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Wash East Coastal Management Strategy

Environmental Report (Final)

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1. Introduction

1.1 Background and Context

Following the first SMP for The Wash (SMP1, published in 1996), a local strategy was developed for the Environment Agency-managed frontage which stretches from South Hunstanton to Wolferton Creek in 2001. This strategy recommended initial structural works, a beach renourishment programme and an annual recycling programme of sand and shingle from Snettisham Scalp in the south, to the low sediment beaches in the north. A subsequent Project Appraisal Report (PAR) was approved in 2007 that confirmed funding arrangements for the annual recycling until 2012. Further funding from the Regional Flood and Coastal Committee was confirmed in 2013 to continue the recycling programme for another two years up to and including 2014.

A second Shoreline Management Plan (SMP2) for The Wash was drafted in 2009. SMP2 identified a number of issues with regard to the ongoing management of the frontage under the 2001 Strategy, in part due to its foundation in the policies of SMP1. These included uncertainty over the viability of the current management approach in the face of future climate change and uncertainty in coastal processes interactions across the frontage length. The SMP2 therefore recommended a review of the 2001 Strategy.

The work from The Wash SMP2 and the 2001 Strategy has formed the basis of the new Wash East Coastal Management Strategy (WECMS).

At the start of the review, the area for the WECMS was extended to include the north of Hunstanton and its cliffs to look at the interactions between the erosion frontage in the north and the flood risk frontage in the south (see **Figure 1.1**). Following this boundary change, King's Lynn and West Norfolk Borough Council became full partners for the development of the WECMS.

The WECMS objectives are to:

1. determine a sustainable approach to flood and erosion risk management for the people, property and environment between Hunstanton Cliffs and Wolferton Creek;
2. identify and promote a coastal management approach that balances technical, environmental, economic and social issues for The Wash East coast;
3. improve our knowledge of relevant coastal processes, where necessary, to inform key project decisions and the study completion;
4. build on the Pathfinder project¹ to improve public understanding of coastal management issues for The Wash East coast, to gain public support for any changes in approach to coastal management and to pursue possible third party funding mechanisms; and
5. identify appropriate responsibility for future coastal management.

Although not mandatory under the Strategic Environmental Assessment (SEA) Directive², all Environment Agency strategies are subject to SEA in line with Defra guidance and Environment Agency national procedures. The key aim of the SEA is to ensure that environmental considerations are fully integrated into high-level decision making; this

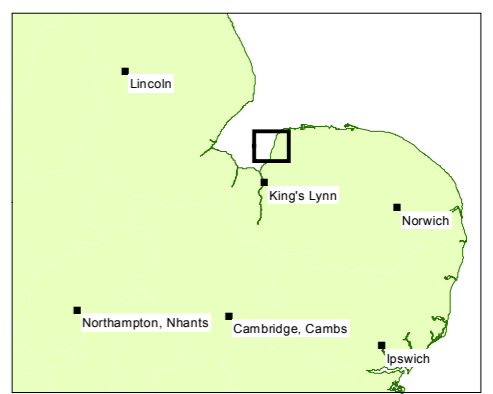
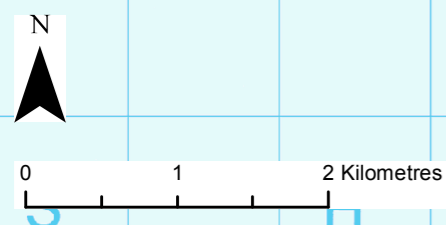
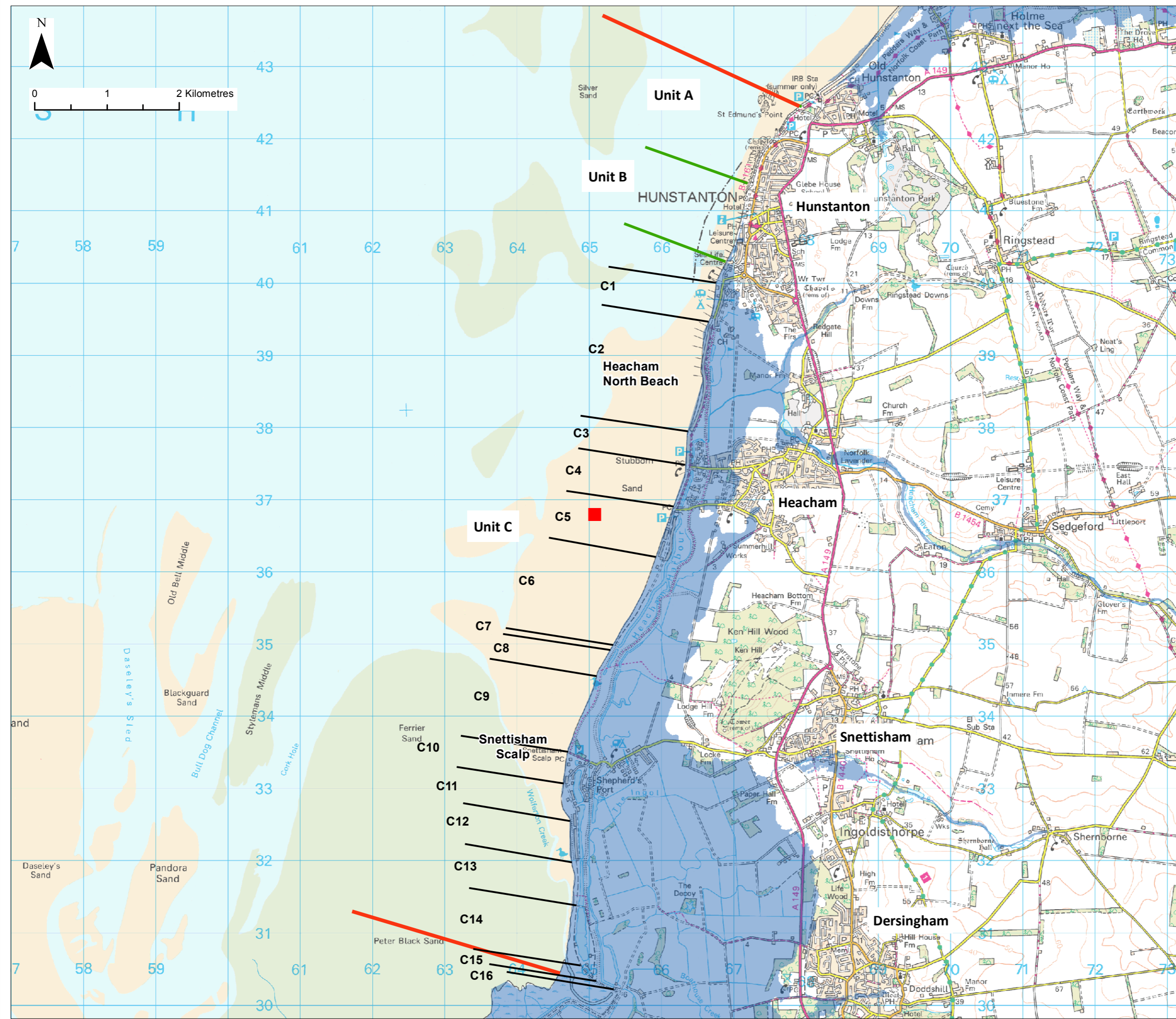
¹ The Pathfinder project was led by the Borough Council of King's Lynn and West Norfolk and undertaken by Risk Policy Analysts. It was an investigation into local willingness to pay and potential funding mechanisms related to future projects.

² Directive 2001/42/EC of the European Parliament and of the Council on the assessment of the effects of certain plans and programmes on the environment.

ensures that all environmental concerns contribute to and ultimately influence the options appraisal process within the preparation and implementation of the Strategy.

1.2 Location

The Project Area is defined as the extent for which a coastal management strategy will be developed. Since the 2001 strategy the frontage has since been modified in order to reflect the SMP Policy Development Zones (PDZs). The amended Project Area extends from the northern edge of the Hunstanton Cliffs to Wolferton Creek in the south. The principal town along the frontage is Hunstanton and the principal villages are Heacham, Snettisham, Dersingham and Wolferton. This area is identified on **Figure 1.1**.



- Key:**
- National Grid Reference Point (TF650368)
 - Wash East Unit C Sub Units
 - Wash East Project Area Boundaries
 - Wash East Unit Boundaries
 - Flood Zone 3

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Title:
Location Plan

Project:
Wash East SEA
Environmental Report

Client:
Environment Agency

Date:
June 2014

Scale @ A3:
1:50,000

Figure:
1.1



I:\97\516\Technical_Data\T5_GIS\Projects\SEA_Scoping_Consultation_Document\Figure 1_1 - Location Plan.mxd

2 The Strategy

2.1 The Study Area

WECMS Project Area

The Project Area is defined as the extent for which a coastal management strategy will be developed. This extends from the northern edge of the Hunstanton Cliffs to Wolferton Creek in the south, as identified on **Figure 1.1**.

The seaward extent is determined by mean high water springs plus approximately 400m out to sea to allow for the development of any options involving offshore structures; its landward extent is determined by the extents of the 1 in 100 year flood and erosion rates, as shown on **Figure 1.1**.

To enable easier assessment of the various coastal processes and issues which occur in the Project Area, the frontage has been subdivided into three units which run from north to south. The units reflect the PDZs developed as part of the Wash SMP2. Unit A (SMP2 PDZ 4) is small and contains the Hunstanton Cliffs area. Unit B (SMP2 PDZ 3) is the town of Hunstanton itself and Unit C (SMP2 PDZ 2) covers the rest of the frontage down to Wolferton Creek, including Heacham and Snettisham. These units, shown on **Figure 1.1**, reflect different aspects of the frontage which in turn require contrasting management options and therefore how each unit boundary has been defined.

The Environment Agency has responsibility for the flood risk management for Unit C of the WECMS frontage. The Borough Council of King's Lynn and West Norfolk is responsible for the erosion risk frontage of Hunstanton Town and Cliffs (Unit A and B). Units B and C have been managed by both parties in recent years.

The early stages of the strategy reviewed, updated and strengthened the understanding of the coastal processes and the problem that lies along the Wash East frontage. Linkages between the units were explored and it has been determined that the physical interactions are limited. Therefore, the WECMS looks at each unit individually for the development of options, while continuing to highlight where the linkages do exist; through the socio-economic interactions.

SEA Study Area

The Study Area is a wider zone of assessment, defined as the area that can influence the development of an option for the Strategy, or can be influenced by it. For instance, in terms of landscape and seascape character this is also a far larger area than the direct project area. With regard to the Water Framework Directive (WFD) this means that the study area includes water bodies which are outside the project area but which either have some connectivity to it or which could be affected by the wider influence of the option selected by the Strategy. For the Habitats Regulations Assessment (HRA), the study area includes all directly adjoining internationally-designated sites and those which may be affected by the proposed options.

2.2 Consultation and Scoping

A Scoping Consultation Document (SCD) was issued in April 2012, with a consultation period running for five weeks. The purpose of this document was to present the SEA stages and tasks along with the purpose of each respective stage in order to ensure effective consultation with statutory consultees, internal specialists and other key

stakeholders³ on the scope of the upcoming assessment and level of detail of the information that is included in this Environmental Report (ER). The ER is the final output of the assessment process.

Interested parties who were invited to comment included statutory consultees the Environment Agency, English Heritage and Natural England, as well as other stakeholders and interested parties such as the Norfolk Coast Partnership, Marine Management Organisation (MMO), the Centre for Environment, Fisheries and Aquaculture Science (CEFAS), Borough Council of King’s Lynn and West Norfolk, Norfolk County Council and the Eastern Inshore Fisheries and Conservation Authority. The key issue raised during this consultation exercise was a need to carry out modelling to confirm potential future flood extents in the event of a breach, specifically in Unit C. An impact upon flood extents in Unit C could have changed the study area, which would have triggered additional baseline assessment and consultation on the new area.

The comments were considered and incorporated into a Scoping Report (Environment Agency, 2013), which drew on the baseline information and consultation responses to outline the final scope of the SEA. The elements ‘scoped in’ to the SEA are those which are now recorded in this ER – the primary written output of the SEA process. The Scoping Report provided the basis for this ER, in particular the baseline, and sets the context/ framework for the ongoing assessment. The Scoping Report is presented as **Appendix A** to this report for ease of reference.

The scoping process is intended to ensure that the SEA focuses only on those issues which are considered to be significant. Through the scoping process, informed by the consultation, it was concluded that a number of SEA topic areas were not likely to be significantly impacted by the Strategy and were therefore scoped out as requiring further assessment. These were soils, contaminated land, coastal processes, bathing waters, shellfish waters, air quality, visual amenity and material assets. **Table 2.1** details the conclusions drawn for each SEA topic.

