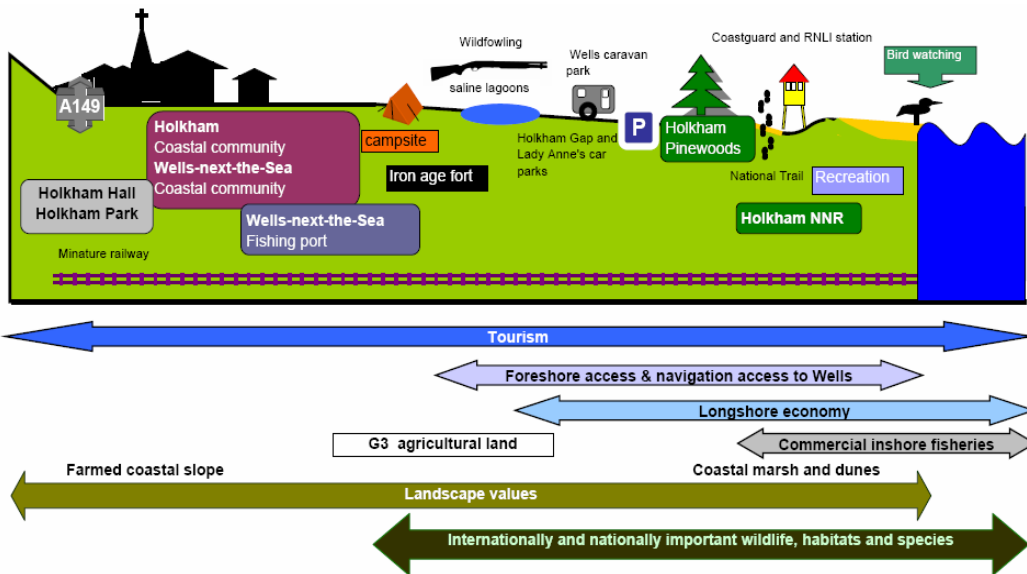
**SUMMARY OF POLICIES**

Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Maintain all the defences where they are now to sustain current land use (tourism, beach access, agriculture, freshwater habitats and lifeboat station).
<b>Local management policy</b>	Maintain the defences where they are now.			

**CHANGES FROM PRESENT MANAGEMENT**































No change from existing policy of hold the line.

**KEY FEATURES AND VALUES:**





**POLICY APPRAISAL RESULTS:**

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

**Location reference:** Wells quay  
**Policy development zone:** PDZ 2K

**POLICY STATEMENT:** Continue to maintain the defences where they are now. This will not reduce reliance on man-made defences, but it will protect current use of the quayside and associated features in Wells-next-the-Sea including around 60 properties and historic assets. Any effect on the setting of Wells conservation area will need to be avoided by sensitive design.

Implementing this policy depends on further confirmation (beyond the SMP) that it is technically possible and economically viable.

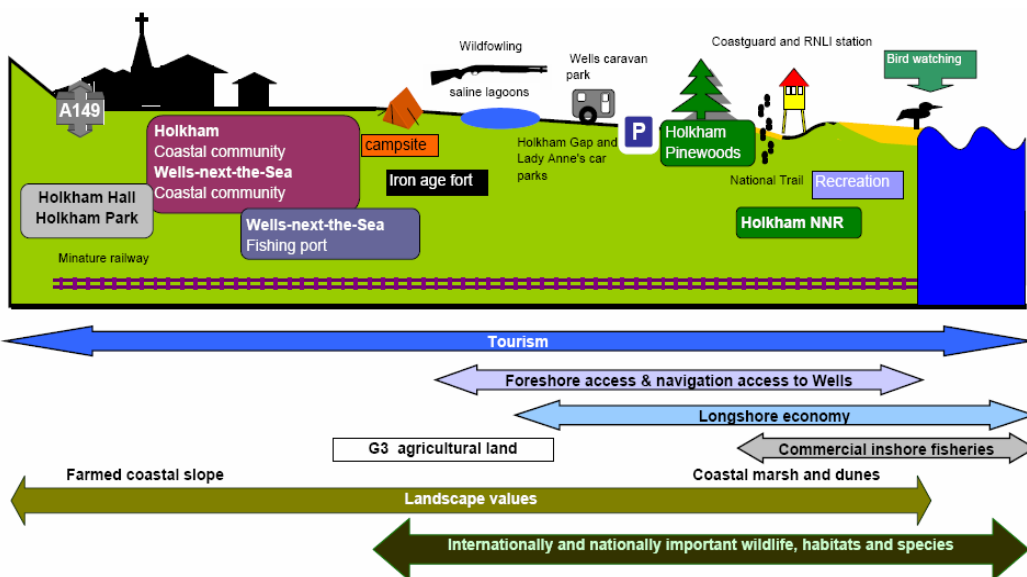
**SUMMARY OF POLICIES**

Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Maintain the defences where they are now to protect current use of the quayside and associated features in Wells-next-the-Sea.
<b>Local management policy</b>	Maintain the defences where they are now.			































**CHANGES FROM PRESENT MANAGEMENT**

No change from existing policy of hold the line.

**KEY FEATURES AND VALUES:**



**POLICY APPRAISAL RESULTS:**

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Wells east bank</b>
<b>Policy development zone:</b>	PDZ 2L

**POLICY STATEMENT:** Maintain flood defence to the community of Wells-next-the-Sea including around 150 properties, its historic assets and infrastructure. In principle this will be done by maintaining the defence where it is now. This will not reduce reliance on man-made defences, but it will sustain current agricultural land use, the surface water drainage function of Warham marshes and the footpath that runs on top of the sea bank. The defences are on private land but are maintained by the Environment Agency.

The SMP has identified that moving the defences further inland and the associated increase in tidal prism could have a range of benefits. It could reduce pressure on the neighbouring bays, provide more sustainable local flood defence, create intertidal habitats and could support navigation in Wells harbour channel. Based on the current condition and height of the sea bank, major improvements would be needed around 2075 (see section 2.1.5). This may not be economically viable or technically possible if sea level rise predictions happen in the future. There may therefore have to be a change in flood risk management. However, some of the potential benefits are uncertain and they are outweighed by the direct negative effects (such as loss of agricultural land, need to adapt drainage and impact on the footpath). This has led to a policy of hold the line for all epochs.

The SMP's action plan contains a specific programme of actions (monitoring, consultation and assessments) to investigate the potential benefits and negative effects of moving the defences further inland. This would include a review of historic attempts to increase the tidal prism in Wells harbour and research into the role of Warham marshes in the surface water drainage of Wells-next-the-Sea. Based on this, the next SMP will review the medium- and long-term policies for this PDZ.

Implementing this policy depends on further confirmation (beyond the SMP) that it is technically possible and economically viable.

### SUMMARY OF POLICIES

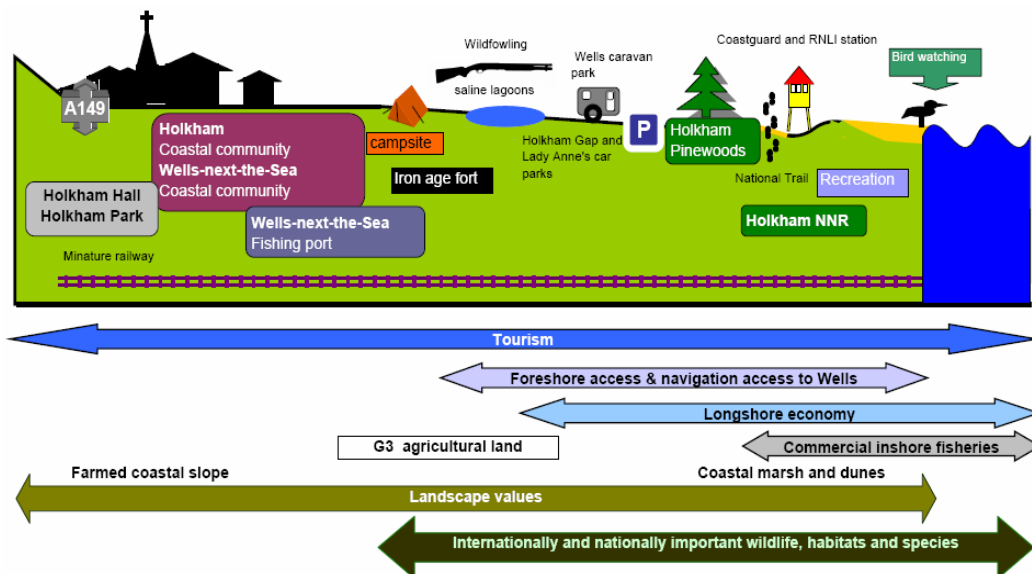
Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Maintain the defences where they are now to sustain the community of Wells-next-the-Sea and current land use in Warham marshes.
<b>Local management policy</b>	Maintain the defences where they are now.			

Key: MR – Managed realignment:  
 MR1 – Maintain natural defence with minimum intervention  
 MR2 – Breach of frontline defence after building defence further inland  
 MR3 – Breach of frontline defence, no building of inland defence































### CHANGES FROM PRESENT MANAGEMENT

No change from existing policy of hold the line.

### KEY FEATURES AND VALUES:



**POLICY APPRAISAL RESULTS:**

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Stiffkey bay</b>
<b>Policy development zone:</b>	PDZ 2M

**POLICY STATEMENT:** Continue the current situation where the frontage is allowed to develop naturally. Currently it is not defended and it is unlikely that there will be any reasons for introducing defences in the future. The potential effects of flooding and erosion on one regionally important (World War two camp) and 27 locally important historic assets needs to be monitored.

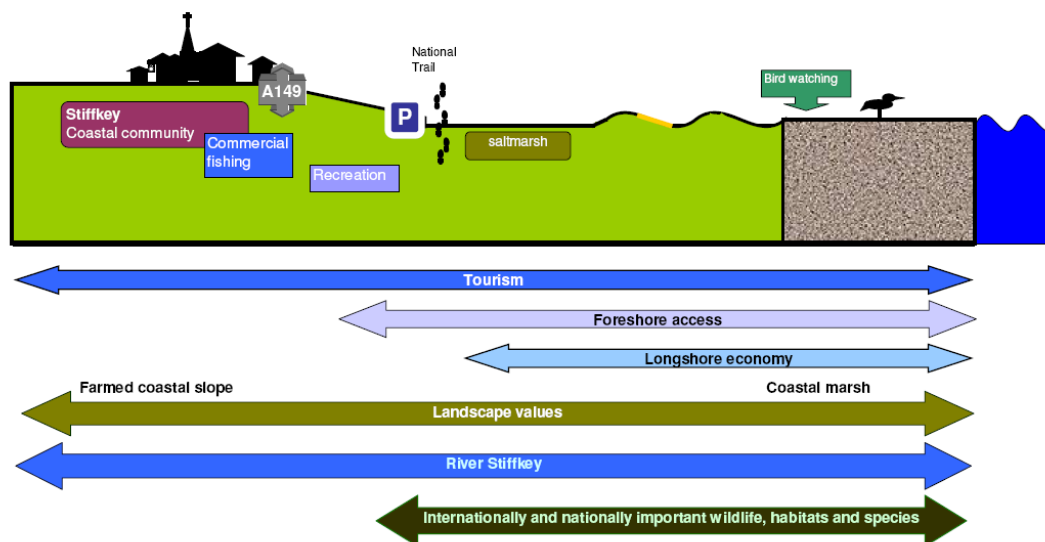
**SUMMARY OF POLICIES**

Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	No active intervention	No active intervention	No active intervention	No change from current policy of allowing the coast to develop naturally.
<b>Local management policy</b>	Continue to allow the frontage to develop naturally.			































**CHANGES FROM PRESENT MANAGEMENT**

No change from existing policy of no active intervention.