Table 2.1 Outcomes of the Scoping Process

SEA topic	Sub section	Scoped In (Y/N)	Reason
Population and communities	Local community and economy	Y	The risk of flooding and coastal erosion has significant implications on the population of Hunstanton, Heacham and Snettisham in terms of stress, disruption, and impacts on local amenity and recreational facilities. Agriculture – of note particularly in Unit C – was added into the assessment by the project team following consultation.
	Flood and coastal erosion risk	Y	
	Recreation and tourism	Y	
Historic environment	Historic environment	Y	Strategic options may impact on the rich heritage of the area with known and potentially unknown archaeological and historic features.
Soil	Geology	Y	A number of sites of national geological interest are contained within the project area or wider study area.
	Soils	N	Construction of flood risk management options could adversely affect local soil quality but these issues can be addressed at project level.
	Contaminated land	N	No sites with the potential for significant contamination have been identified.
	Coastal processes	N	Strategic options have the potential to affect coastal processes in the study area. However we propose that coastal processes are considered as a pathway in assessing impacts on other SEA topics, and that hydromorphological changes are already considered as an element of WFD water bodies.

³ The SEA regulations require that as a minimum the statutory consultees (for England this being Natural England, English Heritage and the Environment Agency) be consulted when deciding on the scope and detail of the Environmental Report.

SEA topic	Sub section	Scoped In (Y/N)	Reason
Water	WFD water bodies	Y	Strategic options have the potential to affect the status/potential of the water bodies within the study area.
	Bathing waters	N	Strategic options have the potential to affect water quality and water resources. For example, by changing patterns of water flow (ground and surface water), currents and sediment flow. We propose that bathing water quality is considered as part of the local amenity; acknowledging the requirements of the Bathing Waters Directive, and that riverine and groundwater quality (including impacts to abstraction/discharge consents) are considered within the WFD water bodies assessment. Shellfish Waters are also considered under the WFD.
	Shellfish waters	N	
	Riverine surface water quality	N	
	Groundwater quality	N	
Licensed abstraction and discharge consents	N		
Air and climatic factors	Air quality	N	Strategic options are unlikely to significantly influence this or any other pollution source. Localised impacts associated with construction will be assessed in more detail at a project level rather than at this strategic level.
	Climate	Y	Climate projections will be considered in line with the latest Defra guidance, and more recent outputs from UKCP. Rising sea levels and increased storminess has significant implications on strategic options. Options also have the potential to contribute to lower (whole life) carbon delivery of the Strategy's objectives.
Landscape and seascape	Landscape / seascape character	Y	Strategic options have the potential to impact on landscape character and visual amenity whether through a changed coastline as a result of doing nothing or altered landscape through construction of defences. Amenity value, considered under <i>Population and Communities</i> , incorporates visual amenity
	Visual amenity	N	
Critical infrastructure and material assets	Material assets	N	Transport links and other infrastructure in the study area are central to the functionality of this stretch of the coastline. Strategic options may have significant impacts on these. Other material assets and community infrastructure are considered within the <i>Population and Communities</i> section.
	Critical infrastructure	Y	
Biodiversity, flora and fauna	Designated sites and features	Y	Strategic options may directly or indirectly impact on habitats and associated species as a result of land loss, disturbance and damage or for example from altered coastal processes.
	Terrestrial ecology	Y	
	Marine ecology	Y	

3 The SEA Approach

3.1 The WECMS Approach

Although not mandatory under the SEA Directive⁴, all Environment Agency strategies are subject to a SEA in line with the SEA legislation, Defra guidance and Environment Agency national procedures. **Figure 3.1** outlines the key steps in an SEA and how the various stages interlink.

We are currently at the Environmental Reporting stage of the SEA process (Stage C in **Figure 3.1**). This stage involves reporting on the process of developing and refining alternatives and undertaking an SEA of the significance of their impacts. The ER details the output of the process of assessing environmental impacts of the Strategy options (Stage B in **Figure 3.1**). This stage assessed potential environmental impacts of strategic options and 'reasonable alternatives' and assisted in the selection of a preferred strategic solution(s).

The key aim of the SEA is to ensure that environmental considerations are fully integrated into high-level decision making (in this case integrated into the preparation and implementation of the Strategy). **Table 3.1** below sets out where the specific SEA requirements have been met in this report.

Table 3.1 Schedule of Strategic Environmental Assessment Requirements

Requirements of the Directive	Where Covered
Preparation of an environmental report in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and geographical scope of the plan or programme, are identified, described and evaluated. The information to be given is:	
a) An outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes.	Section 1 and Section 3
b) The relevant aspects of the current state of the environment and the likely evolution without implementation of the plan or programme.	Section 4
c) The environmental characteristics of areas likely to be significantly affected.	Section 4
d) Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directive 79/409/EEC and 92/43/EEC.	Section 4
e) The environmental protection objectives established at international, community or national level which are relevant to the programme and the way those objectives and any environmental considerations have been taken into account during its preparation.	Section 3
f) The likely significant effects on the environment, including: short, medium and long term; permanent and temporary; positive and negative; secondary, cumulative and synergistic effects on issues such as: biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors.	Section 6
g) The measures envisaged to prevent, reduce and, as fully as possible, offset any significant adverse effects on the environment of implementing the plan or programme.	Section 6
h) An outline of the reasons for selecting the alternatives dealt with and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.	Section 5
i) A description of measures envisaged concerning monitoring (in accordance with Regulation 17).	Section 6
j) A non-technical summary of the information provided under the above	Provided as a separate

⁴ EC Directive 2001/42/EC

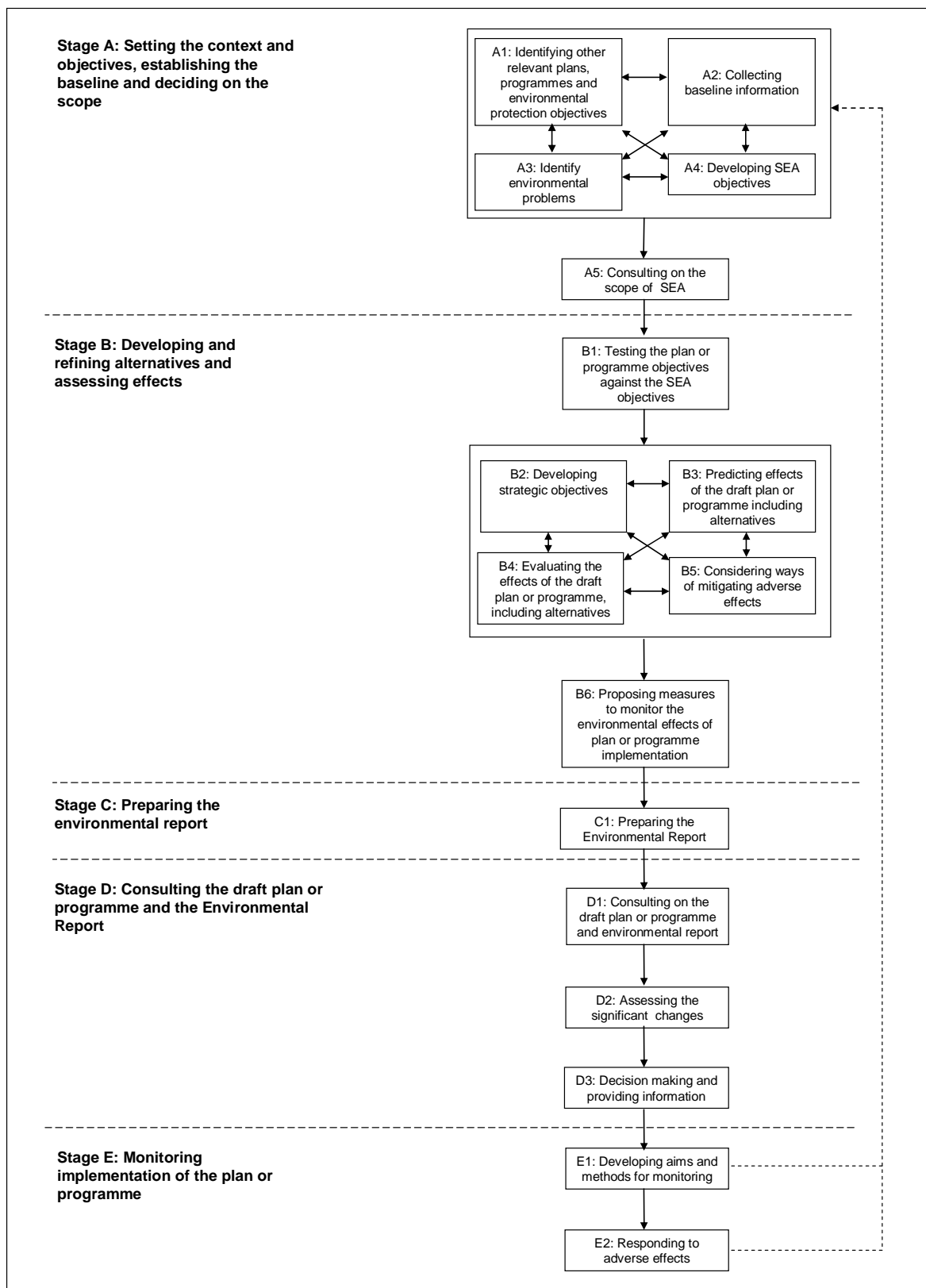
Requirements of the Directive	Where Covered
headings.	document

In line with guidance the assessment includes consideration of an ‘environmentally-preferable’ option. The process included the development of a longlist of potential strategic options, which was assessed and also influenced by engagement with the stakeholder groups. The project-wide objectives and criteria were used to assess each option, again with the input of stakeholder groups.

Through further consultation and assessment a final ‘preferred’ option selected, together with a rationale for its preference over reasonable alternative options.

Due to uncertainties related to the options within the WECMS (on which further information is provided in **Section 5**), the SEA undertaken of the preferred options (**Section 6**) has been high level based on professional judgement and qualitative assessment. As a result it is likely that further assessment at the project level will be required as the preferred options are developed further.

Figure 3.1 SEA stages and relationship between tasks (Table from Office of the Deputy Prime Minister (2005))



The ER is the main written output of the SEA process and documents the complete assessment of developing the preferred strategic approach.

Following production of the ER, the report will be made available alongside the draft Strategy for consultation. The outcome of this consultation exercise is the production of the final Strategy, incorporating any concerns raised during the consultation exercise.

3.2 SEA Methodology

The SEA Directive requires that the nature of the impact be considered (i.e. impact magnitude, whether beneficial or adverse, permanent or temporary, short, medium or long term) and also that indirect, synergistic and cumulative impacts be considered. The Directive also requires that predicted impacts are evaluated for significance to facilitate targeting of mitigation and monitoring measures. These issues are inherent to the assessment carried out.

Many environmental issues result from the accumulation of multiple small and often indirect impacts, for example changes in landscape as a result of flood defence works along the coastline. These impacts are defined below (adapted from Office for Deputy Prime Minister, 2006):

- Secondary or indirect impacts – Impacts that are not a direct result of the strategic options, but occur away from the original impact or as a result of a complex pathway; and
- Cumulative Impacts – These can arise where several developments each have insignificant impacts but together have a significant impact, or where several individual impacts of the strategic options (e.g. dust, noise and visual) have a combined effect.

Secondary or indirect impacts were identified and assessed primarily through the examination of the relationship between various objectives, and the consideration of complex impacts, during the assessment of environmental impacts.

Cumulative impacts are difficult to deal with on a project by project basis through the Environmental Impact Assessment (EIA) process. It is at the SA/SEA level that these are most effectively identified and addressed. Cumulative impact assessment is a systematic procedure for identifying and evaluating the significance of impacts from multiple activities. The analysis of the causes, pathways and consequences of these impacts is an essential part of the process. Cumulative impacts were considered throughout the entire SEA process, and are identified and discussed in **Section 7**.

The considerations above have been brought together to form an overall impact assessment for each unit within the frontage. The assessment has considered the timing of impacts during implementation of the Strategy; however, as the end-of-Strategy period impacts remain broadly similar, phasing issues have not significantly affected the conclusions.

The impact of all of the potential options for each unit on the various SEA receptors has been scored using the approach set out in **Table 3.1**, and the scoring guidance detailed within **Appendix A**.

Table 3.1 Impact significance

		Sensitivity of Receptor			
		Negligible	Low	Medium	High
Magnitude of Impact	High	Minor + or -	Minor + or -	Major ++ or --	Major ++ or --
	Medium	Neutral / No impact 0	Minor + or -	Minor + or -	Major ++ or --
	Low	Neutral / No impact 0	Neutral / No impact 0	Minor + or -	Minor + or -
	Negligible	Neutral / No impact 0	Neutral / No impact 0	Neutral / No impact 0	Minor + or -

3.3 HRA Methodology

The need for a ‘Habitats Regulations Assessment’ (HRA) arises from the EC Habitats Directive (92/43/EEC) and its implementation in the UK under The Conservation of Habitat and Species Regulations 2010 (as amended). The assessment is undertaken for European sites - designated under the Habitats Directive (Special Areas of Conservation (SAC)) or the Birds Directive (Special Protection Areas (SPA)). Sites designated under the Ramsar Convention are also subject to the same provisions. The intention is that adverse effects on site integrity are avoided. An adverse effect is considered to be one that prevents the site from maintaining the condition of the relevant feature(s). The HRA process follows a four-staged approach as follows:

1. Screening: The process to identify the likely impacts of a project upon an international site, either alone or in combination with other plans and projects, and consider whether the impacts are likely to be significant.
2. Appropriate Assessment (AA): The consideration of the impacts on the integrity of the European site, either alone or in combination with other plans and projects, with regard to the site’s structure and function and its conservation objectives. Where there are adverse impacts, an assessment of mitigation options is carried out to determine adverse effect on the integrity of the site. If these mitigation options cannot avoid adverse effects then development consent can only be given if stages 3 and 4 are followed.
3. Assessment of Alternative Solutions: Examining alternative ways of achieving the objectives of the project to establish whether there are solutions that would avoid or have lesser effect on European sites.
4. Imperative Reasons of Overriding Public Interest (IROPI): Assessment where no alternative solution exists and where adverse impacts remain. The process to assess whether the development is necessary for IROPI and, if so, the potential compensatory measures needed to maintain the overall coherence of the site or integrity of the European site network.

During the scoping stage of the WECMS (as detailed within **Appendix A**) five European sites were identified within or adjacent to the Strategy study area which could be potentially affected to some degree by any proposed options. Stage 1 (screening) is presented in **Section 5.8**.

3.4 WFD Methodology

In December 2003, the WFD was transposed into national law by means of the Water Environment (WFD) (England and Wales) Regulations 2003. These Regulations require that all surface waters (rivers, lakes, transitional (estuarine) and coastal waters) and groundwaters achieve Good Ecological Status (GES) or Good Ecological Potential (GEP) by 2015 (or in some cases by 2021 or 2027).

The ecological status of a surface water body is assessed according to:

- The condition of biological elements, for example fish, benthic invertebrates and other aquatic flora;
- Concentrations of supporting physico-chemical elements, for example thermal conditions, salinity, and concentrations of oxygen, ammonia and nutrients;
- Concentrations of specific pollutants, for example copper and other priority substances; and
- The condition of the hydromorphological quality elements, including morphological condition, hydrological regime and tidal regime (coastal waters only).

For the purposes of this Strategy, five water bodies within and adjoining the Study Area were identified during the scoping stage and potential impacts on their objectives assessed. This assessment is presented in **Appendix B** of the Scoping Report (Environment Agency, 2013). Assessment of the preferred options on these water bodies is presented in **Section 5.4**.

3.5 Relevant Plans, Policies and Strategies

Table 3.2 outlines the key legislation, plans and documents that have the potential to interact with the Strategy, and describes the objectives of each which are relevant to the Strategy. The complete list is detailed within the Scoping Report (Environment Agency, 2013).

Table 3.2 Legislation, policy and guidance relevant to the WECMS

Legislation, policy or guidance	Title	Relevance to the WECMS
International		
Legislation	<ul style="list-style-type: none"> The Water Framework Directive (WFD) 	<ul style="list-style-type: none"> Sets a target of aiming to achieve at least 'good status/potential' in all water bodies by 2015. However, provided that certain conditions are satisfied, the achievement of good status/potential may be delayed until 2021 or 2027. Specific 'measures' are set for water bodies to achieve the Environmental Objectives of the WFD (outlined in River Basin Management Plans (RBMPs)). A preliminary assessment of the Options included under the WECMS is required under the WFD to ascertain the impact of the Options upon the status of waterbodies within the study area.
	<ul style="list-style-type: none"> The Habitats Directive 	<ul style="list-style-type: none"> Requires member states to take measures to maintain or restore natural habitats and wild species at a favourable conservation status, introducing robust protection for those habitats and species of European importance. Under <i>The Conservation of Habitats and Species Regulations 2010</i> (the implementation of the Habitats Directive into UK law) an assessment is required if there is likely to be a significant effect on European site as a result of a plan or programme.
	<ul style="list-style-type: none"> The Birds Directive 	<ul style="list-style-type: none"> Requires member states to take measures to conserve and manage wild birds in Europe. Under <i>The Conservation of Habitats and Species Regulations 2010</i> (the implementation of the Birds Directive into UK law) an assessment is required if there is likely to be a significant effect on European site as a result of a plan or programme.
	<ul style="list-style-type: none"> The Bathing Water Directive 	<ul style="list-style-type: none"> Lays down provisions for: <ul style="list-style-type: none"> the monitoring and classification of bathing water quality; the management of bathing water quality; and the provision of information to the public on bathing water quality.
	<ul style="list-style-type: none"> The Urban Waste Water Directive 	<ul style="list-style-type: none"> Puts in place a requirement for: <ul style="list-style-type: none"> The collection and treatment of waste water in all agglomerations of >2000 population equivalents (p.e.); Secondary treatment of all discharges from agglomerations of > 2000 p.e., and more advanced treatment for agglomerations >10 000 population equivalents in designated sensitive areas and their catchments; A requirement for pre-authorisation of all discharges of urban wastewater, of discharges from the food-processing industry and of industrial discharges into urban wastewater collection systems; Monitoring of the performance of treatment plants and receiving waters; and

Legislation, policy or guidance	Title	Relevance to the WECMS
		<ul style="list-style-type: none"> ▪ Controls of sewage sludge disposal and re-use, and treated waste water re-use whenever it is appropriate.
National		
Legislation	<ul style="list-style-type: none"> • Marine and Coastal Access Act 2009 • Climate Change Act 2008 • Natural Environment and Rural Communities Act 2006 • Countryside and Rights of Way Act 2000 • The Wildlife and Countryside Act 1981 (as amended) • Planning (Listed Buildings and Conservation Areas) Act 1990 • The Ancient Monuments and Archaeological Areas Act 1979 • National Heritage Act 1997 and 2002 amendment 	<ul style="list-style-type: none"> • Provides the framework environmental protection for marine areas through the planning system, conservation, fisheries and marine licensing. This Strategy must consider its impact upon all of these. • Provides a legal framework for ensuring that Government meets its commitments to tackle climate change • Requires that the UK's emissions are reduced by at least 80% by 2050, compared to 1990 levels, and introduces legally binding carbon budgets. • Sets the legal framework for adaptation policy in the UK • Confers local authorities with the duty to conserve biodiversity, and the responsibility to produce biodiversity lists of species and habitats which are of principal importance for the purpose of conserving biodiversity. • Places a duty on Government Departments to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity. • Implements the Bern Convention and the Birds Directive. Contains details of European and national designated sites, protection for designated species. • An Act of Parliament that altered the laws on granting of planning permission for building works, notably including those of the listed building system in England and Wales. • Provides protection to sites which warrant protection due to their national importance as ancient monuments. • Damage to an ancient monument is a criminal offence and any works taking place within one require Scheduled Monument Consent from the Secretary of State. • The National Heritage Acts comprise four Acts that aim to alter the way in which Britain's national heritage assets are managed and protected.
Policy	<ul style="list-style-type: none"> • National Planning Policy Framework (2012) • UK Sustainable Development Strategy (2005) 	<ul style="list-style-type: none"> • Enshrines a "<i>presumption in favour of sustainable development</i>" within the planning system (where sustainable means ensuring that better lives for ourselves don't mean worse lives for future generations, whilst development means growth). • Contains five main principles of sustainable development within the UK: <ul style="list-style-type: none"> ▪ living within environmental limits; ▪ ensuring a strong, healthy and just society; ▪ achieving a sustainable economy; ▪ promoting good governance; and ▪ using sound science responsibly.

Legislation, policy or guidance	Title	Relevance to the WECMS
	<ul style="list-style-type: none"> UK BAP 	<ul style="list-style-type: none"> provides detailed plans for conservation of the UK biological resources at national and devolved levels
Regional		
Policy	<ul style="list-style-type: none"> Catchment Flood Management Plans Anglian River Basin Management Plan (RBMP) (2009) Wash Shoreline Management Plan (SMP2) The North West Norfolk Catchment Abstraction Management Strategy (CAMS) Norfolk and The Wash Biodiversity Action Plans (BAPs) The Wash and Fens Green Infrastructure Plan (2011) 	<ul style="list-style-type: none"> Recommend methods for managing flood risk now and over the next 50-100 years. The North Norfolk CFMP is proposing Policy 2 for the Hunstanton area which is classified as “Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions” A small section of the study area to the south of Hunstanton falls within Policy 3 of the Great Ouse CFMP. Policy 3 is classified as “Areas of low to moderate flood risk where we are generally managing existing flood risk effectively” The rest falls in Policy 4 which is described as “Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change” The RBMP was prepared under the WFD and identifies the ‘quality’ elements’ of each water body, against which the strategic options can be assessed. These include: <ul style="list-style-type: none"> Physico-chemical elements (which for the purposes of this report includes with respect to specific pollutants), under Section 5.4 (Water and specifically Sections 5.4.1 and 5.4.2); Biological elements, under Section 5.8 (Biodiversity, Flora and Fauna); and Hydromorphology, under Section 5.3 (Soils, and specifically Section 5.3.4 Coastal Processes). Set out policy to manage flood and erosion risk to people and the developed, historic and natural environment and to identify opportunities where shoreline managers can work with others to make improvements. Set out how water abstraction will be managed until 2014, in terms of Water Resource Management Units (WRMUs) Two WRMUs fall within the study area; currently one has water available (River Ingol), the other has no water available (River Heacham). The Norfolk and The Wash BAP sets out the action plans for key species and habitats identified in the region (full details of which can be found in Section 5.8, including: <ul style="list-style-type: none"> Internationally designated species of The Wash Internationally important communities of The Wash Nationally important habitats Provides details of existing green infrastructure resources within the area surrounding The Wash estuary and provides evidence indicating the biodiversity,

Legislation, policy or guidance	Title	Relevance to the WECMS
	<ul style="list-style-type: none"> The Wash Estuary Management Plan (2004) 	<p>agricultural, flood risk, health, community and cultural benefits generated through the maintenance and enhancement of green infrastructure.</p> <ul style="list-style-type: none"> Provides high level strategy for The Wash estuary, including the following environmental policies: <i>NCA2 – The Wash Estuary Strategy Group will seek to ensure that the biodiversity of The Wash is maintained and enhanced and that all proposals which may affect The Wash should respect the obligations and commitments set out in the Wash and North Norfolk Coast European Marine Site Scheme of Management and The Wash Biodiversity Action Plan.</i> <i>NCA6 – ...The Wash Estuary Strategy Group will promote the fact that organisations engaged in engineering activities, including coastal protection and marine developments, should consider the historic environment throughout the life cycle of any works.</i> <i>NCA10 – Decision makers should make sure that new proposals, projects, developments and landscaping will not result in the deterioration of the remote and wild landscapes of The Wash.</i>
	<ul style="list-style-type: none"> East Inshore Marine Plan (2014) 	<ul style="list-style-type: none"> Provides a plan for maintaining the eastern coastline, including the following relevant policies: Policy SOC1 Proposals maintaining, or enhancing, access to the coast and marine area should be supported. Policy SOC1 Proposals that provide health and social well-being benefits including through maintaining, or enhancing, access to the coast and marine area should be supported. Policy SOC2 Proposals that may affect heritage assets should demonstrate, in order of preference: <ul style="list-style-type: none"> a) that they will not compromise or harm elements which contribute to the significance of the heritage asset b) how, if there is compromise or harm to a heritage asset, this will be minimised c) how, where compromise or harm to a heritage asset cannot be minimised it will be mitigated against or d) the public benefits for proceeding with the proposal if it is not possible to minimise or mitigate compromise or harm to the heritage asset Policy SOC3 Proposals that may affect the terrestrial and marine character of an area should demonstrate, in order of preference: <ul style="list-style-type: none"> a) that they will not adversely impact the terrestrial and marine character of an area b) how, if there are adverse impacts on the terrestrial and marine character of an area, they will minimise them c) how, where these adverse impacts on the terrestrial and marine character of an area

Legislation, policy or guidance	Title	Relevance to the WECMS
		<p>cannot be minimised they will be mitigated against</p> <p>d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts</p> <ul style="list-style-type: none"> • Policy ECO1 Cumulative impacts affecting the ecosystem of the East marine plans and adjacent areas (marine, terrestrial) should be addressed in decision-making and plan implementation. • Policy BIO1 Appropriate weight should be attached to biodiversity, reflecting the need to protect biodiversity as a whole, taking account of the best available evidence including on habitats and species that are protected or of conservation concern in the East marine plans and adjacent areas (marine, terrestrial). • Policy CC1 Proposals should take account of: how they may be impacted upon by, and respond to, climate change over their lifetime and how they may impact upon any climate change adaptation measures elsewhere during their lifetime. Where detrimental impacts on climate change adaptation measures are identified, evidence should be provided as to how the proposal will reduce such impacts. • Policy CC2 Proposals for development should minimise emissions of greenhouse gases as far as is appropriate. Mitigation measures will also be encouraged where emissions remain following minimising steps. Consideration should also be given to emissions from other activities or users affected by the proposal. • Policy TR1 Proposals for development should demonstrate that during construction and operation, in order of preference: <ul style="list-style-type: none"> a) they will not adversely impact tourism and recreation activities b) how, if there are adverse impacts on tourism and recreation activities, they will minimise them c) how, if the adverse impacts cannot be minimised, they will be mitigated d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts
Local		
Policy	<ul style="list-style-type: none"> • King's Lynn and West Norfolk Borough Council Local Development Framework Core Strategy (2011) and Detailed Policies & Sites Plan (in production) 	<ul style="list-style-type: none"> • The Core Strategy objectives for Hunstanton are that it meets the needs of residents with an expanded and improved retail core offering year round services, becomes a town that respects its heritage whilst continuing to look to the future, becomes a more attractive seaside destination with all year round tourism potential and expanded water sports and is an environmental resort making the most of the coast's natural assets. • Policies CS05 Hunstanton, CS07 Development in Coastal Areas are of particular relevance to the SEA/Strategy. • The draft Detailed Policies & Sites Plan is scheduled to be published for comment in 2014 and adopted 2015. It will contain housing, employment and green