**KEY FEATURES AND VALUES:**

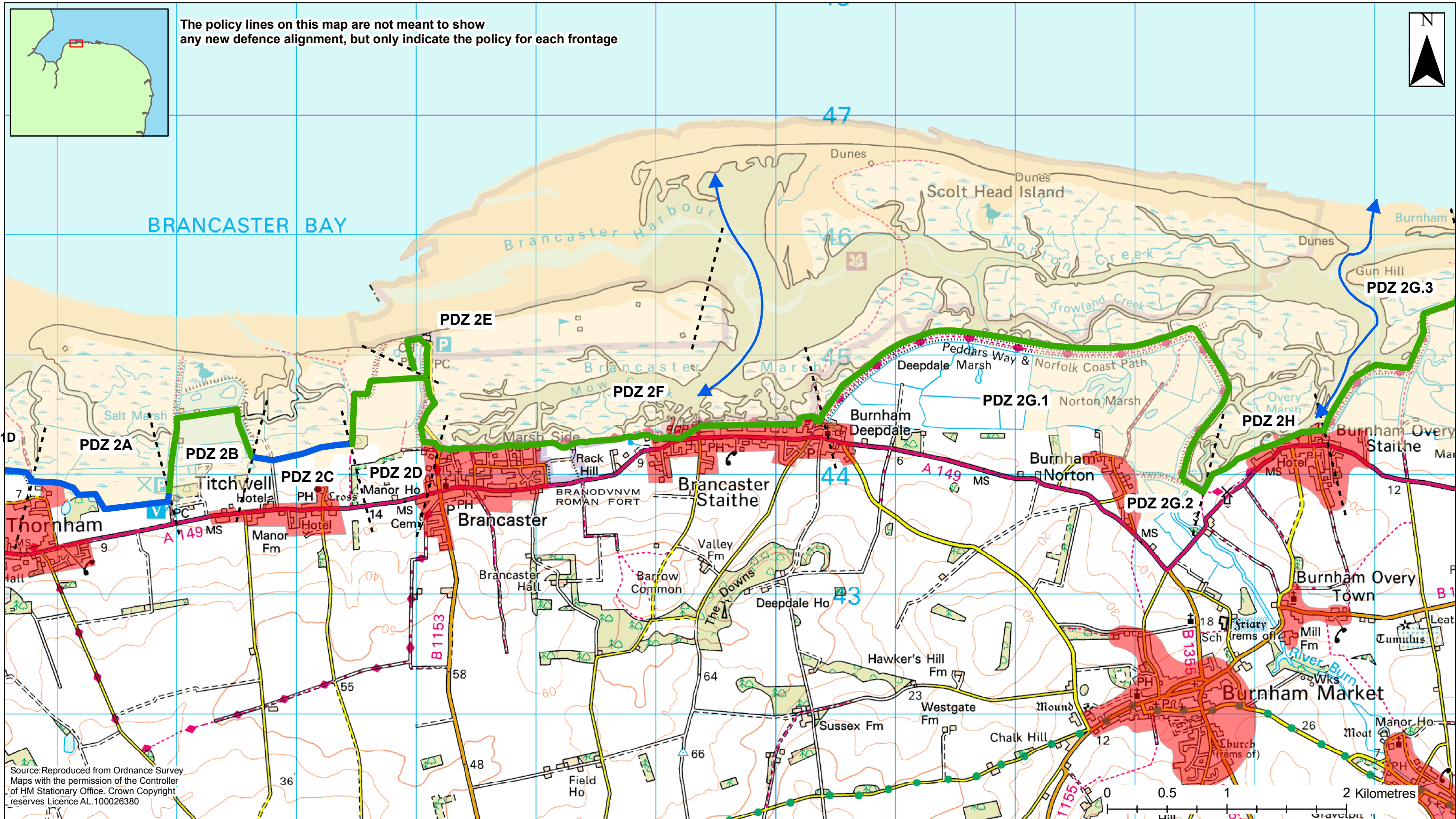


## POLICY APPRAISAL RESULTS

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.





The policy lines on this map are not meant to show any new defence alignment, but only indicate the policy for each frontage

Source: Reproduced from Ordnance Survey Maps with the permission of the Controller of HM Stationary Office. Crown Copyright reserves Licence AL100026380

KEY: Policy (full details see relevant policy statement)







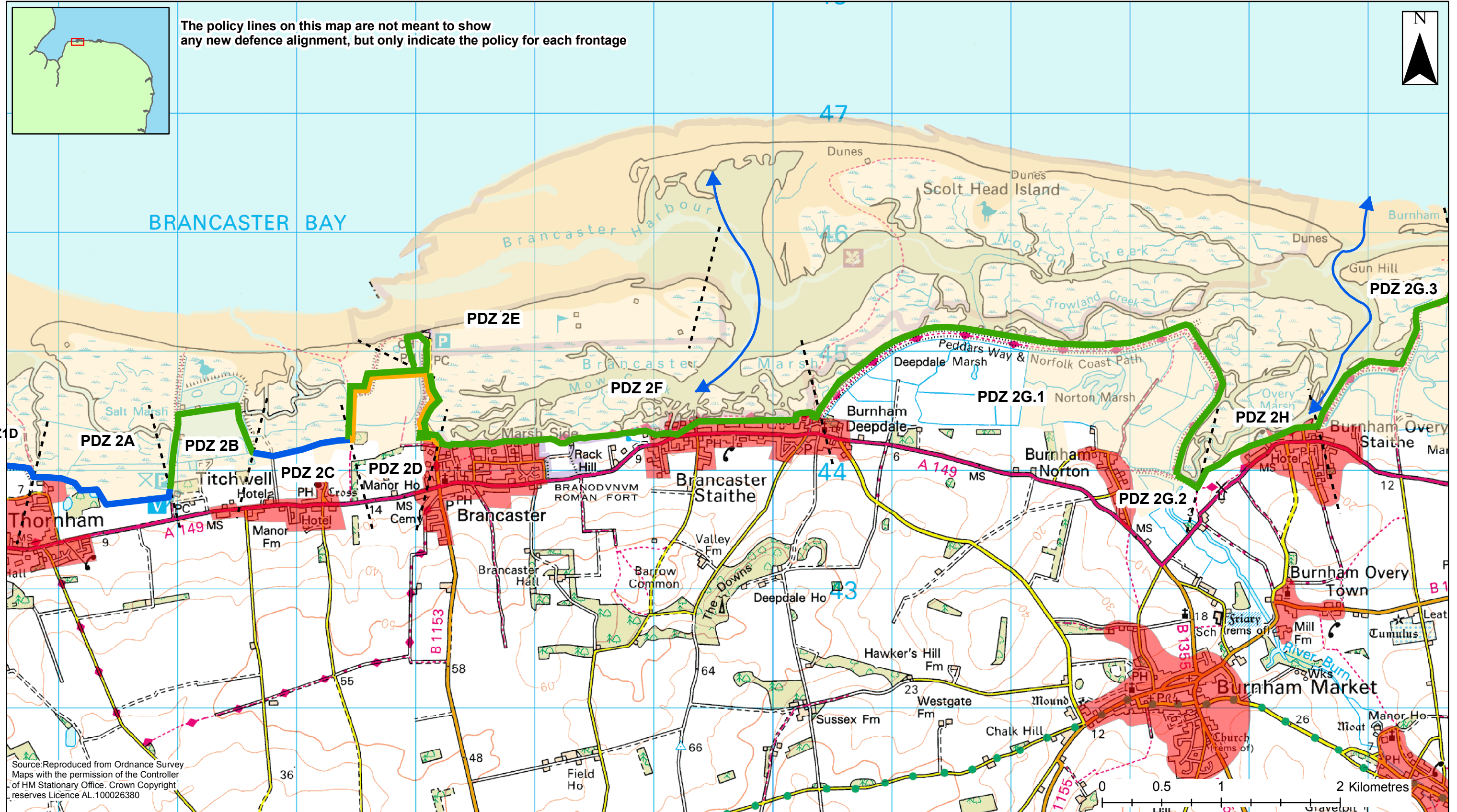







	Policy Development Zone boundaries		Indicative navigation routes		Settlements		International designations		No active intervention	All other Symbols are based on the background OS maps
	Hold the line									

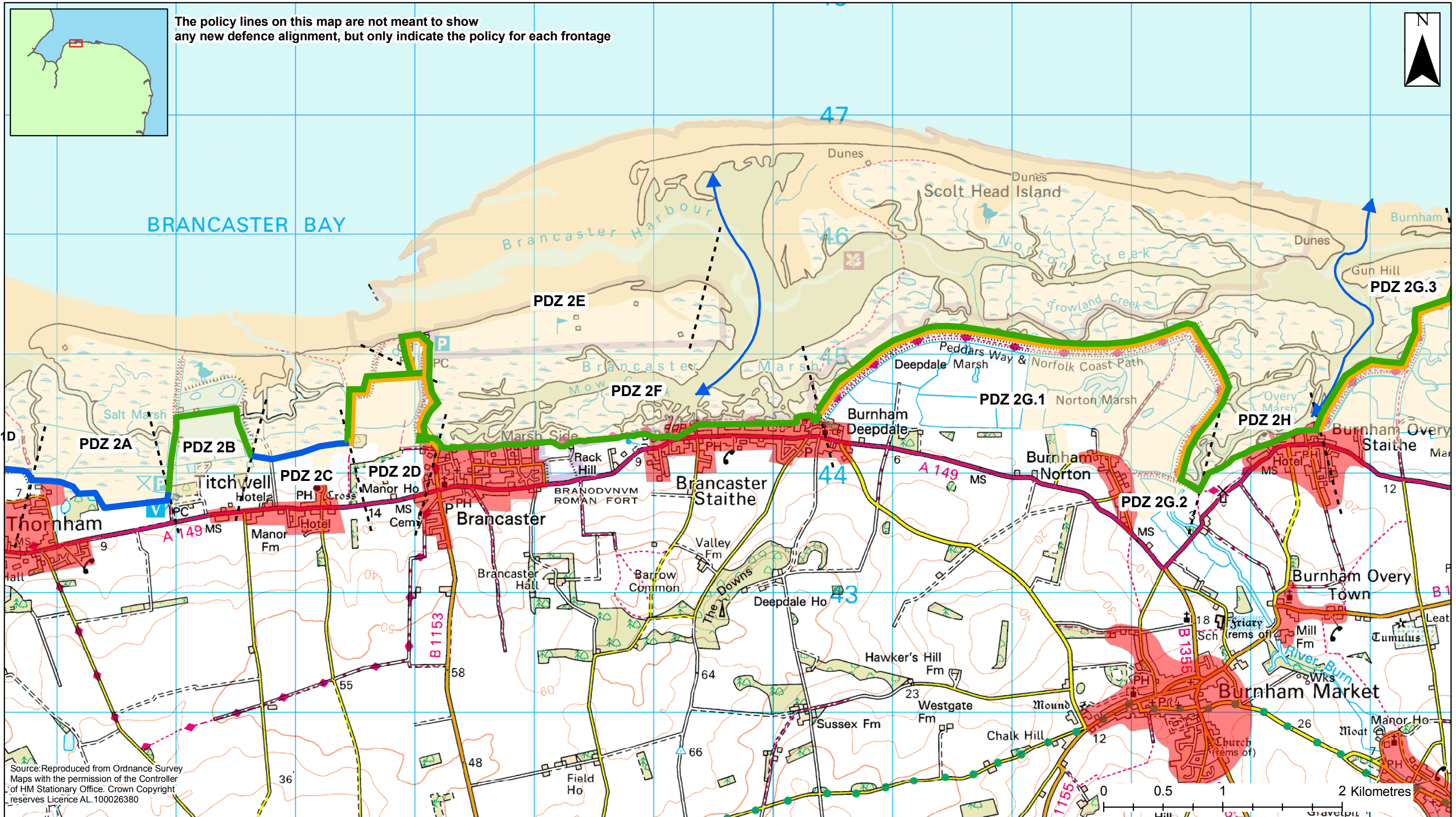
Figure 4.10: Super-frontage 2 (PDZ 2A to 2H) - Policies for the medium term (epoch 2 - 2026 to 2055)

Thornham to Holkham Dunes



KEY: Policy (full details see relevant policy statement)

 Policy Development Zone boundaries	 Indicative navigation routes	 Settlements	 International designations	 No active intervention
 Hold the line	 Conditional policy - Hold the line or Landward realignment (Managed realignment type 3)	All other Symbols are based on the background OS maps		



The policy lines on this map are not meant to show any new defence alignment, but only indicate the policy for each frontage

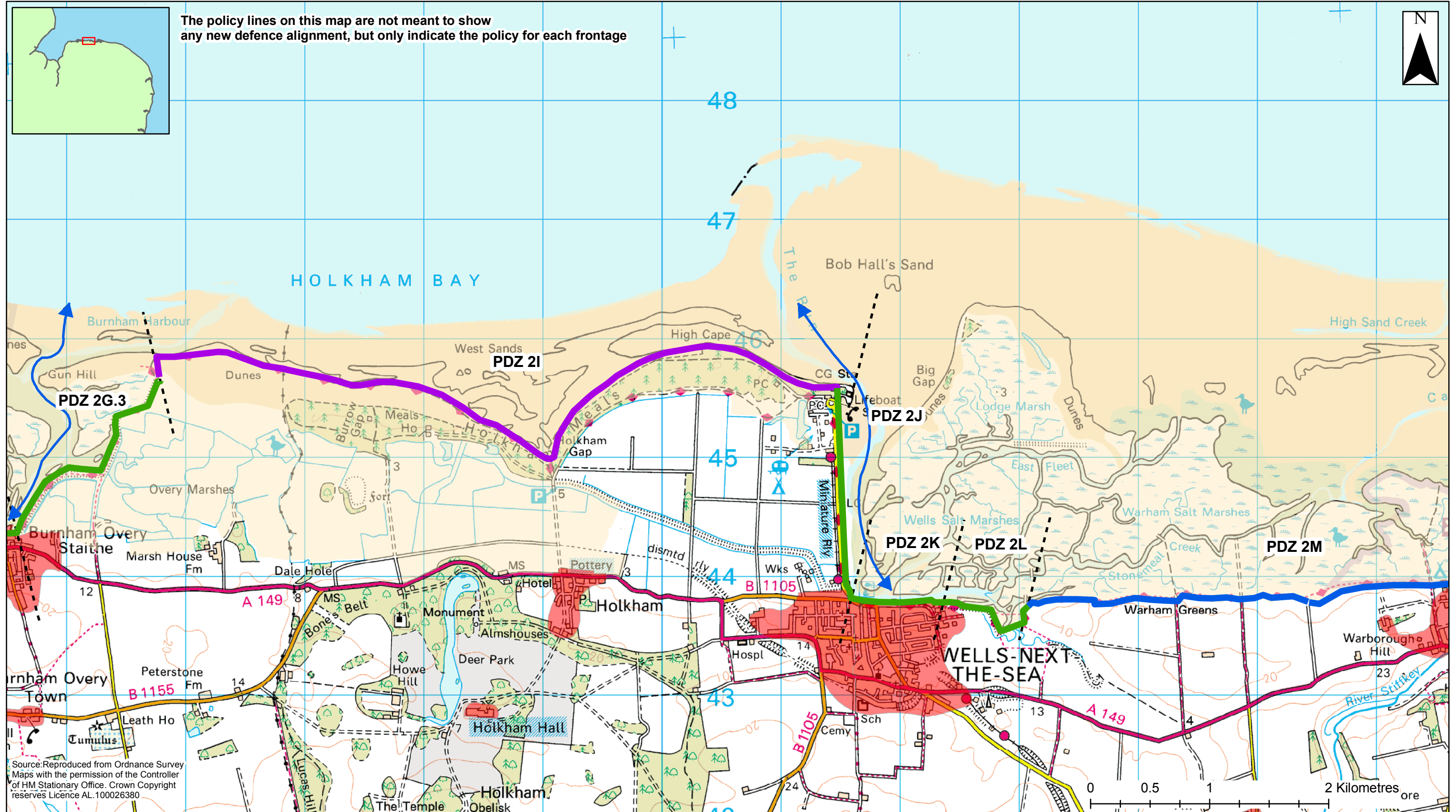
Source: Reproduced from Ordnance Survey Maps with the permission of the Controller of HM Stationary Office. Crown Copyright reserves Licence AL100026380

KEY: Policy (full details see relevant policy statement)

----- Policy Development Zone boundaries	←→ Indicative navigation routes	■ Settlements	■ International designations	■ No active intervention	All other Symbols are based on the background OS maps
— Hold the line	— Conditional policy - Hold the line or Landward realignment (Managed realignment type 3)				

Figure 4.12: Super-frontage 2 (PDZ 2I to 2M) - Policies for the short term (epoch 1 - now to 2025)

Holkham Dunes to Stiffkey

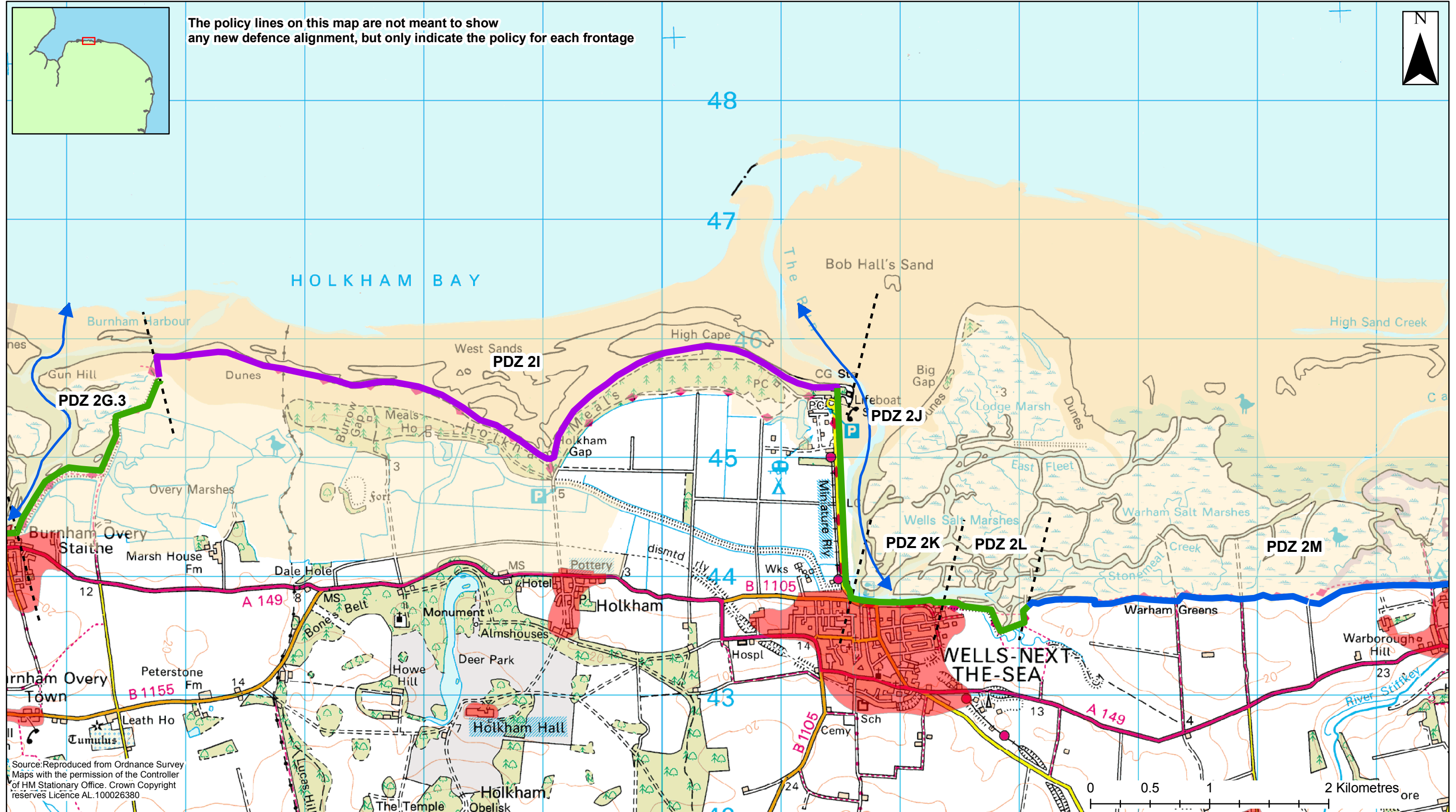


KEY: Policy (full details see relevant policy statement)

Policy Development Zone boundaries	Indicative navigation routes	Settlements	International designations	No active intervention	All other Symbols are based on the background OS maps
Hold the line			Limited intervention (Managed realignment type 1/2)		

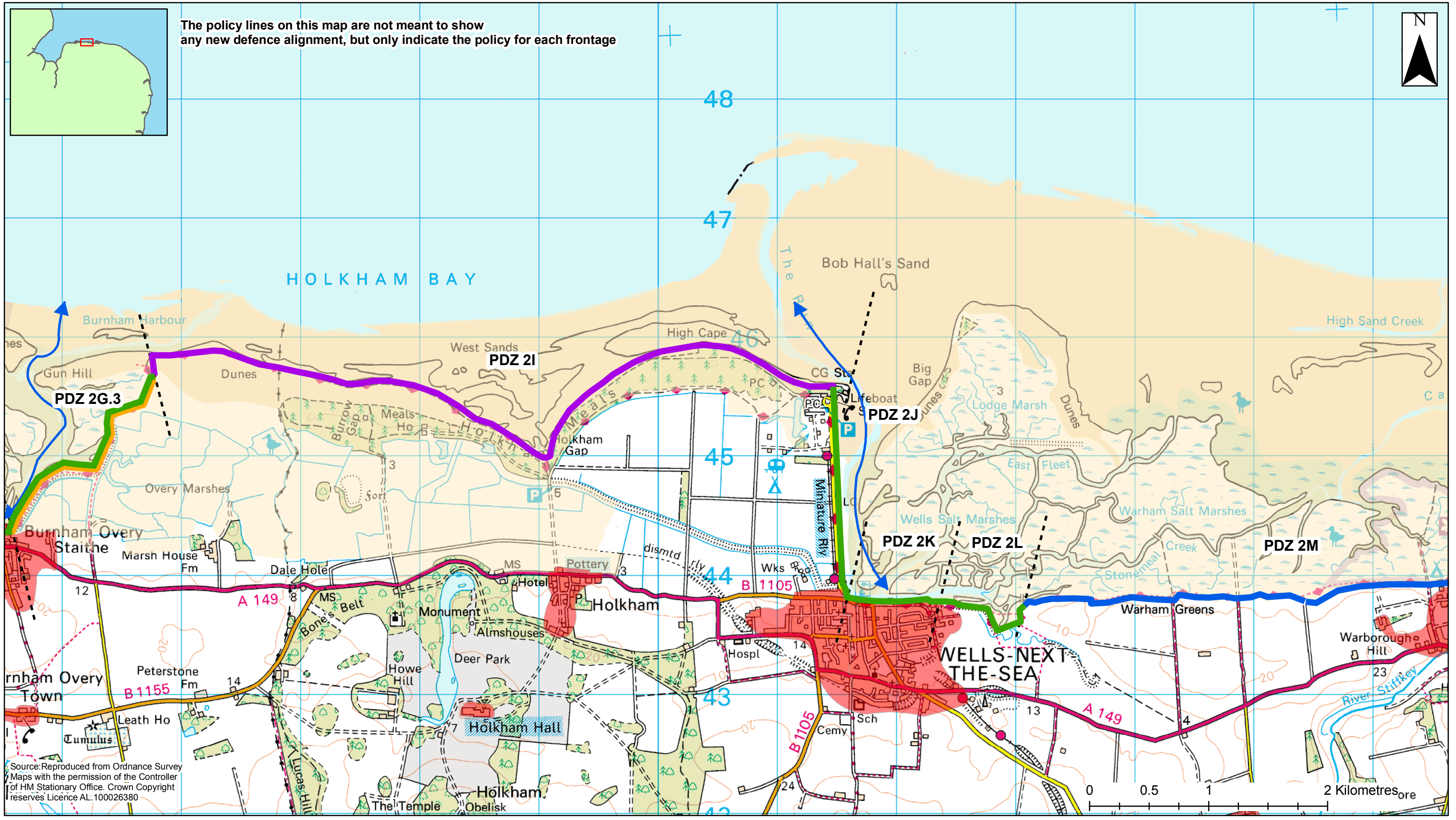
Figure 4.13: Super-frontage 2 (PDZ 2I to 2M) - Policies for the medium term (epoch 2 - 2026 to 2055)

Holkham Dunes to Stiffkey



KEY: Policy (full details see relevant policy statement)

Policy Development Zone boundaries	Indicative navigation routes	Settlements	International designations	No active intervention	All other Symbols are based on the background OS maps
Hold the line			Limited intervention (Managed realignment type 1/2)		



**KEY: Policy (full details see relevant policy statement)**

----- Policy Development Zone boundaries	↔ Indicative navigation routes	■ Settlements	■ International designations	— No active intervention	All other Symbols are based on the background OS maps
— Hold the line	— Conditional policy - Hold the line or Landward realignment (Managed realignment type 3)	— Limited intervention (Managed realignment type 1/2)			

#### 4.4 Super-frontage 3: Stiffkey to Kelling Hard

The overall plan for the frontage from Stiffkey to Kelling Hard is to increase natural processes gradually while continuing to provide flood defence where this is technically possible and economically viable. Where there is currently no active management, the plan is to allow natural development to continue.