Legislation, policy or guidance	Title	Relevance to the WECMS
		infrastructure strategies and will inform the SEA as it is produced.
	<ul style="list-style-type: none"> King's Lynn and West Norfolk Borough Council Outline Water Cycle Study (2009) 	<ul style="list-style-type: none"> Provides details of how development in the borough may impact upon the water supply, including benchmarks for waste water, water supply and flood risk.
	<ul style="list-style-type: none"> West Norfolk Tourism Strategy 2005 – 2010 (2005) 	<ul style="list-style-type: none"> Although currently elapsed, the Council considers that the strategy's aims and objectives remain valid whilst another strategy is being developed with the West Norfolk Tourism Forum. These include: <ul style="list-style-type: none"> To sustain existing tourism markets currently attracted to West Norfolk and to attract new markets where appropriate. To focus on actions which will provide the maximum economic benefit, balanced with the social and environmental needs of the local economy. To ensure that growth is sustainable and is appropriate to the well-being of the host communities and environment. To support and encourage initiatives which enhance the quality of the tourism product. To use tourism as a mechanism to revitalise and support prosperity in key areas, to the benefit of residents, businesses and visitors alike.
	<ul style="list-style-type: none"> Borough Council of King's Lynn and West Norfolk Green Infrastructure Study: Stage 2 (2010) 	<ul style="list-style-type: none"> This report aims to provide a plan by which future development of green infrastructure in the borough can be structured. It has been identified that there is a need to provide access to the east of Hunstanton across to Hunstanton Park and out towards Ringstead and the Peddars Way. The masterplan produced as part of the strategy indicates the need for linkages required with Heacham to the south of the town and Hunstanton Park to create comprehensive support for the existing green infrastructure network, supporting movement along the Coast and between residential areas and recreation provision.
	<ul style="list-style-type: none"> Hunstanton Town Centre and Southern Seafront Master plan (2008) 	<ul style="list-style-type: none"> The Plan identifies key sites their potential for development investigated and overall design guidance for enhancing the built environment and public realm provided. The key objectives detailed within the Masterplan which are relevant to the Strategy are to develop the town's water sports offer, create an attractive seafront, redevelop the southern seafront and refurbish the promenade.
<ul style="list-style-type: none"> Norfolk Minerals and Waste Development Framework Core Strategy and Minerals and Waste Development Management Policies Development Plan Document 2010-2026 (2011) 	<ul style="list-style-type: none"> Contains strategic objectives and policies that make clear where, in broad terms, mineral extraction and associated development and waste management facilities should be located in Norfolk, and conversely where they should not be located. The plan identifies that preference will be given for mineral extraction facilities to those sites located near key infrastructure and settlements, one of which is Hunstanton. Hunstanton has also been identified as the potential location for non-strategic 	

Legislation, policy or guidance	Title	Relevance to the WECMS
	<ul style="list-style-type: none"> Norfolk Rights of Way Improvement Plan 2007 – 2017 (2007) 	<p>waste facilities</p> <ul style="list-style-type: none"> Sets out the Councils future aspirations for improving our network of local rights of way based on the existing baseline. Future aspirations include to: <ul style="list-style-type: none"> Maintain the network so that it is better able to meet the varying demands placed upon it; Increase public benefit; Actively seek involvement of the public; and A collaborative approach to responsibilities and resources. <p>The Plan as a consideration in local DPDs.</p>
	<ul style="list-style-type: none"> Norfolk Local Transport Plan 2011 – 2026 (2011) 	<ul style="list-style-type: none"> Includes a Transport Implementation Plan, which sets out specific transport measures to be delivered over the short term under the headings: <ul style="list-style-type: none"> Managing and maintaining the transport network Sustainable growth Strategic connections Transport emissions Road safety Accessibility Approach to delivery
	<ul style="list-style-type: none"> Tomorrows Norfolk, Today's Challenge: A Climate Change Strategy for Norfolk (2011) 	<ul style="list-style-type: none"> Contains details of the likely impacts to Norfolk from climate change over different time periods and the associated vulnerabilities and opportunities for all sectors, including an adaptation plan to address these vulnerabilities and opportunities.
	<ul style="list-style-type: none"> Norfolk Coast Area of Outstanding Natural Beauty Management Plan 2009 to 2014 (2009) 	<ul style="list-style-type: none"> Contains a number of key environmental policies for the management of the AONB area, which fall under the following headings: <ul style="list-style-type: none"> highlight the special qualities and enduring significance of the area and the importance of its landscape features and identify those that are vulnerable to change; present an integrated vision for the future of the AONB as a whole, in the light of national, regional and local priorities; set out agreed objectives and policies which will help secure that vision; and identify the means by which objectives, actions and overall management will be reviewed.

3.6 SEA Objectives

The SEA objectives, indicators and targets provide a means by which the environmental issues and outcomes of strategic options can be assessed. They serve a different purpose from the objectives of the Strategy (outlined in **Section 1.1**) but have been closely linked to them as there has been full integration of the Strategy and SEA process throughout the development stages. SEA objectives form part of the assessment framework for the Strategy options, and are effectively used to help show whether the objective of the Strategy are beneficial for the environment; to compare the environmental impacts of alternatives; or to suggest improvements (Office of the Deputy Prime Minister, 2005).

The SEA objectives, indicators and targets for each of the 'scoped in' receptors is shown in **Table 3.3** Each SEA objective selected for this Strategy is assessed against criteria, informed by indicators and targets. The assessment criteria were developed during the scoping stage of the assessment and are designed to accurately describe the impacts of the WECMS upon the different environmental receptors. Rather than acting as a framework for assessing environmental performance, the criteria should ask questions of the Strategy, the outcome of which is a description of the environmental impacts of its adoption. The objectives, indicators and targets have been developed and revised throughout the various stages of the SEA, as information and knowledge has been collated.

Table 3.3 SEA objectives and assessment criteria

SEA 'topic'	Proposed SEA objective	Assessment criteria Will implementing the proposed option ... ?	Indicators	Target
Population and communities	Protect and enhance local communities, properties and community assets	Maintain the coherence and stability of the local communities, in particular the role of Hunstanton as a local centre, and support local development and regeneration intentions	<ul style="list-style-type: none"> Number of identified regeneration objectives supported. 	No conflict with development and regeneration objectives within the relevant adopted plans.
		Protect homes, residential properties and community assets	<ul style="list-style-type: none"> Number of properties protected/affected under strategic options. 	To protect residential and commercial assets in the main settlements and outlying areas.
	Reduce risks to life, safety and wellbeing	Guard against increased risks to health and welfare, including public risk, especially disproportionate impacts on the elderly	<ul style="list-style-type: none"> Qualitative assessment of public risk and safety implications 	To avoid risks to life, health and welfare.
		Reduce the risk to life associated with catastrophic breach or failure of the existing defence line	<ul style="list-style-type: none"> Number of people protected/affected by strategic option. 	To protect human life.
	Protect and enhance the local and wider economy, and features which support it	Ensure the continued resilience of the local economy, in particular tourism elements but also minority sectors, and the frontage's contribution to the wider regional economy	<ul style="list-style-type: none"> Number of tourism attractions protected/affected under strategic options. Number of businesses protected/affected by strategic option. 	To maintain the local economy and maintain the tourism features which will contribute to the future economic development of the study area
		Protect and enhance formal and informal recreational and amenity features	<ul style="list-style-type: none"> Number and area of local recreation and amenity facilities protected/affected under strategic option. Qualitative assessment of contribution to amenity value. 	To maintain or where possible enhance the recreational and amenity features in the study area.
Historic environment	Protect and enhance the historic environment and historic landscape character	Protect and enhance the site and setting of nationally-designated heritage and identified locally-important heritage features	<ul style="list-style-type: none"> Percentage of designated heritage features within study area at risk from strategic option. 	No adverse effects on heritage features.
		Provide suitable protection to undesignated, unidentified and potential assets, including historic landscapes	<ul style="list-style-type: none"> Number of HER records protected/affected by strategic options. 	

SEA 'topic'	Proposed SEA objective	Assessment criteria Will implementing the proposed option ... ?	Indicators	Target
			<ul style="list-style-type: none"> Qualitative assessment of potential impacts undesignated, unidentified and potential assets. 	
Geology	Protect and enhance geological interest features	Protect and enhance nationally-designated sites of geological interest	<ul style="list-style-type: none"> Area of designated site protected/affected. 	No decline in the condition of the nationally designated geological sites.
Water	Maintain water elements and improve where appropriate (or feasible)	Support the achievement or maintenance of good status for water bodies, with equivalent standards beyond 2027.	<ul style="list-style-type: none"> Status of water body. Number (proportion) of feasible WFD water body measures supported / achieved. 	<ul style="list-style-type: none"> No deterioration in the status of water bodies No preventing of achieving 'good' status in any water body Maximise delivery of measures.
Climate	Act to limit climate change impacts and vulnerability to future change	Reduce vulnerability to the predicted effects of climate change in a flexible way where future management can be altered in the light of updated information on likely impacts??	<ul style="list-style-type: none"> None identified 	None identified. Potentially in line with Norfolk climate change strategy
		Limit or reduce contributions to future climate change (for instance through low or positive carbon options)?	<ul style="list-style-type: none"> Calculated carbon footprint for options 	Achieve desired outcomes by the lowest carbon means
Landscape and seascape	Protect and enhance landscape / seascape character and visual amenity	Protect and contribute to the enhancement of the landscape character, including the AONB	<ul style="list-style-type: none"> Area of AONB protected/affected by strategic options. Sensitivity of landscape character and potential for significant change against landscape objectives. 	No adverse effects on landscape character or features.
		Protect and contribute to the enhancement of the seascape character	<ul style="list-style-type: none"> Sensitivity of seascape character and potential for significant change against landscape objectives. 	No decline in the seascape character of the study area.
Critical infrastructure	Protect critical infrastructure assets	Protect the material, or function, of critical infrastructural assets	<ul style="list-style-type: none"> Number of assets protected/affected under strategic option. 	Ensure that critical infrastructure is not adversely affected by strategic option.

SEA 'topic'	Proposed SEA objective	Assessment criteria Will implementing the proposed option ... ?	Indicators	Target
Biodiversity, flora and fauna	Protect and where possible enhance, biodiversity features	Protect and enhance internationally-designated conservation sites and their features	<ul style="list-style-type: none"> Area of designated site protected/affected by strategic option. 	No decline in condition of internationally-designated features.
		Protect and enhance nationally-designated sites and their features and nationally recognised habitats and species	<ul style="list-style-type: none"> Area of designated site protected/affected by strategic option. Area of BAP habitat protected/affected by strategic option. Number of BAP targets contributed to. 	No decline in condition of nationally-designated features.

4 Key Issues

The following section summarises the baseline information for the Strategy area, however further detail is presented in the Scoping Report. A copy of which is provided in **Appendix A**. The key environmental constraint for the Units area presented in **Figures 4.1** and **4.2**.

4.1 Population and Communities

The Strategy falls within the Borough of King's Lynn and West Norfolk. The three main settlements within the study area are Hunstanton, Heacham and Snettisham. Based on 2001 Census data these settlements have a combined population of 14,143. The population of the Borough is expected to rise from 143,600 in 2010 to 156,900 by 2026; although the majority of this growth is expected to be outside the Strategy area, within King's Lynn and Downham Market (Borough Council of King's Lynn and West Norfolk, 2010).

Table 4.1 details the key statistics for the study area. The percentage of people with long-term illness is above both UK and regional averages, which is also above the UK and regional averages.

Table 4.1 Population statistics for the study area

	Population			% aged 16-74. Unemployed	% aged 16-74. retired	% with a limiting long-term illness
	2001*	2010**	% increase 2001* to 2010**	2001	2001	2001
Hunstanton (Units A and B)	5,685	-	-	3.08	30.10	29.04
Heacham (Unit C)	4,611	-	-	1.95	29.70	28.35
Snettisham (Unit C)	3,847	-	-	1.94	23.36	24.59
King's Lynn and West Norfolk	135,345	143,600	6	2.57	18.43	20.41
Regional (East of England) Average %	4,388,140	5,831,800	33	2.60	13.99	16.21
National (UK) Average %	49,138,831	60,462,100	23	3.35	13.54	17.93

*2001 data taken from Office for National Statistics (2011a, b and c)

**2010 data taken from Office for National Statistics (2011d)

The key employment sectors in the Borough are advanced engineering and manufacturing, added value food activity, and tourism (Borough Council of King's Lynn and West Norfolk, 2011). The majority of employment opportunities are located in King's Lynn, but Hunstanton provides a number of jobs, especially during peak tourism months. The Wash also generates significant employment due to its value as an important commercial fishery area, particularly for shellfish. In 2009 The Wash Fisheries had 80 commercial fishing vessels, operated by 165 skippers and crew; this operation further supported a greater number of onshore jobs.

The main tourism facilities/attractions are located in Hunstanton but caravan parks are common in the wider area. The coastline offers a number of beaches and long distance paths which attracts visitors throughout the summer months. Shoreline recreation includes sea angling and bait digging.

4.2 Historic environment

The Norfolk coastline has a varied history, with the earliest evidence for human populations dating from between 950,000 to 700,000 years BP⁵ at Happisburgh. The study area has a large number of historic features in particular listed buildings. There are nine listed buildings within Hunstanton and Heacham has 22 Grade II listed buildings, several of which are connected to the church. There are two undesignated buildings of local conservation interest on the Cliff tops north of Hunstanton, including radio tower Marconi Tower and Coastguard Cottages.

Much of Hunstanton is designated as a Conservation Area. This is due to the deliberately informal layout of the town centre, the triangular green, the Arts and Crafts style of the residential area near the cliffs and square, and the Esplanade Gardens along the sea front (Borough Council of King's Lynn and West Norfolk, 2009). There is also a Conservation Area to the south of Heacham.

A number of historic wreck sites are found in The Wash, including nine ship and two aircraft wrecks within 1km of the shoreline.

The Norfolk Historic Environment Record (HER) has identified a wide variety of non-designated sites, finds and features in The Wash coastline and intertidal zones. These include Mesolithic, Neolithic, and Bronze Age finds; Roman settlements; a small number of Saxon finds; medieval settlements and ports; and a large number of structures relating to World War II defences.

Historic Landscape Characterisation (HLC) has defined the majority of the area covered by the WECMS as consisting of 20th century agriculture, with a strip of Coastal – drained enclosure, and Coastal – managed wetlands and parks and gardens (as presented within **Appendix A**). Significant areas of Woodland also exist within the study area.

4.3 Geology

The Wash is a large, relatively low-energy embayment open to the North Sea in which tides are the main, but not exclusive, factor controlling sedimentary processes. It is a marine basin carved out of the Jurassic clays of eastern England by fluvial processes and glacial action. Tidal flood embankments separate the Wash from the land-claimed coastal plain of the fenland. Seaward of these embankments are a series of sand banks and low water channels and large intertidal areas made of sand and mud flats and salt marshes. There is a shingle ridge between Wolferton Creek and Hunstanton and sea cliffs at Hunstanton.

A number of sites within the study area have been designated for their geological features (as geological SSSI). These include the cliffs at Hunstanton, brick pits near Heacham and a park to the east of Hunstanton.

4.4 Water

The area of coast around Hunstanton and Heacham is known for its bathing with several designated bathing beaches. None are designated as Blue Flag Beaches but the water quality complies with both EU and UK guideline standards.

⁵ Before Present

There are two areas in the Wash, at Boston and King's Lynn, which are designated under the Shellfish Waters Directive (2006/113/EC). These areas support mussels, cockles and razor clams.

The Environment Agency has classified the majority of bedrock underlying the study area as a mix of 'Principal'⁶ and 'Secondary B'⁷ aquifers with a small area of 'Secondary A'⁸ aquifer. The majority of the study area is 'Principal' which is formerly classified as major aquifers. Unit C lies within a Groundwater Vulnerability Zone of category Major Aquifer High, indicating that it is an important aquifer with a high vulnerability to pollution.

There are 5 WFD designated water bodies within or adjoining the study area and which could therefore potentially be affected by the Strategy. These are estuarine and riverine water bodies and include Heacham River (GB105033053480), Ingol (GB105033053470), Boat House Creek (GB105033047800), Babingley River (GB105033047620) and Wolferton Lagoon Complex (GB640523160000). Details of these water bodies are given in Appendix B of the Scoping Report (**Appendix A**).

4.5 Climate

The mean annual temperature over the region varies from just over 9°C to around 10.5°C, lower nearer the coast. Mean daily minimum winter temperatures across the region are close to 1°C, slightly higher nearer the coast. Mean daily maximum summer temperatures range from 19°C to 22.5°C, comparable with summer values found in the London area which tends to be the warmest part of the UK. Across most of the region there are, on average, about 30 rain days (rainfall greater than 1 mm) in winter and fewer than 25 days in summer. The prevailing wind direction is from the south-west but Eastern England, away from the track of Atlantic storms, is one of the more sheltered parts of the UK.

Given its coastal location, the study area is particularly vulnerable to future sea level rise, the primary climate consideration in terms of coastal and flood defence. Other features of climate change – increased temperature, rainfall variations, and their consequences - will also have variable effects on many elements of society in the study area and more widely.

4.6 Landscape and Seascape

The southern-most section of the study area is designated as part of the Norfolk Coast Area of Outstanding Natural Beauty (AONB). The AONB was designated to protect the largely undeveloped land between the Wash and Great Yarmouth. The study area also falls within the Natural England National Character Area (NCA) 46: Fens and NCA 76: North West Norfolk (Natural England, 2005).

There are two local seascape units within the study area, one that covers most of the study area (Heacham and Hunstanton) and a smaller unit to the south (Peter Black Sand). Both seascape units are relatively linear with much of the landform low-lying, except for the coastal cliffs.

⁶ These are layers of rock or drift deposits which provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

⁷ Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

⁸ Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

Within the Heacham and Hunstanton seascape unit, the general coastline consists of beaches backed by dunes and flood embankments. The main feature is Hunstanton Cliffs. Views inland from the sea are restricted by the cliffs and Hunstanton. The Peter Black Sand seascape unit (which has been identified for the purpose of this Strategy only) consists of mudflats backed by linear lagoons and flood embankments. Views inland from the sea are restricted due to flood embankments and the low-lying fen landscape. Further information on these seascape units is presented in **Appendix A**.

4.7 Critical Infrastructure

Critical infrastructure in the study area includes a Wastewater Treatment Works (WwTW), located in Unit C and the main roads (A149, B1161 and B1440) which run through all three Units, connecting the settlements to the wider Norfolk area. The Heacham WwTW is situated to the south of Heacham and discharges to a tributary of the Heacham River. There is an associated pumping station near the WwTW. The A149 is the main road along the coast connecting Cromer to King’s Lynn. The B1161 runs around Hunstanton, along the front. The B1454 and B1440 are the principal links to smaller towns to the east.

Emergency services are located in Hunstanton, Heacham and Dersingham, with Hunstanton having a police station, a fire station, an ambulance station and a coastguard base. Old Hunstanton also has an RNLI Lifeboat Station.

4.8 Biodiversity, Flora and Fauna

The following table details the designated nature conservation sites within or adjacent to the project area.

Table 4.2 Designated sites

Site Name	Designation	Distance from frontage	Dominant habitat / feature
Dersingham Bog	Ramsar, Site of Special Scientific Interest (SSSI) and National Nature Reserve (NNR)	Within	Mire and heathland
North Norfolk Coast	SPA, SAC, Ramsar and SSSI	Within	Sandflats, mudflats, saltmarsh, shingle banks and sand dunes
The Wash	SPA, Ramsar and SSSI	Within	Mudflat and saltmarsh
Roydon Common and Dersingham Bog	SAC	Within	Mire
The Wash and North Norfolk Coast	SAC	Within	Range of estuarine and coastal habitats
Ringstead Downs	SSSI	1km to east	Species rich chalk grassland
Heacham Brick Pit	SSSI	Within	Geological interest
Hunstanton Cliffs	SSSI	Within	Geological interest
Hunstanton Park Esker	SSSI	1.9km to east	Geological interest
Snettisham Carstone Quarry	SSSI	Within	Insect species

The frontage is considered to have little terrestrial habitat interest as the area is predominantly arable land. The marine habitats present in the study area include shingle ridges, beaches, saltmarsh, and mudflat. There is also a small network of saline lagoons near Snettisham and also south of Heacham Harbour. BAP Habitat in the area includes coastal floodplain and grazing marsh, hedgerows, cereal field margins, lowland mixed deciduous woodland and the Cliffs at Hunstanton.

The Norfolk BAP identifies a number of species which may be present within the study area, including brown hares *Lepus europaeus* and otters *Lutra lutra*.

The Wash is an important breeding ground for common seals and also supports a smaller population of grey seals *Halichoerus grypus*. The Wash supports a range of marine fauna, for example large dense beds of brittlestars *Ophiothrix fragilis*. Benthic communities on sandflats in the deeper, central part of the Wash are known to be particularly diverse. The mudflats in the Wash support large numbers of polychaetes, bivalves and crustaceans. The Wash and North Norfolk Coast SAC and its surrounding waters are considered important as it is the only currently known location of well-developed stable *Sabellaria* reef in the UK.

The Wash provides spawning and nursery habitat for a number of commercially important species, including plaice, cod and sole. The area is also a valuable commercial fishery for shellfish including cockles, mussels and shrimp.

4.9 Summary of key issues

The key issues highlighted in **Sections 4.1 – 4.8** are summarised in **Table 4.3** below.

Table 4.3 Summary of key issues from the baseline information for the Strategy area

SEA Topic	Key issues
Populations and Communities	<ul style="list-style-type: none"> • The study area has as strong tourist economy. • The Wash provides significant employment as a shellfish fishery. • The retired percentage of the population within the study area is double the national average. • The tourist economy is strongly linked to Hunstanton and the coastal areas, including the beaches and coastal caravan parks.
Historic Environment	<ul style="list-style-type: none"> • There are many sensitive heritage features along the coastal area including the Hunstanton conservation area, listed buildings in Hunstanton, Heacham and atop Hunstanton cliffs and historic landscapes types. • There a large number of buried heritage features in the intertidal zone, and protected wreck sites in The Wash.
Geology	<ul style="list-style-type: none"> • There are three geological SSSIs within the study area, including Hunstanton Cliffs SSSI which is of key concern for coastal management in the area.
Water	<ul style="list-style-type: none"> • The beaches around Heacham and Hunstanton pass EK and EU guidelines for water quality. • Key aquifers for the region are located within the study area, which high vulnerability to pollutant contamination. • The Wash is an important shellfish fishery, with two areas designated under the Shellfish Waters Directive. • There are five WFD water bodies within the strategy area.
Climate	<ul style="list-style-type: none"> • The study area is particularly vulnerable to sea level rise.
Landscape and Seascape	<ul style="list-style-type: none"> • The southern section of the study area lies within the Norfolk Coast AONB. • The landscape character of the study area is predominately of relatively undeveloped and isolated coastline with wide panoramic views across an ever-changing Wash. • The seascape of the inner Wash is also designated.

SEA Topic	Key issues
Critical Infrastructure	<ul style="list-style-type: none"> • Key roads are potentially vulnerable to flood risk if changes in the coast management take place.
Biodiversity, Flora and Fauna	<ul style="list-style-type: none"> • Internationally designated intertidal habitats located along the coastline. Features of note include a breeding colony of fulmars in the Hunstanton Cliffs SSSI. • The Wash contains a number of valuable marine features including brittlestars <i>Ophiothrix fragilis</i>.

4.10 Evolution of Baseline without the Strategy

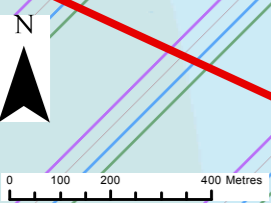
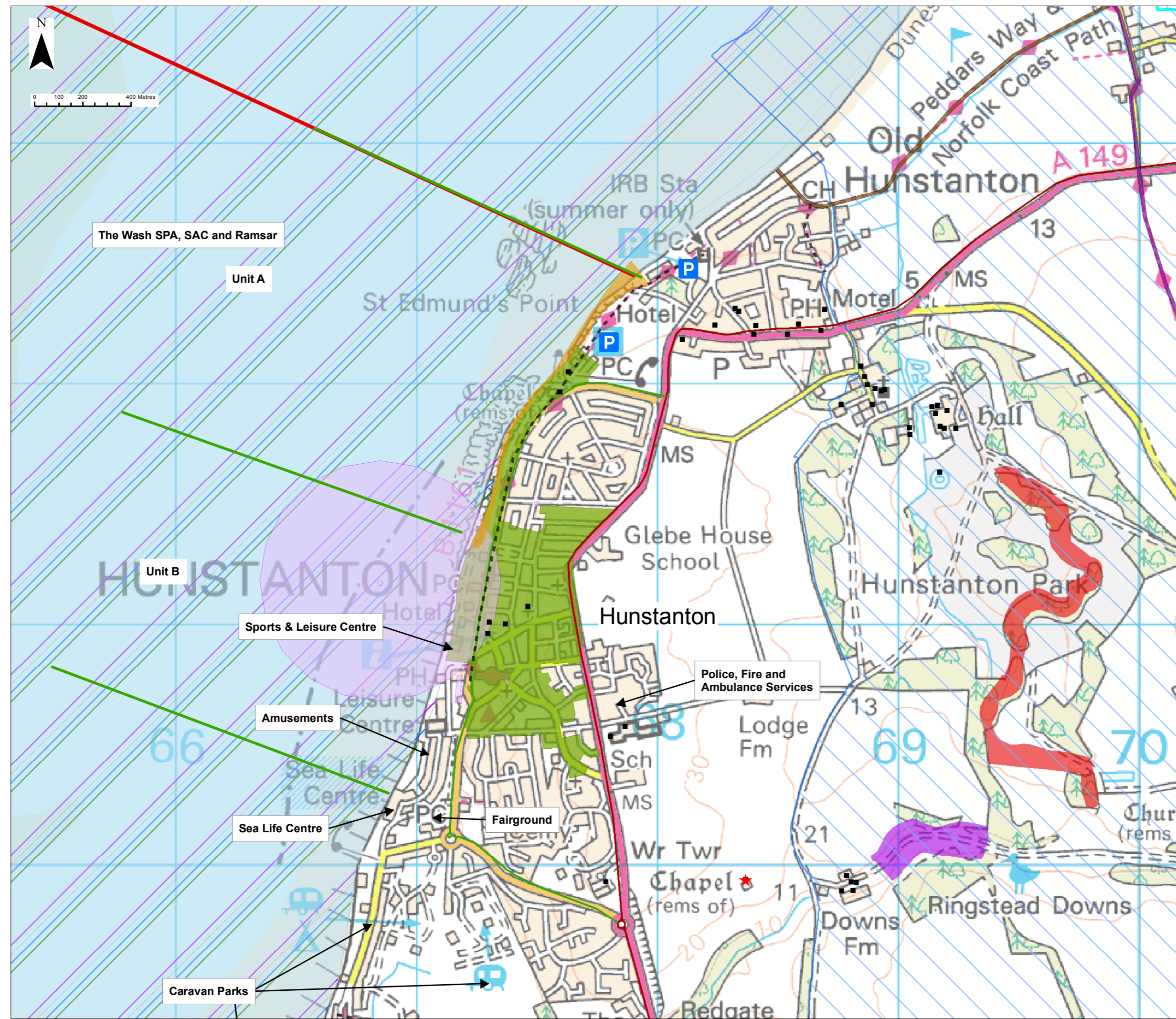
The SEA Directive requires that information is provided on “... *the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan*”.