The plan is to hold the defences where they are now at Morston and the outfalls of the rivers Stiffkey and Glaven. The intent is to move the defences further inland at Blakeney Freshes and possibly at Cley west bank. These realignments are expected to sustain the role of Blakeney Spit as a control for Stiffkey bay to its west (in super-frontage 2), which will reduce pressure on the intertidal area. The plan will improve navigability of the channels behind Blakeney Spit, create more intertidal habitat and move defences to more sustainable sheltered positions. However, this will come partly at the expense of existing freshwater habitats, limited agricultural land use and some historic assets and may have other negative local effects. Any European designated habitat lost through managed realignment will be compensated for by finding replacement habitat. The realignments are planned for the medium- to long-term to allow time for this to happen.

The SMP has identified that, for some places, the potential disadvantages of the plan are significant. For those places, more knowledge needs to be gained in the short- and medium-term to confirm the changes proposed for the long-term.

For the Cley to Salthouse shingle ridge the plan is to continue the current approach of allowing the shingle ridge to develop naturally, while allowing for intervention in response to events that cause immediate risk to life and to residential and commercial buildings in Cley and Salthouse, or threaten the transport function of the A149. The policy for the shingle ridge will also ensure that any sediment movement towards the neighbouring frontage (part of the Kelling to Lowestoft SMP) is not interrupted. The neighbouring SMP states there will be no effect along the shoreline from its policies.

For super-frontage 3, the total economic benefits of the policy are estimated to exceed the costs, but not by a wide margin, so the plan is marginally viable. This is the case for both policy options at Cley west bank (hold the line or managed realignment in epoch 3). As indicated in section 1.1, implementing the policies will depend on funding being available. In this case it is not certain that national sources will cover all the costs. The SMP partners are eager to explore alternative sources of funding, for example related to the benefits that the plan would create for tourism, nature conservation, access, local landowners, navigation and other local interests.

Appendix G contains more detailed background information. Figures 4.17 to 4.19 show the short, medium and long term policies for super-frontage 3.

<b>Location reference:</b>	<b>Reclaimed areas behind Blakeney Spit</b>
<b>Policy development zone:</b>	PDZ 3A

**POLICY STATEMENT:** Maintain flood defence to all houses and infrastructure. Gradually increase tidal exchange by realigning the reclaimed areas at Blakeney Freshes in the medium term, and possibly also at Cley marshes in the long term if confirmed during epochs 1 and 2. The action plan contains actions to obtain this knowledge to inform future policy decisions in this PDZ.

The medium-term realignment of Blakeney Freshes and the potential long-term realignment of Cley west bank could have a range of benefits:

- The increase in tidal exchange will enhance the outer estuary at Blakeney Point, strengthening its role as a control point for Stiffkey bay and supporting the role of the saltmarshes as a habitat and a natural flood defence.
- The realignments will move the defences to more sustainable sheltered positions, which will reduce the risk of flooding to the people of Blakeney and Cley-next-the-Sea and reduce reliance on human intervention here. This could become more relevant as climate change starts to increase the pressure on the sea banks. Based on the current condition and height of the sea banks, major improvement works would be needed around 2075 (see section 2.1.5). This may not be economically viable or technically possible if sea level rise predictions happen in the future. There may therefore have to be a change in flood risk management.
- The realignments will create intertidal habitat and are likely to benefit the ecological integrity of the area by sustaining the channels and supporting the dunes in Stiffkey bay. They may also contribute to the ecological status of Stiffkey bay.
- The realignments would increase the tidal exchange. This is likely to scour out the tidal channels and deposit most of the silt in the currently-defended areas. This would help to reduce the siltation that is currently hampering navigation from Blakeney, which could create social and economic benefits.

The realignments could also have negative effects on current land use, freshwater habitats and the footpath that runs on top of the banks. A number of archaeological sites may become at risk of erosion and the setting of Blakeney and Cley conservation areas could be affected by a realignment, requiring sensitive design. Finally, the increased channel flows may have local negative effects on structures or on the local mussel lays.

All potential effects of the Blakeney Freshes realignment will be taken into account during project appraisal and scheme development. This will be carried out in the coming years with full stakeholder involvement before any works start. This process will need to achieve landowner agreement and show that the negative effects are acceptable and manageable.



For the potential Cley west bank realignment, the SMP has identified that more knowledge is needed to assess its effects and support a firm long-term decision in future SMPs. The SMP's action plan therefore contains a specific programme of actions (monitoring, consultation and assessments) to investigate the potential positive and negative effects described above. So the next SMP will review the medium- and long-term policies for this PDZ.

The intent is to hold the defence line where it is now at Morston (both west and east banks) and at the river Stiffkey and Glaven outfalls. This will sustain the settlements (with around 225 properties) and their historic assets, the A149, current agricultural land use, the partly-designated freshwater habitats and the footpath that runs on top of the sea bank.

Figures 4.15 and 4.16 show where the new defences could be built following the managed realignment at Blakeney Freshes in epoch 2 and the potential realignment at Cley marshes in epoch 3. Implementing the policies below depends on further confirmation (beyond the SMP) that they are technically possible and economically viable.

#### SUMMARY OF POLICIES

##### PDZ3A.1 – River Stiffkey outfall

Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Maintain the defences where they are now to sustain the communities in River Stiffkey valley.
<b>Local management policy</b>	Maintain the defences where they are now.			

##### PDZ3A.2 – Morston

Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Maintain the defences where they are now to sustain the community of Morston and current land use in the reclaimed area.
<b>Local management policy</b>	Maintain the east and west banks where they are now.			

PDZ3A.3 – Blakeney Freshes marshes

<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	Hold the line	Managed realignment (MR2)	Hold the line	Sustain flood defence to all houses and infrastructure. Move the sea bank at Blakeney Freshes further inland in epoch 2 to create new intertidal habitat and sustain Blakeney harbour.
<b>Local management policy</b>	Maintain the defences where they are now. Carry out the work needed to implement realignment in the medium term.	Build new defences to protect properties and infrastructure. Then partly remove existing defences.	Hold the new line of defence.	

PDZ3A.4 – River Glaven outfall

<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Maintain the defences where they are now to sustain the communities in the River Glaven valley.
<b>Local management policy</b>	Maintain the defences where they are now.			

Key: MR – Managed realignment:  
 MR1 – Maintain natural defence with minimum intervention  
 MR2 – Breach of frontline defence after building defence further inland  
 MR3 – Breach of frontline defence, no building of inland defence

PDZ3A.5 – Cley marshes

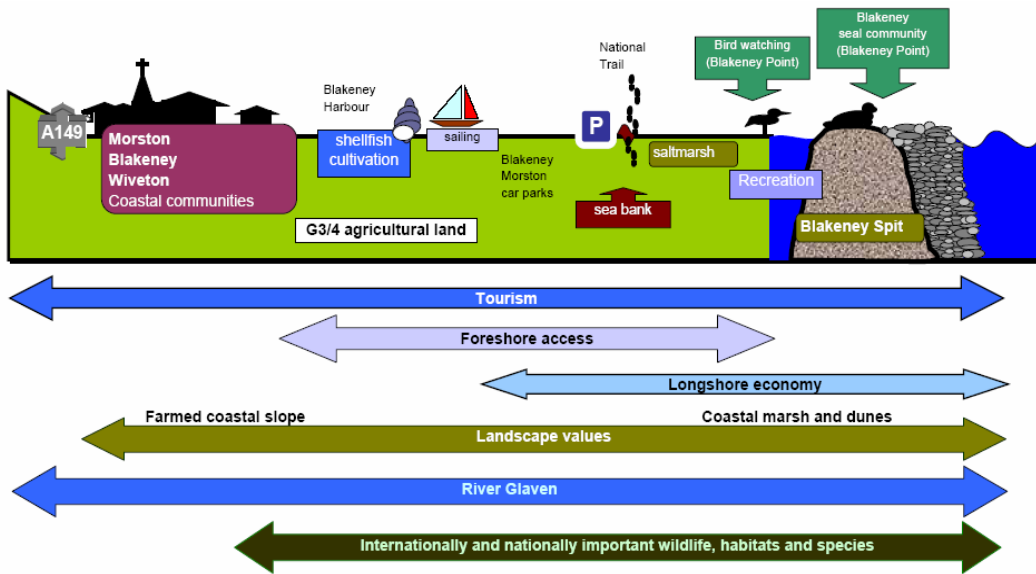
Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	Hold the line	Hold the line	Managed realignment (MR2) or hold the line	The policy for epoch 3 is conditional. It depends on the results of monitoring and research into the effects of realignment to be carried out during epochs 1 and 2. In both scenarios defences will continue to sustain the communities of Cley-next-the-Sea and Salthouse.
<b>Local management policy</b>	Maintain defences where they are now. Monitoring and assessment to investigate realignment in the future.		If confirmed, build new defences to protect properties and infrastructure. Then partly remove existing defences to increase tidal exchange. If not confirmed, continue to maintain the defences where they are now.	

Key: MR – Managed realignment:  
 MR1 – Maintain natural defence with minimum intervention  
 MR2 – Breach of frontline defence after building defence further inland  
 MR3 – Breach of frontline defence, no building of inland defence

**CHANGES FROM PRESENT MANAGEMENT**

In epoch 1 there is no change from the existing hold the line policy for the whole frontage. SMP1 suggested managed realignment in the longer term but did not specify where and when. Therefore the SMP2 policy of managed realignment for Blakeney Freshes in epoch 2 and potential managed realignment for Cley west bank in epoch 3 is compatible. The action plan identifies the need for stakeholder involvement and communication in implementing the (potential) changes in approach.

**KEY FEATURES AND VALUES:**

































**POLICY APPRAISAL RESULTS:**

With Cley west bank hold the line in epoch 3

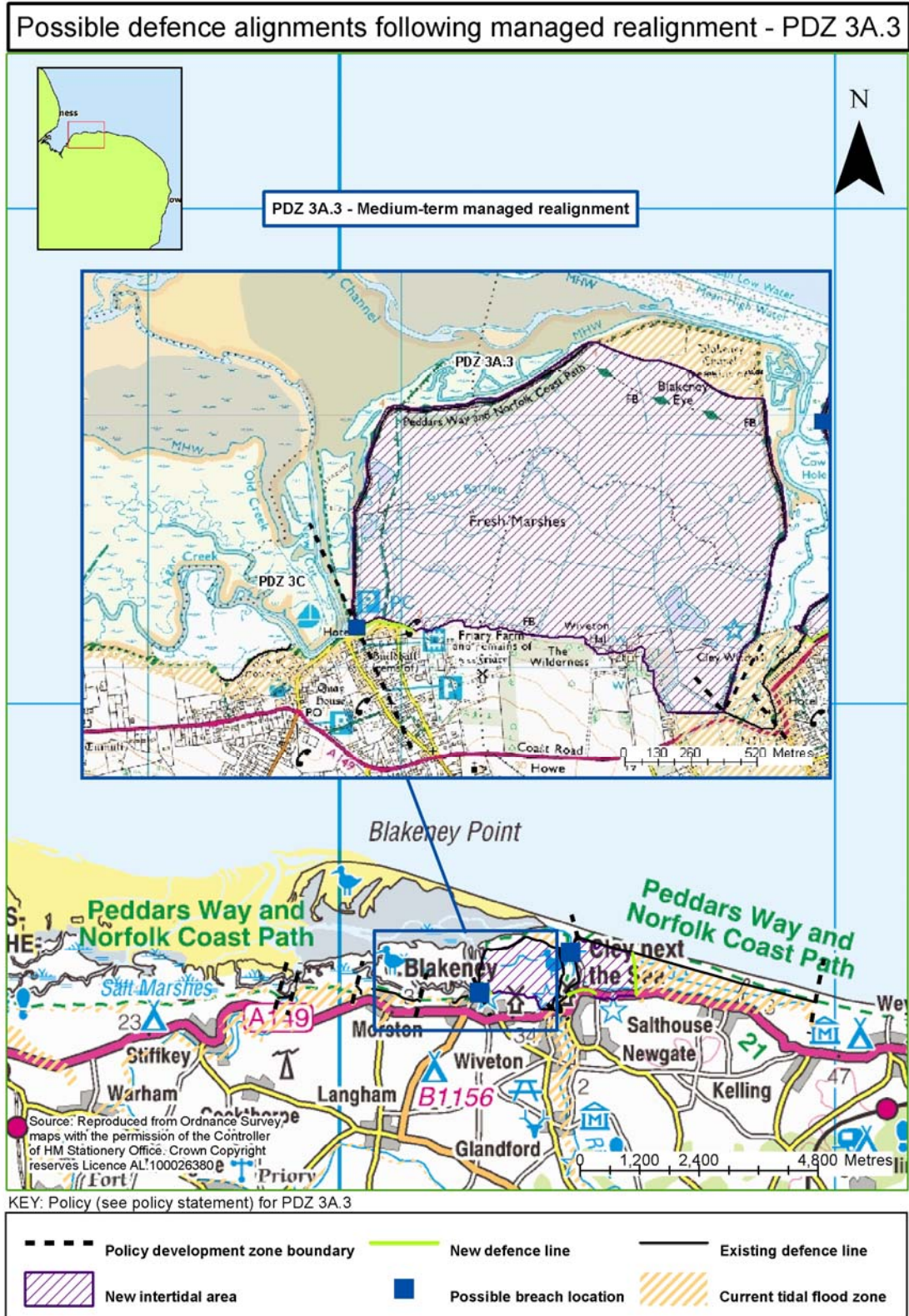
Epoch 1					
Epoch 2					
Epoch 3					

With Cley west bank realignment in epoch 3

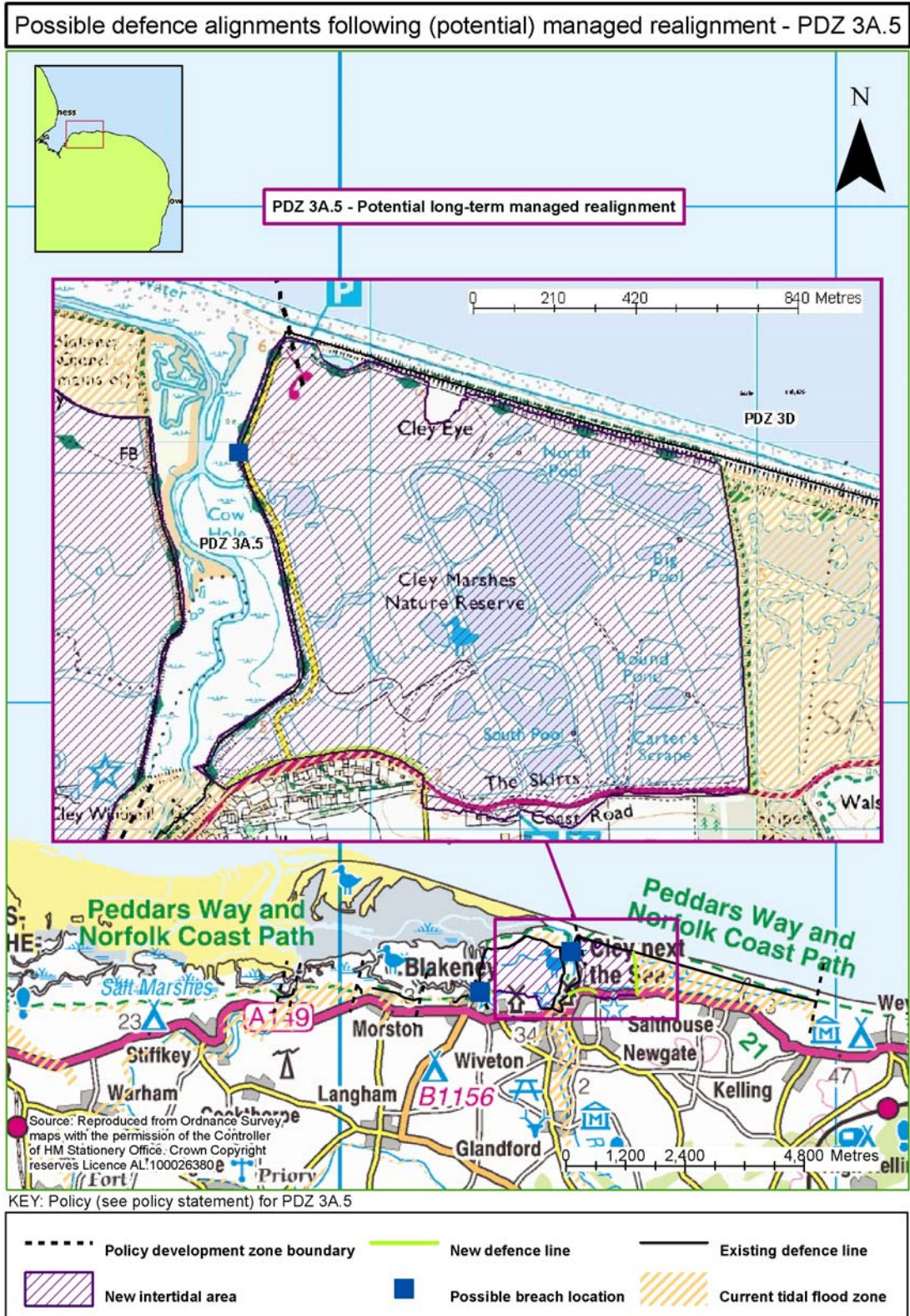
Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

Figure 4.15: Indicative defence alignments following managed realignment – PDZ3A.3



**Figure 4.16: Indicative defence alignments following (potential) managed realignment – PDZ3A.5**



<b>Location reference:</b>	<b>Stiffkey to Morston</b>
<b>Policy development zone:</b>	PDZ 3B

**POLICY STATEMENT:** Continue the current situation where the frontage is allowed to develop naturally. Currently it is not defended and it is unlikely that there will be any reasons for introducing defences in the future.

The potential effect of flooding and erosion on six locally important historic assets needs to be monitored.

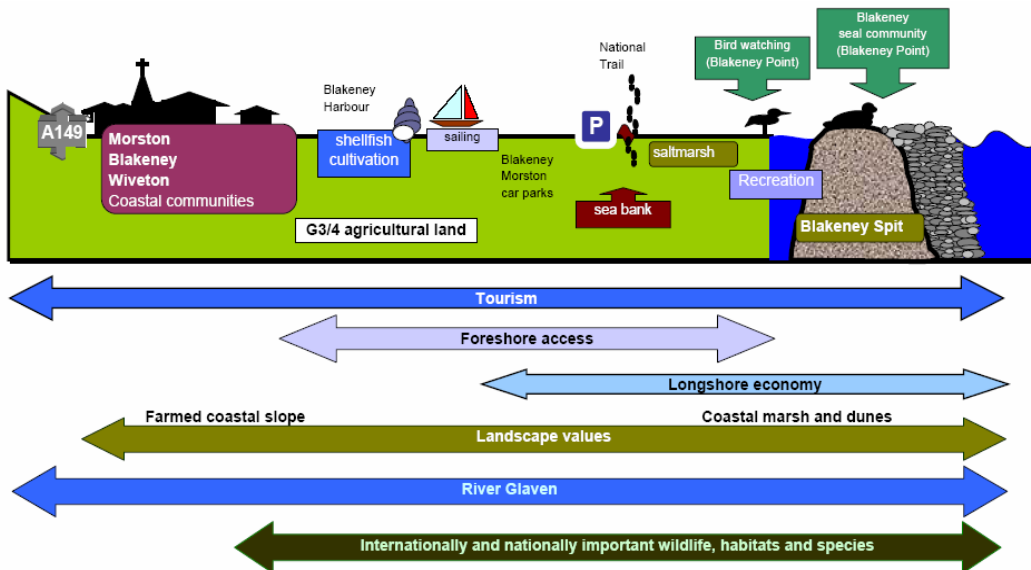
**SUMMARY OF POLICIES**

Policy	to 2025	2025 to 2055	2055 to 2105	What this means
<b>National SMP policy</b>	No active intervention	No active intervention	No active intervention	No change from current policy of allowing the coast to develop naturally.
<b>Local management policy</b>	Continue to allow the frontage to develop naturally.			

**CHANGES FROM PRESENT MANAGEMENT**































No change from existing policy of no active intervention.

**KEY FEATURES AND VALUES:**





**POLICY APPRAISAL RESULTS:**

Epoch 1					
					
Epoch 2					
					
Epoch 3					
					

See page 75 for a key to the symbols.

<b>Location reference:</b> Blakeney
<b>Policy development zone:</b> PDZ 3C

**POLICY STATEMENT:** Continue to maintain the defences where they are now. This will not reduce reliance on man-made defences, but will protect current use of the quayside and associated features in Blakeney, including around 25 properties and historic assets. Any effect on the setting of Blakeney conservation area will need to be avoided by sensitive design.

Implementing this policy depends on further confirmation (beyond the SMP) that it is technically possible and economically viable.

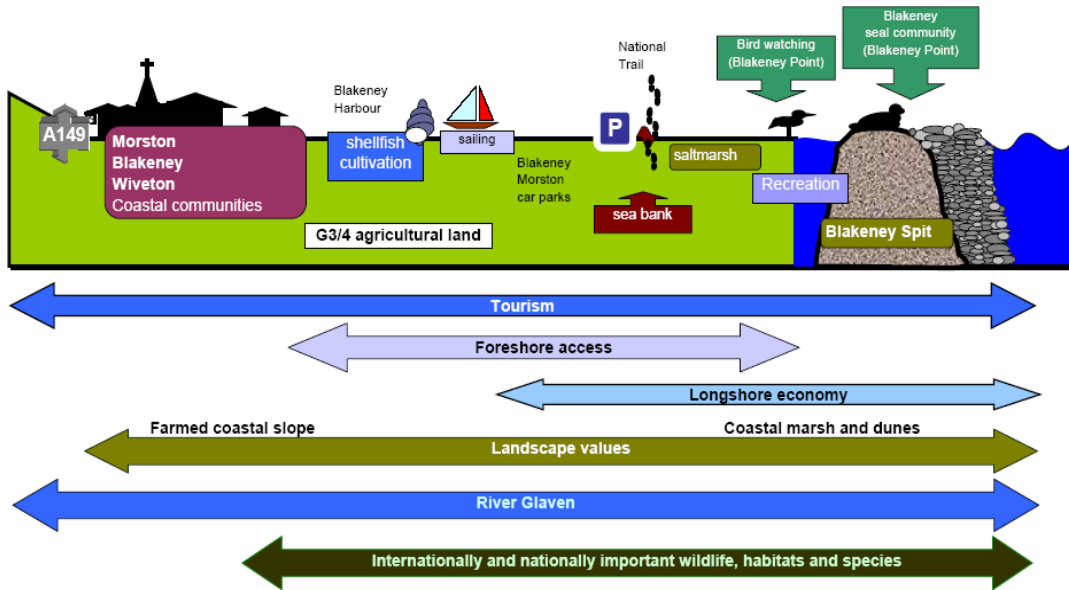
**SUMMARY OF POLICIES**

<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	Hold the line	Hold the line	Hold the line	Maintain the defences where they are now to protect current use of the quayside and associated features in Blakeney.
<b>Local management policy</b>	Maintain the defences where they are now.			

**CHANGES FROM PRESENT MANAGEMENT**

No change from existing policy of hold the line.

**KEY FEATURES AND VALUES:**



**POLICY APPRAISAL RESULTS:**

Epoch 1					
Epoch 2					
Epoch 3					

See page 75 for a key to the symbols.

<b>Location reference:</b>	<b>Cley to Salthouse</b>
<b>Policy development zone:</b>	PDZ 3D

**POLICY STATEMENT:** Allow natural development of the shingle ridge to continue. Also allow for intervention in response to events that cause immediate risk to life and to residential and commercial buildings in Cley and Salthouse or threaten the transport function of the A149. This continues the current approach. Around 20 properties are currently at risk of flooding. The long-term intent to realign part of Cley west bank (see PDZ 3A) would reduce the need for flood protection from the shingle ridge.