It is recognised that the future baseline or “no Strategy scenario” is difficult to describe as trend data is often not available. Also, in this case, the impacts of coastal erosion mean that a ‘*No Active Intervention*’ scenario will result in large-scale loss of a wide range of assets along the frontage with likely resulting social, environmental and economic impacts (hence the key driver for the development of the WECMS). However, this section considers key future trends within the strategy area for each SEA topic.

Table 4.4 Evolution of baseline without the Strategy

SEA Topic	Trends
Populations and Communities	<ul style="list-style-type: none"> • The population of elderly in the area remains high. • Hunstanton is seen as an area of ongoing regeneration. • The tourist economy is still strong in Hunstanton and measures are being taken to increase the tourist assets within the town.
Historic Environment	<ul style="list-style-type: none"> • Future changes in water levels may be critical to the preservation of buried archaeology, or to the retention of historic landscapes. • Changes in coastal erosion may affect the condition of designated, non-designated and unidentified features, sites and landscapes. • Coastal management measures could result in the physical disturbance to sites, finds, features and historic landscapes.
Geology	<ul style="list-style-type: none"> • Future sediment transport and erosion rates pose a risk to cliff and beach habitats.
Water	<ul style="list-style-type: none"> • The East of England and Anglian River Basin District (RBD) is one of the driest and most water-stressed regions in the county (Scott Wilson, 2009). It has also been the site of substantial physical development and population increase – a trend which is expected to continue thereby elevating pressure on water resources. • Climate change is expected to lead to warmer wetter winters, hotter drier summers, and an increase in ‘extreme weather events’ such as storms. Impacts on water resources are expected, but have not been quantified. • The Wash is an important shellfish fishery. • Water body quality (status) is expected to increase through the first 20 years of the Strategy, in the absence of the WECMS, as measures ensure compliance with the WFD.
Climate	<ul style="list-style-type: none"> • Climate change is expected to enhance a wide range of climatic conditions – broadly leading to warmer wetter winters and hotter, drier summers in the UK.
Landscape and Seascape	<ul style="list-style-type: none"> • The LCA promotes that the relatively undeveloped and isolated character of the study area coastline with wide panoramic views across an ever-changing Wash are conserved. • Urban development is continuing in Hunstanton and Heacham and is likely to extend outwards. The contrast between the peaceful unsettled low-lying coastline with the tourist developments associated with Heacham and Hunstanton to the north of the study area should be maintained. • Increased coastal erosion in the future could alter the local landscape character, as the cliffs and Hunstanton centre are impacted.

SEA Topic	Trends
Critical Infrastructure	<ul style="list-style-type: none"> • Due to the broadly undeveloped nature of the study area, no significant changes to infrastructure within the study area are anticipated in the future. • Hunstanton is still a key tourism area in the Borough and improvement of material assets within the town is planned. • Increased coastal erosion and flood risk could impact some material assets within Hunstanton and further down the coastline.
Biodiversity, Flora and Fauna	<ul style="list-style-type: none"> • Intertidal habitats along the coastline are under threat from coastal squeeze as a result of holding the line of existing formal defences. • Terrestrial and freshwater habitats are under threat from coastal erosion and flooding which may affect both designated and non-designated features.



Key:

- Wash East Unit Boundaries
- Wash East Project Area Boundaries
- P Car Parks
- ★ Scheduled Monuments
- Listed Buildings
- Footpaths
- Norfolk Coast Path
- Peddars Way Path
- A Road
- B Road
- Norfolk Coast Area of Outstanding Natural Beauty (AONB)
- Historic Wreck Areas
- Conservation Areas
- SPA
- SAC
- Ramsar

SSSI

- The Wash
- Ringstead Downs

Geological Site of Special Scientific Interest (SSSI)

- Hunstanton Cliffs
- Hunstanton Park Esker

Water Framework Directive

- Wash Outer Coastal (GB640523160000)

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Title:
Environmental Constraints
in Units A and B

Project:
Wash East SEA
Environmental Report

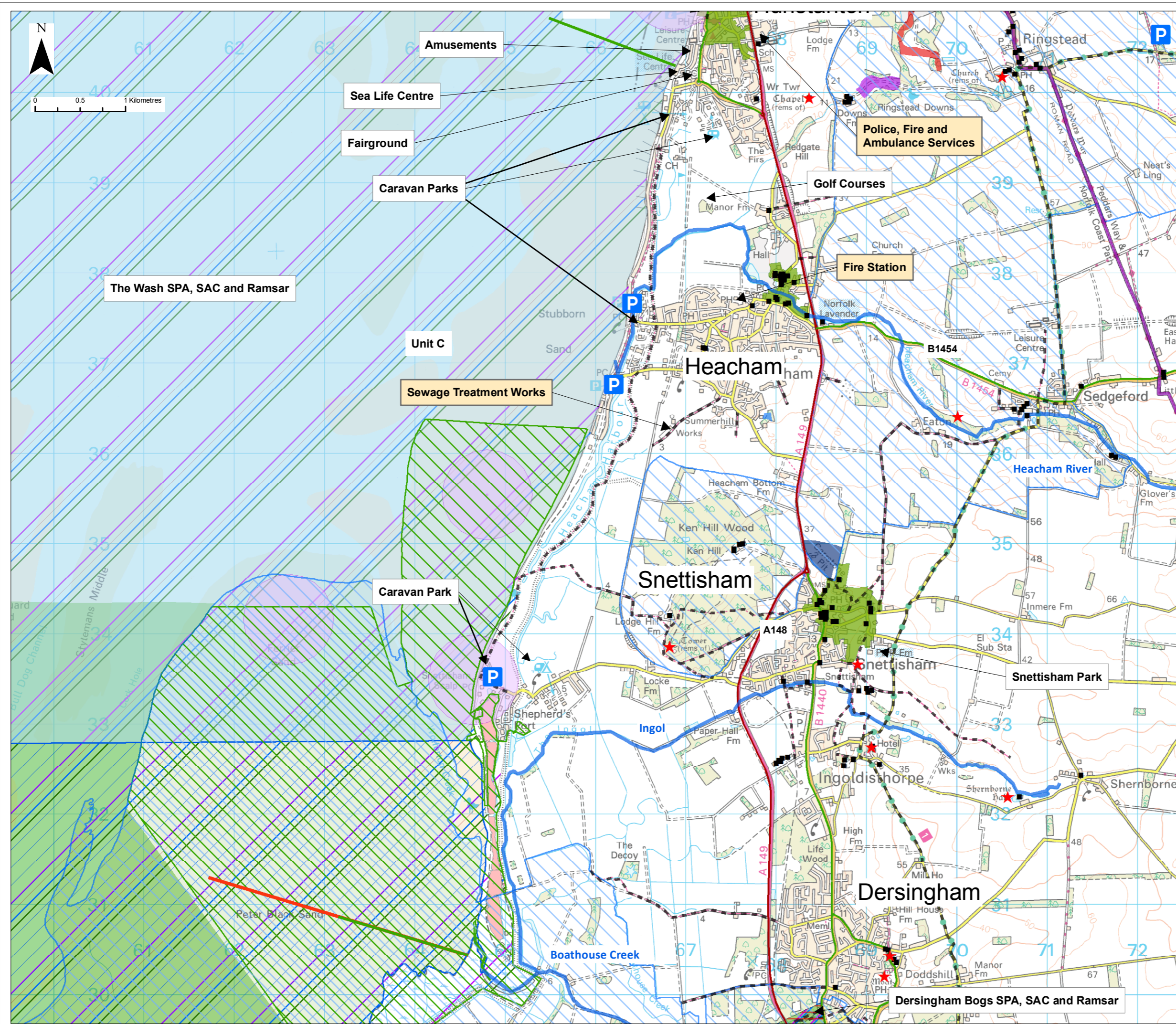
Client:
Environment Agency

Date: June 2014	Scale @ A3: 1:15,000
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Figure:
4.1



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Key:

- Wash East Unit Boundaries
- Wash East Project Area Boundaries
- P Car Parks
- ★ Scheduled Monuments
- Listed Buildings
- - - Footpaths
- Peddars Way Path
- A Road
- B Road
- ▨ Norfolk Coast Area of Outstanding Natural Beauty (AONB)
- ▨ Historic Wreck Areas
- ▨ Conservation Areas
- ▨ Snettisham RSPB Reserve
- ▨ Dersingham Bog NNR
- ▨ The Wash NNR
- ▨ SPA
- ▨ SAC
- ▨ Ramsar

SSSI

- ▨ The Wash
- ▨ Ringstead Downs
- ▨ Dersingham Bog
- ▨ Snettisham Carstone Quarry

Geological Site of Special Scientific Interest (SSSI)

- ▨ Heacham Brick Pit
- ▨ Hunstanton Park Esker

Water Framework Directive

- ▨ Coastal
- ▨ Wash Inner
- ▨ Wolferton Lagoon Complex

Wash Outer (GB640523160000)
Wash Inner (GB530503311300)
Wolferton Lagoon Complex (GB560503316700)

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Title:
Environmental Constraints
in Unit C

Project:
Wash East SEA
Environmental Report

Client:
Environment Agency

Date: June 2014	Scale @ A3: 1:40,000
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Figure:
4.2



5 WECMS Options

The following section summarises the option development process which has been undertaken for each Unit, and provides further information on how the preferred option has been selected for each Unit.

5.1 Optioneering Process

5.1.1 Decision pathways

The WECMS has developed the approach for coastal management option selection in the form of decision pathways. These pathways are built around parameters that need to trigger decisions about whether and how to intervene and margins to ensure that measures will be implemented in time to avoid flood and erosion impacts. The decision pathways have been developed in an iterative process in conjunction with the Advisory Group⁹ and all of the partners.

For each decision pathway a range of options has been developed. The level of detail for each option varies depending on how soon the decision is required. For short term¹⁰ decisions, the project develops a preferred solution through a detailed appraisal of options. For longer term decisions the options are developed in less detail, but still contain sufficient level of information to provide a strategic overview and support decisions that are needed in the short term.

This approach to option development is based on the expectation that there will be a review every five years of the triggers, based on the results of the ongoing monitoring of the trigger parameters, to assess whether decision points have been reached or are about to be reached. Such reviews will also be initiated if it becomes clear that a particular trigger is about to be reached, or if flood or erosion events occur in the project area. This is similar to the current five-yearly process to confirm funding for continuation of the shingle recycling. In addition to the options per Unit, the Strategy also assessed the potential of broad scale technical options that could cover all three Units.

5.1.2 Longlist to shortlist process

For all Units, workshops were held with the Advisory Group and partners to consider the longlist of options and through discussion reduce them to a shortlist. A wide range of flood and erosion risk management options were considered which included:

- Do Nothing;
- Do Minimum;
- Defend – hard engineering options (e.g. rock armour or walls);
- Defend – soft engineering options (e.g. beach recycling and renourishment);
- Defend – combinations of the above; and
- Adaptation.

The long list assessment took place against a wide list of economic, social and environmental criteria based on the SEA criteria described in **Section 3.6**. This also

⁹The Advisory Group consists of representatives from the local community including Parish and Town Councils, caravan businesses, holiday homes and environmental bodies. Their role is to represent their groups in the WECMS and feedback information as the strategy has moved forward.