**SUMMARY OF POLICIES**

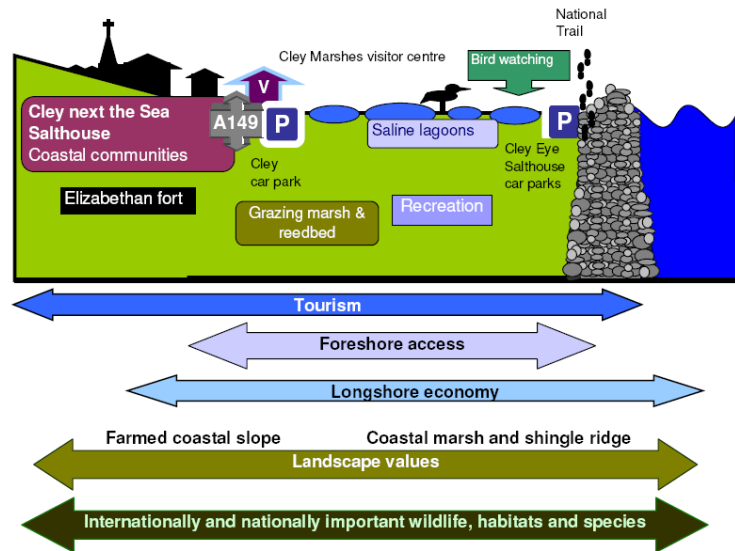
<b>Policy</b>	<b>to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2105</b>	<b>What this means</b>
<b>National SMP policy</b>	Managed realignment (MR1)	Managed realignment (MR1)	Managed realignment (MR1)	Monitoring and managing the natural development of the shingle ridge if needed to manage immediate risk to life, residential and commercial buildings or the A149.
<b>Local management policy</b>	Allow the shingle ridge to develop naturally. Intervene in response to events, if needed, to manage immediate risk to life, residential and commercial buildings or the A149.			

Key: MR – Managed realignment:  
 MR1 – Maintain natural defence with minimum intervention  
 MR2 – Breach of frontline defence after building defence further inland  
 MR3 – Breach of frontline defence, no building of inland defence

**CHANGES FROM PRESENT MANAGEMENT**

No substantial change from existing policy. SMP1 suggested that, in the medium to long term, a policy of managed realignment should be implemented and the current policy is compatible with this.

**KEY FEATURES AND VALUES:**



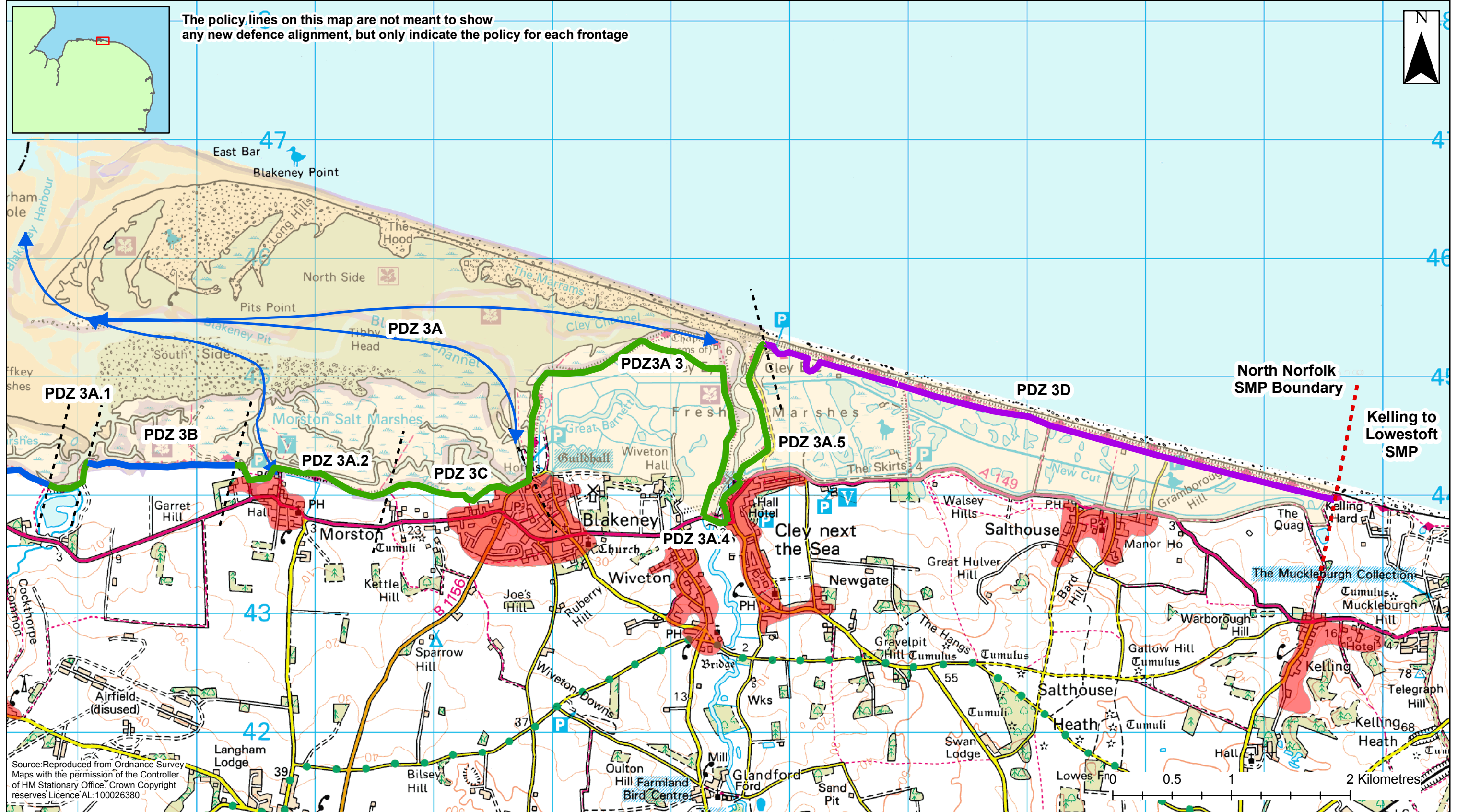
**POLICY APPRAISAL RESULTS:**

Epoch 1					
Epoch 2					
Epoch 3					

See page 75 for a key to the symbols.

Figure 4.17: Super-frontage 3 (PDZ 3A to 3D) - Policies for the short term (epoch 1 - now to 2025)

Stiffkey to Kelling

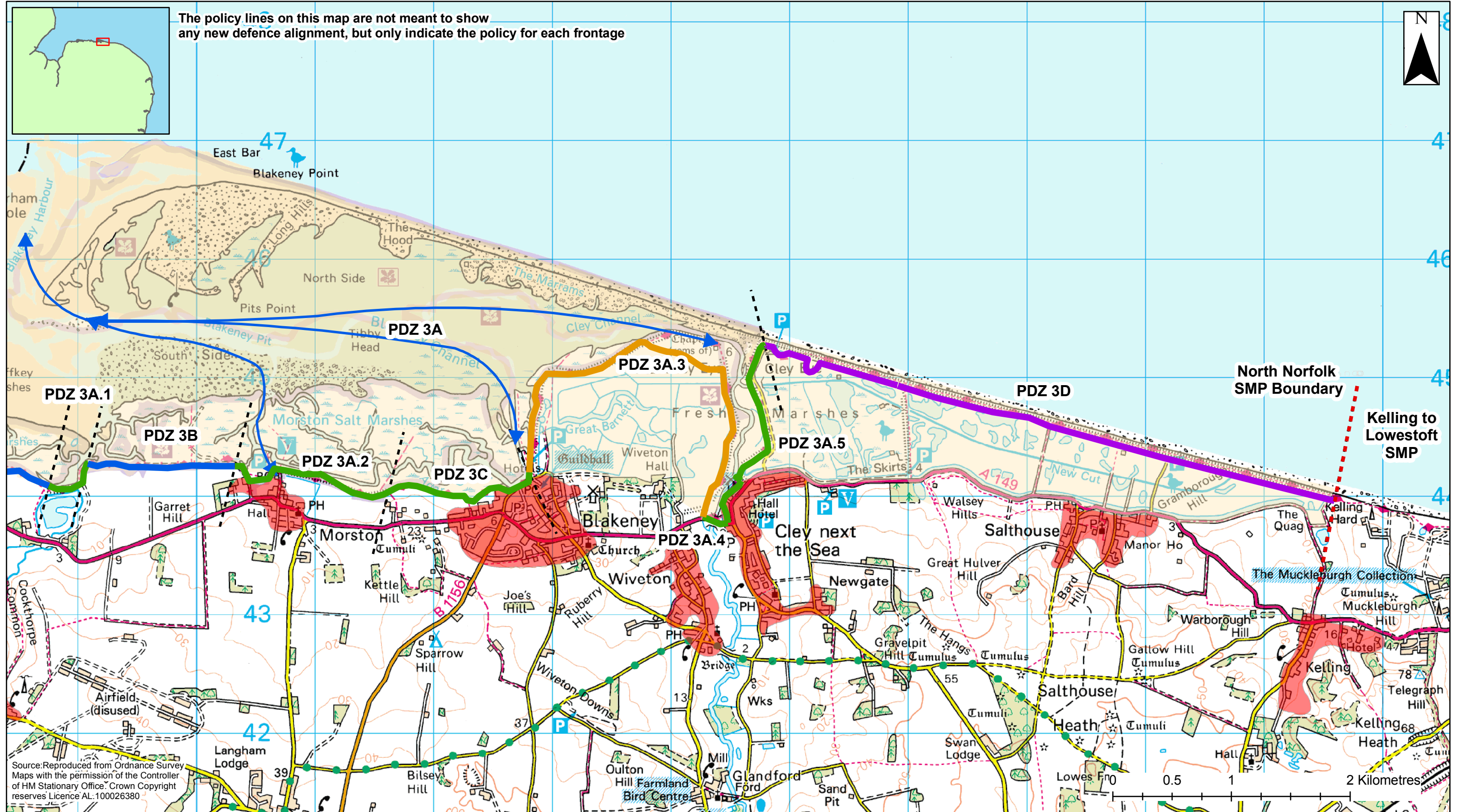


KEY: Policy (full details see relevant policy statement)

Policy Development Zone boundaries	Indicative navigation routes	Settlements	International designations	No active intervention	All other Symbols are based on the background OS maps
Hold the line			Limited intervention (Managed realignment type 1/2)	SMP area boundary	

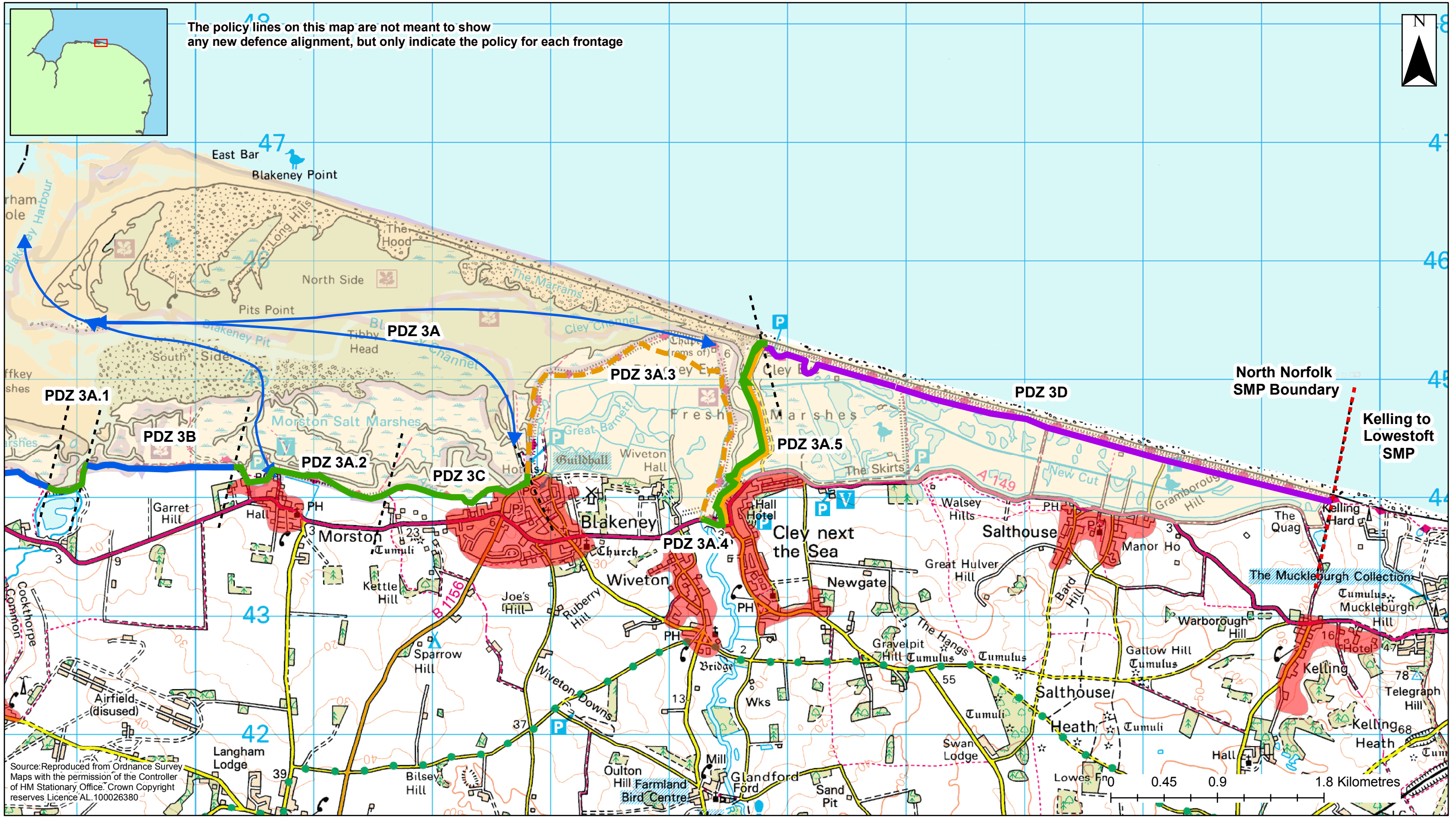
Figure 4.18: Super-frontage 3 (PDZ 3A to 3D) - Policies for the medium term (epoch 2 - 2026 to 2055)

Stiffkey to Kelling



KEY: Policy (full details see relevant policy statement)

----- Policy Development Zone boundaries	←→ Indicative navigation routes	Settlements	International designations	No active intervention	All other Symbols are based on the background OS maps
Hold the line	Landward realignment (Managed realignment type 3)	Limited intervention (Managed realignment type 1/2)	SMP area boundary		



The policy lines on this map are not meant to show any new defence alignment, but only indicate the policy for each frontage

Source: Reproduced from Ordnance Survey Maps with the permission of the Controller of HM Stationary Office. Crown Copyright reserves Licence AL100026380

KEY: Policy (full details see relevant policy statement)

Policy Development Zone boundaries	Indicative navigation routes	Settlements	International designations	No active intervention	All other Symbols are based on the background OS maps
Hold the line	Conditional policy - Hold the line or Landward realignment (Managed realignment type 3)		Limited intervention (Managed realignment type 1/2)	Hold the realigned line	



## 5 Action plan

This section includes the summary action plan for the North Norfolk SMP.

This action plan is a very important element of the SMP and particularly for the North Norfolk SMP. The plan has identified that there are a number of important uncertainties and that we need to improve our understanding to support firmer policy decisions in the next SMP and beyond.

As indicated in section 1.3.3, the intent is to continue the partnership approach, through which we have developed this SMP, at the level of elected members, officers, other organisations and individuals, to be linked with the existing coastal group. By organising regular progress meetings, this partnership can actively monitor and drive the progress of the action plan. This will allow a continuing process of shoreline management in the coming years in the run-up to the next SMP in five to ten years' time.

The action plan summarises all the specific actions that are needed to implement the plan and the policies. This includes actions by the Environment Agency and local authorities to develop flood and erosion risk management strategies and schemes. It also includes actions for 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. A specific element for the North Norfolk SMP action plan is the monitoring and assessments needed to support firmer decisions in the next SMP about the potential managed realignments for the medium and long term. These will consider the predicted effects of moving the defences further inland on a variety of assets and features, including 14 listed buildings.

The table below is a summary of the action plan. The complete version of the action plan has been developed in an Access database to use as a living document in the coming years. The East Anglia Coastal Group (EACG) will host this action plan, and those for other East Anglian SMPs, on its website. The action plan contains an action to arrange who will have access to this, how this will happen and who will maintain and update the action plan.

As indicated in section 1.1, implementing SMP policies will depend on funding being available, even if a policy is considered to be economically viable (see appendix H). This is not only the case for building and maintaining flood defences, but also for all the other actions needed to implement the plan. This funding may be available from the national flood and coastal erosion risk management budget, but it could also come from other national sources or from local and/or third-party funding. The SMP partners will look very carefully at potential sources of funding to implement the actions, as indicated in the 'potential source for funding' column in the action plan.

## SMP-wide actions

Action	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
<b>Strategy</b>	All the assessments identified for each PDZ are part of an overall strategy for the whole SMP area. This may include clarifying and confirming frontages where national funding is unlikely (based on expected appraisal results) so there is a potential need for local or third party funding to implement the SMP's policies.	EA, NNDC, BCKL&WN, NCC, NE, EH	High	EA	2020
<b>Monitoring (data collection)</b>	Continue shoreline monitoring programme for coastal processes, saltmarsh development and beach profiles, including movement of dune systems. Expand and fine-tune to address data needs raised in the SMP for each PDZ to inform SMP2 policies and SMP3 and feed into assessments.	EA, NE, EH, Port of Wells (and other ports), BCKL&WN, NNDC, NCC	High	EA	Ongoing
	Update and upgrade Rapid Coastal Zone Assessment Survey for Norfolk.	EH	High	EH	SMP3

Action	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
	Use the Groundwater Model for East Anglia to predict the effect of SMP policies on the saline water interface along this coastline.	EA	Medium	EA	Ongoing
<b>Asset management</b>	Update and maintain flood defence asset database (NFCDD).	EA	Medium	EA	Ongoing
	Maintain and manage data management tool supplied to retain all data used to produce this SMP.	EA	High	EA	2010
	Determine expected residual life of all embankments under current maintenance regimes to inform SMP3 policy.	EA	Medium	EA	SMP3
<b>Communication</b>	Monitor and manage action plan to ensure SMP policies are put into practice. Build on the SMP's engagement strategy to develop ongoing communication with communities, businesses and the public about progress and issues, including regular progress reporting and public events.	All partner organisations	Medium	EA	Ongoing

Action	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
	Host this action plan on website, arrange access to it and who will be responsible for updating it.	East Anglia Coastal Group	High	EACG	2010
	Continue to liaise with key local landowners to encourage an understanding of coastal change, ensure that local knowledge is taken into account in implementing policy and ensure participation in SMP3.	All partner organisations	Medium	EA, NNDC, BCKL&WN, Natural England	Ongoing
	Provide guidance for landowners directly affected by SMP policies.	EA	High	EA	Complete
<b>Interface with planning and land management</b>	Make sure that relevant development and planning documents take account of SMP policies and communicate SMP outcomes to LA planning teams.	BCKL&WN, NNDC, NCC, EERA, EA	Medium	BCKL&WN, NNDC, NCC, EERA, EA	Ongoing
	Provide continued up-to-date evidence base for planning decisions. Produce specific development control guidance.	EA	Medium	EA	Ongoing

Action	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
	Develop plan for managing the coastal footpath (national trail) from Old Hunstanton to Kelling Hard. Coordinate shoreline management with the development of coastal access under the Marine and Coastal Access Act.	NCC, NE, EA	Medium	NCC, NE	Ongoing
<b>Emergency response</b>	Review emergency response plans to prepare for extreme events that exceed standard.	BCKL&WN, NNDC, NCC, EA	Low	BCKL&WN, NNDC, NCC, EA	Ongoing
<b>Adaptation / resilience</b>	Identify funding options to facilitate adaptation to coastal change (for example, follow-on from Pathfinder for coastal change programme).	BCKL&WN, NNDC, NCC, EA	Medium	BCKL&WN, NNDC, NCC, EA	Ongoing
<b>Flood forecasting and warning</b>	Continue with improvements to flood risk maps and inundation modelling to provide improved flood warning service.	EA	Low	EA	Ongoing
	Take action to include additional properties on the Floodline Warnings Direct service as they become at flood risk over time.	EA	Low	EA	Ongoing

## Super-frontage 1

Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
<b>Assessments for PDZs</b>	PDZ1A	Assessments to look at the flood defence function of Hunstanton dunes to decide if new defences are needed to protect properties in Old Hunstanton and Holme-next-the-Sea during epoch 3.	EA, BCKL&WN, NE, NCC, EH	Medium	EA	End of epoch 2
		Assessments to look at compatibility of western boundaries of SMP and coastal water body (WFD).	EA	Low	EA	SMP3
	PDZ1B	Investigate and record historic assets and features around Holme-next-the-Sea at risk from dunes rolling back over time to enable adaptation and mitigation where needed.	EH, NCC (NLA)	Medium	EH	Epoch 2
	PDZ1C	Assessments to confirm the policy for epoch 3 (HtL or MR), including sustainability of defence system, longshore effects, habitats, historic environment, navigation, groundwater and coastal access.	EA, BCKL&WN, NE, NCC, EH	Medium	EA, NE	Epoch 3
<b>Monitoring (data collection)</b>	PDZ1B	Continue beach monitoring at Holme dunes to determine how the dunes respond to changes in sea level etc over time and inform future policy.	EA, BCKL&WN, NE, NCC	High	EA	Ongoing

Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
Scheme work	PDZ1A	Work needed to maintain defence function of Old Hunstanton dunes during epochs 2 and 3 will depend on outcome of assessments and other actions.	EA, BCKL&WN, NE, NCC	Low	EA	Epoch 3
	PDZ1B	Work needed to maintain defence function of Holme dunes will depend on outcome of assessments and other actions.	EA, BCKL&WN, NE, NCC	Medium	EA	Ongoing
	PDZ1C	Work to realign Thornham sea bank and River Hun outfall in epoch 3 depends on outcome of assessments and other actions.	EA, BCKL&WN, NE, NCC	Low	EA	Epoch 3
Asset management	PDZ1A	Continue to manage defences at Old Hunstanton dunes in accordance with a hold the line policy in epoch 1 and limited intervention in later epochs.	EA, BCKL&WN, NCC	Medium	EA	Ongoing
	PDZ1A and B	Continue to manage defences at Holme dunes with limited intervention to maintain a natural coastline and sustain flood defence to properties.	EA, BCKL&WN, NE, NCC	Medium	EA	Ongoing
	PDZ1C	Continue to manage defences at Thornham sea bank in accordance with a hold the line policy in epochs 1 and 2.	EA, BCKL&WN, NE, NCC	Medium	EA	Ongoing

Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
<b>Communication</b>	PDZ1B and C	Consult and communicate with the local community and landowners to prepare for possible realignment of Thornham sea bank during epoch 3.	EA, BCKL&WN, NCC, NE	Medium	EA, NCC, BCKL&WN	Epoch 3
	PDZ1D	Consult with local community and Norfolk County Council about how to maintain coastal path along the Thornham frontage under a no active intervention policy.	EA, NCC, BCKL&WN	High	NCC, EA	SMP3
<b>Emergency response</b>	PDZ1A	Update emergency plans for Old Hunstanton to reflect change in policy from epoch 2 and increased number of properties at flood risk over time.	BCKL&WN, NCC, EA, businesses	Medium	BCKL&WN, EA	Epoch 2
	PDZ1B	Update emergency plans for Holme-next-the-Sea to reflect changes in flood risk over time.	BCKL&WN, NCC, EA, businesses	Medium	BCKL&WN, EA	ongoing
	PDZ1C and D	Update emergency plans for Thornham to reflect changes in flood risk over time.	BCKL&WN, NCC, EA, businesses	Low	BCKL&WN, EA	ongoing



Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
<b>Adaptation / resilience</b>	PDZ1A	Encourage adaptation and resilience of golf course, beach huts and properties at Old Hunstanton.	BCKL&WN, NCC, EA, Le Strange estate	Medium	BCKL&WN, EA	Epoch 2
	PDZ1B	Encourage adaptation and resilience of properties at Holme-next-the-Sea if needed over time.	BCKL&WN, NCC, EA	Low	BCKL&WN, EA	Epoch 2
	PDZ1C and D	Encourage adaptation and resilience of properties and coastal path at Thornham if needed over time.	BCKL&WN, NCC, EA	Low	BCKL&WN, EA	Epoch 3
<b>Habitat creation and environmental mitigation</b>	PDZ1C	Identify suitable locations and create freshwater habitat to replace any lost if policy for Thornham sea bank is confirmed as managed realignment for epoch 3.	EA, NE	Medium	EA	End of epoch 2