¹⁰ The definition of short term is now, what action needs to be implemented as a result of the Strategy. Longer term varies depending on which Unit is being considered and when monitoring identifies that a trigger has been reached.

included the affordability of the options, which is related to the likelihood and level of national funding, and the local funding required for each option. The level of national funding depends on the benefit that an option provides. During the workshop, the Advisory Group were presented with indicative cost estimates for each longlisted option. In order to provide an appreciation of the local contributions that would be required, the Advisory Group was also presented with the average costs per year for each option, based on one hundred years.

Appendix B details the longlist assessment for the three Units.

5.2 Unit A – Hunstanton Cliffs

5.2.1 Introduction

Unit A is called Hunstanton Cliffs and was known in the Wash SMP2 as PDZ4. It consists of the undefended cliffs and stretches down from the northern limits of Hunstanton cliffs incorporating the lighthouse, coastguard lookout, Chapel of St Edmunds ruin, cliff top café, green areas and the Cliff Parade coastal road with numerous residential homes to the northern end of Hunstanton Promenade. The cliffs are nationally designated for their geological and biological (a fulmar colony) value.

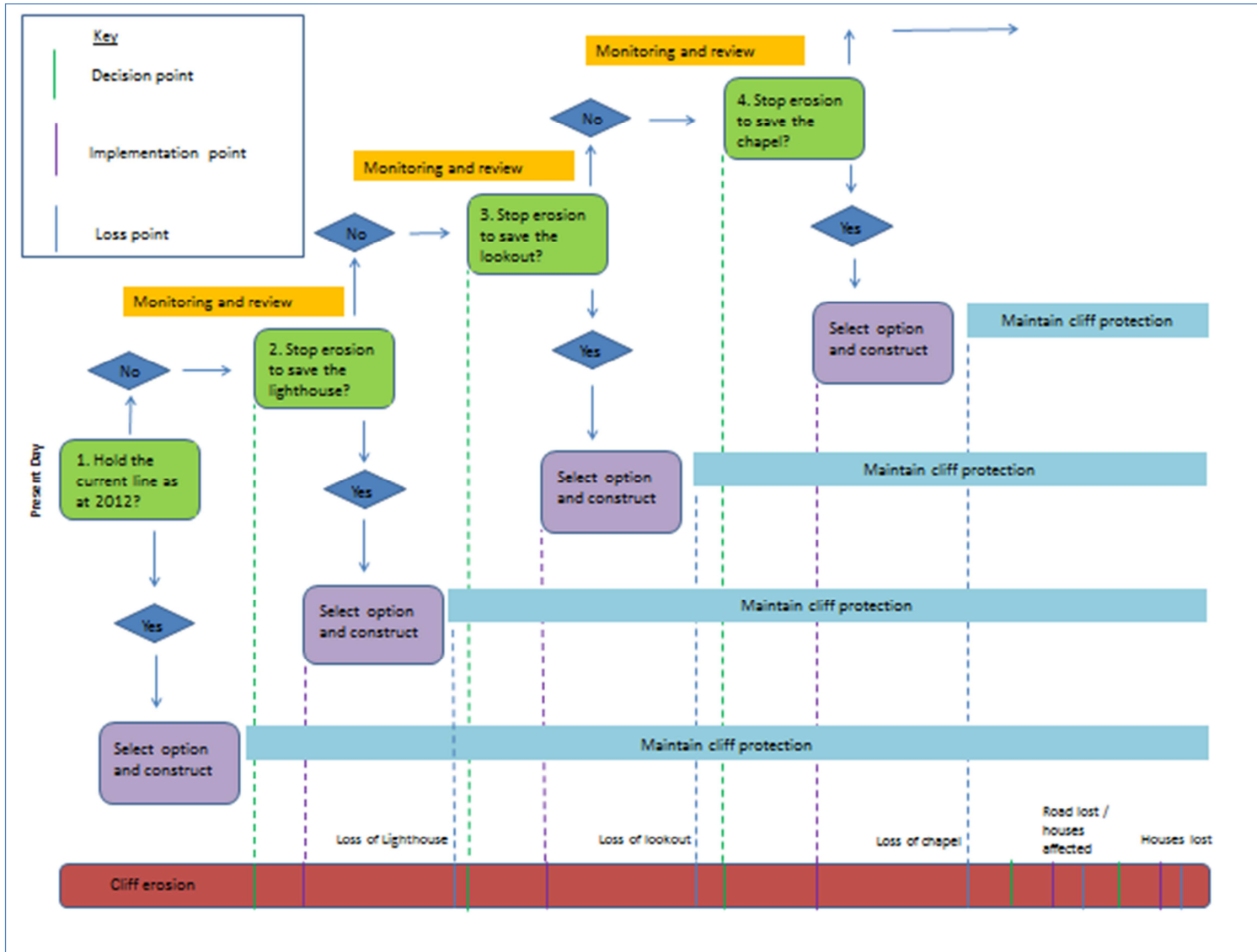
Unit A has never been defended. The cliffs have been allowed to erode and expose their geological value. There is inherent conflict in this Unit between maintaining the nationally designated cliffs and protecting the historic environmental features and other assets which are located on top of the cliffs.

The decision-making process for Unit A is driven by the rate of cliff erosion. This is represented in **Figure 5.1**. It is important to note that the times at which the assets on the cliff top are put at risk is indicative and these times could change as a result of faster or slower rates of cliff erosion. Continued monitoring of the cliffs will be important to determine cliff erosion rates and when decision points are reached. The decision pathway includes appropriate margins for uncertainty.

The first decision to be made is whether to hold the line now at the existing cliff line and reduce erosion in the future. Initial calculations indicate that the benefits provided by halting cliff erosion now are less than the costs of implementing an option. However, if the local community were to select the option of stopping or slowing down cliff erosion now, there are a range of options that would work towards achieving this objective.

For Unit A, the first strategic decision point is the present day. The strategy needs to decide whether cliff erosion needs to be stopped or slowed down now, and, if so, how and where. A key reason to make this decision now, even though it will take an estimated 20 years for the erosion to reach the Lighthouse, is that the implementation of solutions can take a significant amount of time and that erosion is irreversible.

Figure 5.1: Unit A Decision Tree



5.2.2 Longlist Options

The longlist for Unit A ranges from localised methods to slow down cliff erosion, to full scale hard defences to fully stop erosion, using softer options to improve beach volumes, but also the continuation of the current Do Nothing approach and the associated adaptation. The table below sets out the long list of options which are possible in Unit A.

Table 5.1: Unit A Options Long List

Name	How does it work	How it is predicted to affect the shoreline
Do Nothing		Erosion of the cliffs will continue through both toe erosion and groundwater-induced erosion.
Cliff bolting	Bolts inserted into the cliff at regular intervals to support the tensile strength of the cliff material.	Slows down erosion locally where the bolts are applied.
Fencing / netting to reduce cliff fall material movement	Place a row of netting at the base of the cliff to retain fallen cliff material. This will reduce the impact of the waves during regular, every day tides.	Creates a toe protection which slows down toe erosion where applied. Could lead to shallower cliffs as it doesn't stop groundwater-induced erosion.
Rock sill parallel to base of the cliff	A rock sill could be placed either at the toe of the cliff or on the beach to reduce the impact of the waves during regular, every day tides.	Creates a toe protection which slows down toe erosion where applied. Could lead to shallower cliffs as it doesn't stop groundwater-induced erosion.
Sand bags / geotextile	Sand is taken from a local source, where available, and sealed. The geotextile material is resilient to saltwater. These would be placed at the base of the cliff.	Creates a toe protection which slows down toe erosion where applied. Could lead to shallower cliffs as it doesn't stop groundwater-induced erosion.
Sprayed concrete over the cliff fall material	A concrete mix is "sprayed" over the existing cliff fall material at the base of the cliff to hold it in place for a short period of time.	This would slow down toe erosion locally but this could lead to shallower cliffs as it doesn't stop groundwater-induced erosion.
Gabions to encourage beach stability	Rocks are placed in steel cages and placed along the cliff base. This aim of this is to encourage sediment deposition and growth of plants such as marram grass to strengthen the beach.	This would slow down toe erosion locally but this could lead to shallower cliffs as it doesn't stop groundwater-induced erosion.
Cliff drainage improvements	Local improvement to cliff drainage through drilling holes and placing filters.	This would slow down the groundwater-induced erosion but would not reduce wave-induced toe erosion at the base of the cliffs. Likely to lead to overall slow-down, but with steeper / overhanging cliffs.
Rock revetment	Protection of the cliff toe and lower face with rock, designed to be stable under waves. Sloped, permeable, fixed structures.	This option would be designed to stop erosion at the base of the cliffs.
Promenade and sea wall	A continuous shore-parallel structure that is designed to absorb wave energy when exposed. These can be concrete, gabion baskets or sheet pile walls. These are sometimes supported by armour to protect the toe.	This option would be designed to stop erosion at the base of the cliffs. There is likely to be some toe erosion at the base of the sea wall.
Offshore breakwaters	Construction of large off-shore structure from rock or other hard material to influence wave direction and energy.	This option will reduce the wave energy approaching the shore and can be designed to generate accretion. Both will reduce erosion of the cliff face.

Name	How does it work	How it is predicted to affect the shoreline
Timber revetment	A timber revetment is constructed as a palisade, with a number of timber beams nailed to a leaning structure for support. The revetment reflects waves and reduces the wave energy reaching the cliffs.	This structure would be placed on the upper beach. It is likely it would lead to more erosion at the base in front but reduce cliff erosion.
Beach recycling (plus nourishment)	Moving sand or gravel from another location on the beach to improve the volume on the beach at one (or various) locations.	A higher beach reduces the waves reaching the cliffs. This would slow down cliff erosion.
Beach nourishment	The placement of sand or gravel for use on the beach to improve the volume on the beach.	A higher beach reduces the waves reaching the cliffs. This would slow down cliff erosion.
Large scale nourishment	The placement of sand at a location where the natural processes will transport sediment down the coast to build beaches.	A higher beach and foreshore reduces the waves reaching the cliffs. This would slow down cliff erosion.
Rock revetment + beach nourishment	Protection of the cliff toe and lower face with rock, designed to be stable under waves. Sloped, permeable, fixed structures. Supported by the use of sand for use on the beach to improve the volume on the beach.	This option would be designed to stop erosion at the base of the cliffs. A higher beach reduces the waves reaching the revetment which allows a lighter design. In combination this would slow down cliff erosion.
Promenade and sea wall + beach nourishment	A continuous shore-parallel structure that are designed to absorb wave energy when exposed. These can be concrete, gabion baskets or sheet pile walls. These are sometimes supported by armour to protect the toe. Supported by the use of sand for use on the beach to improve the volume on the beach.	This option would be designed to stop erosion at the base of the cliffs. A higher beach reduces the waves reaching the promenade which allows a lighter design. In combination this would slow down cliff erosion.
Offshore breakwaters + beach nourishment	Construction of large off-shore structure from rock or other hard material to influence wave direction and energy. Supported by the use of sand for use on the beach to improve the volume on the beach.	This option will reduce the wave energy approaching the shore and can be designed to generate accretion / sustain imported sand. Both will reduce erosion of the cliff face.
Groynes + beach nourishment	Groynes are long, narrow structures built roughly normal to the shoreline. Their purpose is to limit the movement of material whether this is longshore, cross-shore or a combination of both. Supported by the use of sand for use on the beach to improve the volume on the beach.	This option will reduce the wave energy approaching the shore, reduce erosion of the cliff face and reduce cross-shore material movement.
Shore connected breakwaters & beach	Shore connected breakwaters are usually designed to look like fish tails. The purpose is to manage the movement of material both along the shore and across the shore. Supported by import of sand to improve the volume on the beach.	This option will reduce the wave energy approaching the shore, reduce erosion of the cliff face and reduce cross-shore material movement.
Relocation of Key Assets	Gradual movement of the communities and assets away from the flood risk and erosion risk zone.	Erosion of the cliffs will continue through both toe erosion and groundwater-induced erosion.

Each of these options was assessed against the WECMS assessment criteria and this assessment is presented in **Appendix B**.

The Advisory Group acknowledged that continued erosion is desirable from some points of view (in terms of the benefits for maintaining the landscape value and SSSI requirements), but undesirable from others (in terms of loss of properties and infrastructure and the impact on the local community). They also agreed that measures to

stop or slow down erosion are costly and subject to technical uncertainties. Funding of any structural measures are also a challenge: very little national Flood Defence Grant in Aid funding will be available for reducing erosion, so all projects in the foreseeable future would need to find other funding sources.

In conclusion, there was a clear consensus that it is not realistic or desirable to fully stop erosion, but that it was worth exploring possible ways of locally slowing down erosion, through piloting of innovative solutions based on the Do Minimum methods. Based on this consensus, the Strategy team decided that the strategic decision for this Unit had been made, and there was no need for further work to develop a shortlist or carry out a full appraisal.

5.2.3 Preferred Option

For Unit A (Hunstanton Cliffs), piloting (testing) new measures to slow down erosion at specific locations was selected as the preferred approach.

The following options are proposed for inclusion in the piloting study:

- Base netting;
- Sand bags;
- Gabions; and
- Rock sill.