## Super-frontage 2

Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
<b>Assessments for PDZs</b>	PDZ2D	Assessments to confirm the policy for epoch 2 (MR or HtL) and epoch 3 for Brancaster grazing marsh, including sustainability of defence system, longshore effects, habitats, historic environment, navigation, groundwater and coastal access.	EA, BCKL&WN, NE, NCC, EH	Medium	EA, NE	Epoch 2
	PDZ2G	Assessments to confirm the policy for epoch 3 (HtL or MR) for the area behind Scolt Head Island, including sustainability of defence system, longshore effects, habitats, historic environment, navigation, groundwater and coastal access.	EA, BCKL&WN, NE, NCC, EH	Medium	EA, NE	Epoch 2
	PDZ2I	Assessments to investigate and predict the development of Holkham dune system and its sustainability as a flood defence.	EA, BCKL&WN, NNDC, NE, NCC, EH	Medium	EA	Epoch 2
	PDZ2L	Assessments to investigate the benefits and disadvantages of a possible future realignment of Wells east bank, including sustainability of defence system, longshore effects, navigation, habitats, historic environment, groundwater, coastal access and land drainage.	EA, NNDC, NCC, NE, EH, Port of Wells	Low	NNDC, EA	End of epoch 1

Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
Monitoring (data collection)	PDZ2I	Continue beach monitoring at Holkham dunes to determine how the dunes respond to changes in sea level etc over time.	EA, BCKL&WN, NNDC, NE, NCC	Medium	EA	Ongoing
	PDZ2J, 2K and 2L	Monitor effects of recent developments in Wells harbour.	EA, NE, Wells Harbour Commissioners, Statoilhydro / Siemens	Medium	NNDC	All epochs
	PDZ2G	Monitor effects of SMP policies at Deepdale, Norton and Overy marshes on the ecological potential of the River Burn freshwater body to inform SMP3 and future policies.	EA, BCKL&WN, NCC	Medium	EA	Ongoing
Scheme work	PDZ2B	Managed realignment at RSPB reserve at Titchwell.	RSPB	High	RSPB	2012
	PDZ2D	Work to realign Brancaster grazing marsh bank in epoch 2 depends on outcome of assessments and other actions.	EA, BCKL&WN, NE, NCC	Medium	EA	Epoch 2
	PDZ2G	Work to realign Deepdale, Norton and Overy marsh banks in epoch 3 depends on outcome of assessments and other actions.	EA, BCKL&WN, NE, NCC	Low	EA	Epoch 3

Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
	PDZ2I	Work needed to maintain defence function of Holkham dunes will depend on outcome of assessments and other actions.	EA, BCKL&WN, NNDC, NE, NCC	Medium	EA	Ongoing
<b>Asset management</b>	PDZ2B	Continue to manage the realigned defences at Titchwell reserve in accordance with a hold the line policy during epochs 2 and 3.	RSPB	Medium	RSPB	End of epoch 2
	PDZ2D	Continue to manage the defences at Brancaster grazing marsh in accordance with a hold the line policy during epoch 1.	EA, BCKL&WN, NE, NCC	Medium	EA	End of epoch 1
	PDZ2E	Continue to manage the defences at Royal West Norfolk golf club in accordance with a hold the line policy.	RWNGC	Medium	RWNGC	Ongoing
	PDZ2F	Continue to manage the defences at Brancaster and Brancaster Staithe in accordance with a hold the line policy.	Private defence owners	Medium	Private defence owners	Ongoing
	PDZ2G	Continue to manage defences in accordance with a hold the line policy during epochs 1 and 2 for Deepdale, Norton and Overy marshes and all epochs for the River Burn outfall.	EA, BCKL&WN, NE, NCC	Medium	EA	Ongoing
	PDZ2H	Continue to manage the defences at Burnham Overy Staithe in accordance with a hold the line policy.	EA, BCKL&WN, NE, NCC	Medium	EA	Ongoing

Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
	PDZ2I	Continue to manage defences at Holkham dunes with limited intervention to maintain a natural coastline and sustain flood defence to properties and historic assets.	EA, Holkham Estate, BCKL&WN, NNDC, NE, NCC	Medium	EA	Ongoing
	PDZ2J, 2K and 2L	Continue to manage the defences around Wells-next-the-Sea in accordance with a hold the line policy.	EA, NNDC, NE, NCC	Medium	EA	Ongoing
Communication	PDZ2D	Consult and communicate with the local community and landowners to prepare for possible realignment of Brancaster grazing marsh bank during epoch 2.	EA, BCKL&WN, NCC, NE	High	EA	End of epoch 1
	PDZ2G	Consult and communicate with the local community and landowners to prepare for possible realignment of Deepdale, Norton and Overy marsh banks during epoch 3.	EA, BCKL&WN, NCC, NE	Medium	EA	End of epoch 2
	PDZ2F	Consult with private defence owners at Brancaster and Brancaster Staithe about maintaining their defences through all three epochs under a hold the line policy.	EA, BCKL&WN, NCC	High	EA	End of epoch 1
Emergency response	PDZ2A-2I	Update emergency plans for all communities to reflect changes in flood risk over time.	BCKL&WN, NCC, EA, businesses	Low	BCKL&WN, EA	ongoing

Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
	PDZ2J-2L	Update emergency plans for Wells-next-the-Sea to reflect changes in flood risk over time.	NNDC, NCC, EA, businesses	Low	NNDC, EA	ongoing
<b>Adaptation / resilience</b>	PDZ2I	Encourage adaptation and resilience of properties at Holkham and Wells-next-the-Sea if needed over time.	BCKL&WN, NNDC, NCC, EA	Low	BCKL&WN, NNDC, EA	Epoch 2
	PDZ2D	Encourage adaptation of access road to golf club and beach car park if managed realignment policy goes ahead in epoch 2 or 3.	BCKL&WN, NCC, RWNGC, EA	Medium	BCKL&WN, NCC, EA	End of epoch 1
<b>Habitat creation and environmental mitigation</b>	PDZ2D	Identify suitable locations and create freshwater habitat to replace any lost if policy for Brancaster grazing marsh is confirmed as managed realignment during epochs 2 or 3.	EA, NE	Medium	EA	End of epoch 1
	PDZ2G	Identify suitable locations and create freshwater habitat to replace any lost if policies for Deepdale, Norton and Overy marsh banks are confirmed as managed realignment during epoch 3.	EA, NE	Low	EA	End of epoch 2

### Super-frontage 3

Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
Assessments for PDZs	PDZ3A	Assessments to prepare for managed realignment of Blakeney Freshes during epoch 2, including sustainability of defence system, longshore effects, habitats (including replacement habitat), historic environment, navigation, groundwater and coastal access.	EA, NNDC, NE, NCC, EH, National Trust	High	EA	2015
	PDZ3A	Assessments to confirm the policy for epoch 3 (HtL or MR) at Cley marshes, including sustainability of defence system, longshore effects, habitats, historic environment, navigation and groundwater.	EA, NNDC, NE, NCC, EH	Medium	EA	End of epoch 2
		Consider compatibility of eastern boundaries of SMP and coastal water body (WFD).	EA	Low	EA	SMP3
Monitoring (data collection)	PDZ3D	Continue monitoring of the Cley to Salthouse shingle ridge to inform SMP3.	EA, NE, NNDC	Medium	EA	SMP3
	PDZ3A	Monitor effects of SMP policies at Blakeney Freshes and Cley marshes on the ecological potential of the River Glaven freshwater body to inform SMP3 and future policies.	EA, NNDC, NE	Medium	EA	End of epoch 3

Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
Scheme work	PDZ3A	Carry out managed realignment at Blakeney Freshes and associated work.	EA, NNDC, NE, NCC, EH, National Trust	High	EA	Epoch 2
	PDZ3A	Work to realign Cley west bank in epoch 3 depends on outcome of assessments and other actions.	EA, NNDC, NE, NCC, EH	Low	EA	End of epoch 2
Asset management	PDZ3A	Continue to manage defences in accordance with a hold the line policy during epoch 1 for Blakeney Freshes, epochs 1 and 2 for Cley west bank and all epochs for River Stiffkey outfall, Morston and River Glaven outfall.	EA, BCKL&WN, NE, NCC	Medium	EA	Ongoing
	PDZ3C	Continue to manage the defences around Blakeney in accordance with a hold the line policy.	EA, NNDC, NE, NCC	Medium	EA	Ongoing
	PDZ3D	Review and update management plan for Cley to Salthouse shingle ridge as and when required.	EA, NE	Medium	EA, NE	First review in 2010



Action	PDZ	Action description	Potential source for funding	Priority	Responsibility (lead partner)	When by (subject to funding)
<b>Communication</b>	PDZ3A	Consult and communicate with the local community and landowners to prepare for realignment of Blakeney Freshes during epoch 2 and possible realignment of Cley west bank during epoch 3.	EA, NNDC, NCC, NE	High	EA	End of epoch 1
<b>Emergency response</b>	PDZ3A-3D	Update emergency plans for all communities to reflect changes in flood risk over time.	NNDC, NCC, EA, businesses	Low	NNDC, EA	ongoing
	PDZ3D	Develop triggers for intervention in case of threat of flooding to people, properties and the A149 behind the Cley to Salthouse shingle ridge.	EA, NE, NNDC, NCC	High	EA, NE	2012
<b>Adaptation / resilience</b>	PDZ3D	Encourage adaptation and resilience of properties at Cley and Salthouse if needed over time.	NNDC, NCC, EA	Low	BCKL&WN, EA	Epoch 2
<b>Habitat creation and environmental mitigation</b>	PDZ3A	Identify suitable locations and create freshwater habitat to replace any lost due to epoch 2 managed realignment at Blakeney Freshes and potential epoch 3 realignment at Cley marshes.	EA, NE	High	EA	End of epoch 1

## **Appendices (overview)**

This section gives an overview of the contents of the SMP appendices. They are provided as separate documents.

### **Appendix A SMP development**

- Describe stages and tasks
- Includes references to main text and other appendices for content
- Includes graphics/diagrams shown in CSG/EMF presentations to explain logic of the SMP tasks

### **Appendix B Engagement and consultation**

- Contains engagement strategy
- Includes information about all meetings and public events that have taken place so far
- Summary of public consultation on draft SMP

### **Appendix C Baseline processes**

- Final report looking at coastal processes and evolution

### **Appendix D Theme review**

- Final report (incorporating results of questionnaires and updated Rapid Coastal Zone Assessment Survey (RZCAS)) defining features, benefits and issues

### **Appendix E Policy development and appraisal**

- Describes the policy development and appraisal process
- Objective-setting, including description of the agreed approach, characterisation, objectives for each frontage and accompanying key value cross-sections
- Policy development, including:
  - playing field
  - definition of policy packages (including defining the options for appraisal and defining the alignment of the policy packages)
- Policy appraisal (including additional task of testing the baseline scenarios that helped to shape the policy appraisal method). This includes the full policy appraisal results in tables for one PP for one PDZ. Will present the complete set of policy appraisal graphics for all PPs for all PDZs
- From policy appraisal to draft policy. Describes the steps we went through for PDZ1 and PDZ2 in terms of extra work, modelling, sensitivity analysis and the way forward from this additional work
- Summary of appraisal and policy changes following public consultation

### **Appendix F Shoreline interactions and responses**

- Final report prepared for the assessment of coastal defences
- Final report prepared for developing baseline scenarios
- Final report prepared for assessing shoreline response (under all PPs for all PDZs)
- From policy appraisal to draft policy. Mirrors the same chapter as in appendix E. Discusses the extra tasks in more detail and focuses on the coastal processes elements of the additional work

### **Appendix G Policy appraisal**

- Focuses only on selected policies
- Focuses more on the justification and less on the description of the draft policy

### **Appendix H Economics**

- Final report prepared for the economic viability assessment
- Provides high-level assessment of the economic justification of the draft policy in terms of justified, not justified and marginal

### **Appendix I Metadatabase and bibliographic database**

- Description and tables. Refers to digital deliverables

### **Appendix J Sustainability appraisal signposting**

- Contains 'road map' of how the SMP covers the requirements of the sustainability appraisal

### **Appendix K Water Framework Directive compliance assessment**

- Assessment of the plan and policies against the objectives of the River Basin Management Plan

### **Appendix L Strategic Environmental Assessment**

- Contains the structured evaluation of the plan against an established suite of environmental and social economic receptors. Also contains the SEA scoping report and SEA addendum as annexes

### **Appendix M Appropriate Assessment**

- Contains the assessment of the plan for its potential effects on international wildlife designations in line with the Habitats regulations