These options could be supported by beach nourishment in the future which could provide benefits to tourism and recreation in the area. Nourishment could also support beach management structures.

There is also the potential for cliff drainage options to be implemented in conjunction with another flood defence option, as they would be ineffective to resolving the erosion issues in Unit A on their own. These options will be explored during the project level stage. At that stage, they will also be subject to an environmental assessment to ensure that any impacts are identified and suitably mitigated/compensated.

Based on the Strategy's assessment, the most suitable and cost effective option for reducing erosion at the cliffs is to apply netting across approximately 200 metres in front of the lighthouse and other assets, capturing cliff fall material already in place which will then help to reduce wave impact at cliff toe. This option has low construction costs and will also help in maintaining the cliff's geological interest by preventing erosion during normal tidal cycles but only limiting erosion during big storms. This allows continuing erosion at a reduced rate, and maintaining its geological status designation. In addition, since the netting only covers a specific area, the remainder of the cliffs will remain unprotected and continue to erode. Therefore the activity will not alter its visual appearance. However, regular maintenance would be required. This activity could be provided or managed locally to reduce costs and generate community involvement. If this approach did not effectively reduce erosion then the pilot approach would allow an alternative option to be trialled. At this stage, another environmental assessment is likely to be required to ensure that issues such as the fulmar colony on the cliffs are appropriately considered.

This approach is applicable until the first trigger for a review of the management option is required. This trigger occurs at a point where erosion is within 15 to 20 metres of the lighthouse or another feature; allowing time for a decision of measures, planning and implementation of these measures.

The Strategy recommends monitoring and review at regular intervals (yearly cliff inspection surveys for example, combined with five-yearly review of trigger points alongside the neighbouring Units) to be undertaken by BCKLWN to determine the effectiveness of the piloting approach and that there are no significant impacts to the cliffs. If a change in the approach is required then this change will need to be discussed with the Advisory Group and BCKLWN to discuss the potential options to reduce erosion but also to discuss the need for adaptation, for example, roll back of the lighthouse.

If this option is agreed, a follow-up Review and Monitoring study will be required prior to initiating works, to determine which of the specific piloting options will be carried forward and in what combination. This follow-up study would also provide specific details on any monitoring required for the implementation of this option as a way of ensuring that impacts are controlled at the project level.

5.3 Unit B – Hunstanton Town

5.3.1 Introduction

Unit B is called Hunstanton Town and was known in the Wash SMP2 as PDZ3. It incorporates the defended part of the coastal high ground. This Unit contains tourist attractions such as the funfair and the promenade.

For Unit B, the first strategic decision point is in the future (as illustrated in **Figure 5.2**). A recent engineering inspection has indicated that the residual life of the sea wall and promenade is approximately fifteen to twenty years. The Hunstanton Sea Defence Condition Survey Report (St La Haye Ltd., 2005) has estimated the residual life of the groynes to be ten to fifteen years, dependent on their location and is subject to local improvements that are currently being developed by BCKLWN. The Strategy recommends that in the period prior to this trigger point, the BCKLWN will carry out monitoring and five-yearly, alongside the reviews for the neighbouring Units, to inform when the trigger point is reached.

The next strategic decision point will occur when the new structure reaches the end of its functional life (typically after 50 years, but subject to monitoring and review). Therefore, the next decision point for Unit B will be approximately sixty to seventy years from now (i.e. 2070-2080), allowing time for both the planning and implementation of the option.

5.3.2 Longlist Options

The longlist options for Unit B focused on sustaining the sea defence after this period and ranged from replacing the current promenade with alternative hard defences, to softer options to create a higher beach and foreshore, through to combinations of hard and soft defences. The longlist considered is presented in **Table 5.2** below.

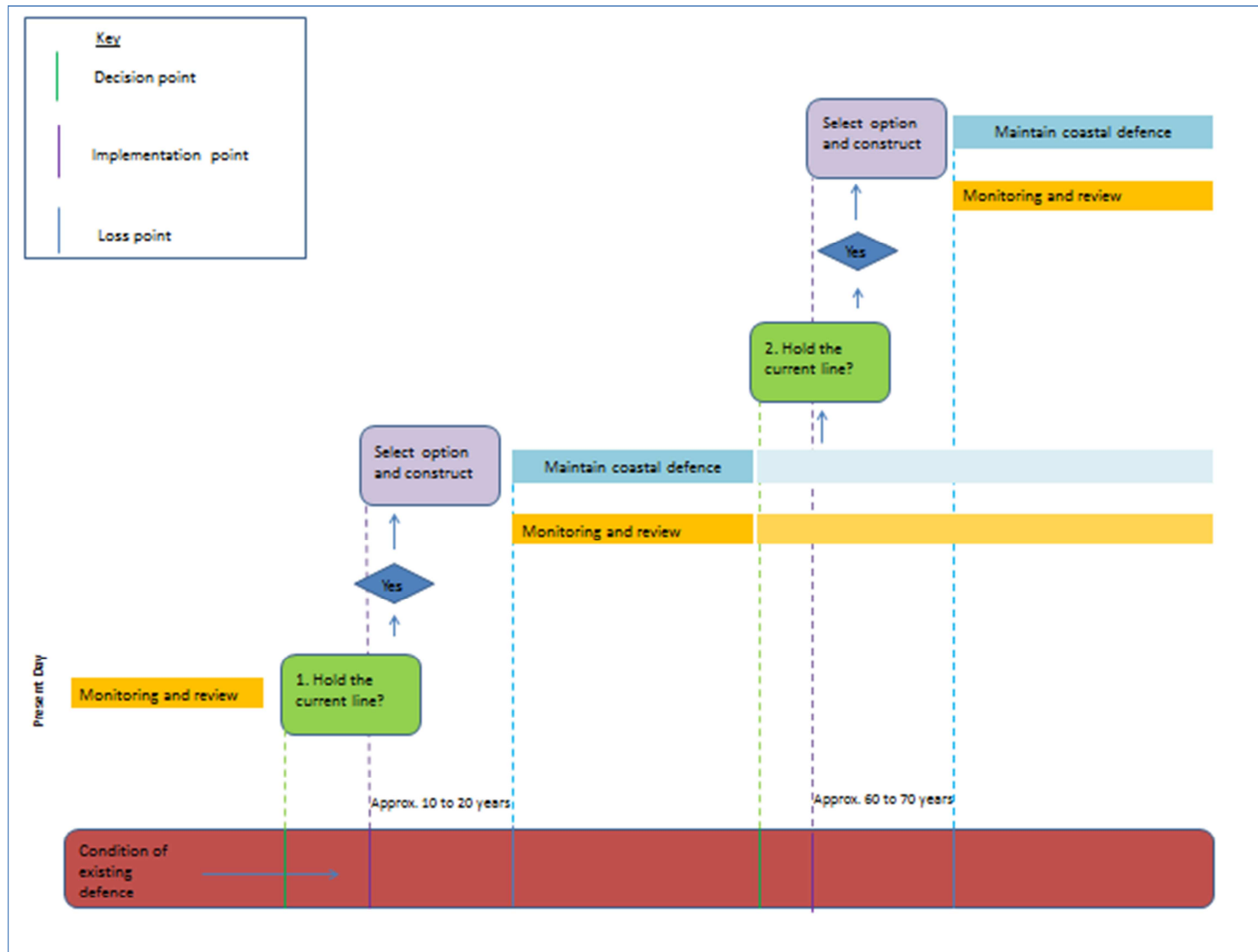
The assessment of these options with the Advisory Group and partners, and wider consultation within the BCKLWN showed a clear consensus that the strategic direction for Hunstanton Town is to sustain the Promenade and seawall – i.e. doing less or doing more is not a realistic option. Similar to Unit A, the Strategy team was able to use this consensus to determine that effectively the strategic decision for this Unit had been made and that development of a shortlist of options was not required.

Table 5.2: Unit B Options Longlist

Name	How does it work	How it is predicted to affect the shoreline
Do Nothing		Erosion will continue.
Patch & Repair	This option is maintaining the defences as they currently are to maintain erosion protection. This means fixing holes and cracks in the sea wall and promenade and ensuring the structures are compliant with health & safety regulations.	This option would retain the current management approach.
Rock revetment	Rock revetments are sloped, permeable, fixed structures. These can influence beach levels through their influence on longshore and cross-shore transport, dependant on their design.	This option would be designed to stop erosion at the base of the Hunstanton town cliffs.
Sea wall	A continuous shore-parallel structure that is designed to absorb wave energy when exposed. These can be concrete, gabion baskets or sheetpile walls. These are sometimes supported by armour to protect the toe.	This option would be designed to stop erosion at the base of the Hunstanton town cliffs. There is likely to be some toe erosion at the base of the sea wall.
Sea wall & Offshore breakwater	Offshore breakwaters principal purpose is to influence wave direction and energy and can reflect, diffract, refract and dissipate waves.	This option will reduce the wave energy approaching the shore and can be designed to generate accretion.
Sea wall & groynes	Groynes are long, narrow structures built roughly normal to the shoreline. Their purpose is to limit the movement of material whether this is longshore, cross-shore or a combination of both. Supported by the use of sand for use on the beach to improve the volume on the beach.	This option will reduce the wave energy approaching the shore, reduce erosion of the cliff face and reduce cross-shore material movement.
Gabions	Rocks are placed in steel cages. This aim of this is to encourage sediment deposition and growth of plants such as marram grass to strengthen the beach.	This would slow down toe erosion locally but this could lead to shallower cliffs as it doesn't stop groundwater-induced erosion.
Sea wall & shore connected breakwaters	Shore connected breakwaters tend to be designed to look like fish tails. This purpose to manage the movement of material both along the shore and across the shore.	This option will reduce the wave energy approaching the shore, reduce erosion of the cliff face and reduce cross-shore material movement.
Large scale beach nourishment	The placement of sand at a location where the natural processes will transport sediment down the coast to build beaches.	A higher beach and foreshore reduces the waves reaching the cliffs. This would slow down erosion.
Rock revetment & beach	Rock revetments are sloped, permeable, fixed structures. These can influence beach levels through their influence on longshore and cross-shore transport, dependant on their design. Supported by the use of sand for use on the beach to improve the volume on the beach.	This option would be designed to stop erosion at the base of the cliffs. A higher beach reduces the waves reaching the revetment which allows a lighter design. In combination this would slow down cliff erosion.

Name	How does it work	How it is predicted to affect the shoreline
Sea wall & beach	A continuous shore-parallel structure that are designed to absorb wave energy when exposed. These can be concrete, gabion baskets or sheetpile walls. These are sometimes supported by armour to protect the toe. Supported by the use of sand for use on the beach to improve the volume on the beach.	This option would be designed to stop erosion at the base of the cliffs. A higher beach reduces the waves reaching the promenade which allows a lighter design. In combination this would slow down cliff erosion.
Sea wall, offshore breakwaters & beach	Offshore breakwaters principal purpose is to influence wave direction and energy and can reflect, diffract, refract and dissipate waves. Supported by the use of sand for use on the beach to improve the volume on the beach.	This option will reduce the wave energy approaching the shore and can be designed to generate accretion. A higher beach reduces the waves reaching the promenade which allows a lighter design. In combination this would slow down cliff erosion.
Sea wall, groynes & beach	Groynes are long, narrow structures built roughly normal to the shoreline. Their purpose is to limit the movement of material whether this is longshore, cross-shore or a combination of both. Supported by the use of sand for use on the beach to improve the volume on the beach.	This option will reduce the wave energy approaching the shore, reduce erosion of the cliff face and reduce cross-shore material movement. A higher beach reduces the waves reaching the promenade which allows a lighter design. In combination this would slow down cliff erosion.
Sea wall, shore connected breakwaters & beach	Shore connected breakwaters tend to be designed to look like fish tails. The purpose is to manage the movement of material both along the shore and across the shore. Supported by the use of sand for use on the beach to improve the volume on the beach.	This option will reduce the wave energy approaching the shore, reduce erosion of the cliff face and reduce cross-shore material movement. A higher beach reduces the waves reaching the promenade which allows a lighter design. In combination this would slow down cliff erosion.
Relocation of key assets	Gradual movement of the communities and assets away from the flood risk and erosion risk zone.	Erosion of the cliffs will begin through both toe erosion and groundwater-induced erosion.

Figure 5.2: Unit B Decision Tree



5.3.3 Preferred Option

The preferred strategic approach for Unit B is to Hold the Line by sustaining the sea wall and promenade. The decision about how the promenade will be sustained will not have to be made until the existing structures approach the end of their functional life, which is not expected until at least 15 years into the future (i.e. 2029). The assessment in Appendix B demonstrates that this option is also the environmentally preferred option for the Unit, as it has the most amount of positive impacts against the SEA criteria.

The most likely technical approach for sustaining the promenade and sea wall is continued maintenance of the existing defences, including patch and repair as necessary, until each section of defence comes to the end of its estimated life. At that point it would be replaced with a similar structure as is currently in place.

As with Unit A, this option could also be supported by beach nourishment. At this stage the need for or extent of beach nourishment is not known; however it has been included in the option appraisal.

5.4 Unit C – Hunstanton Town to Wolferton Creek

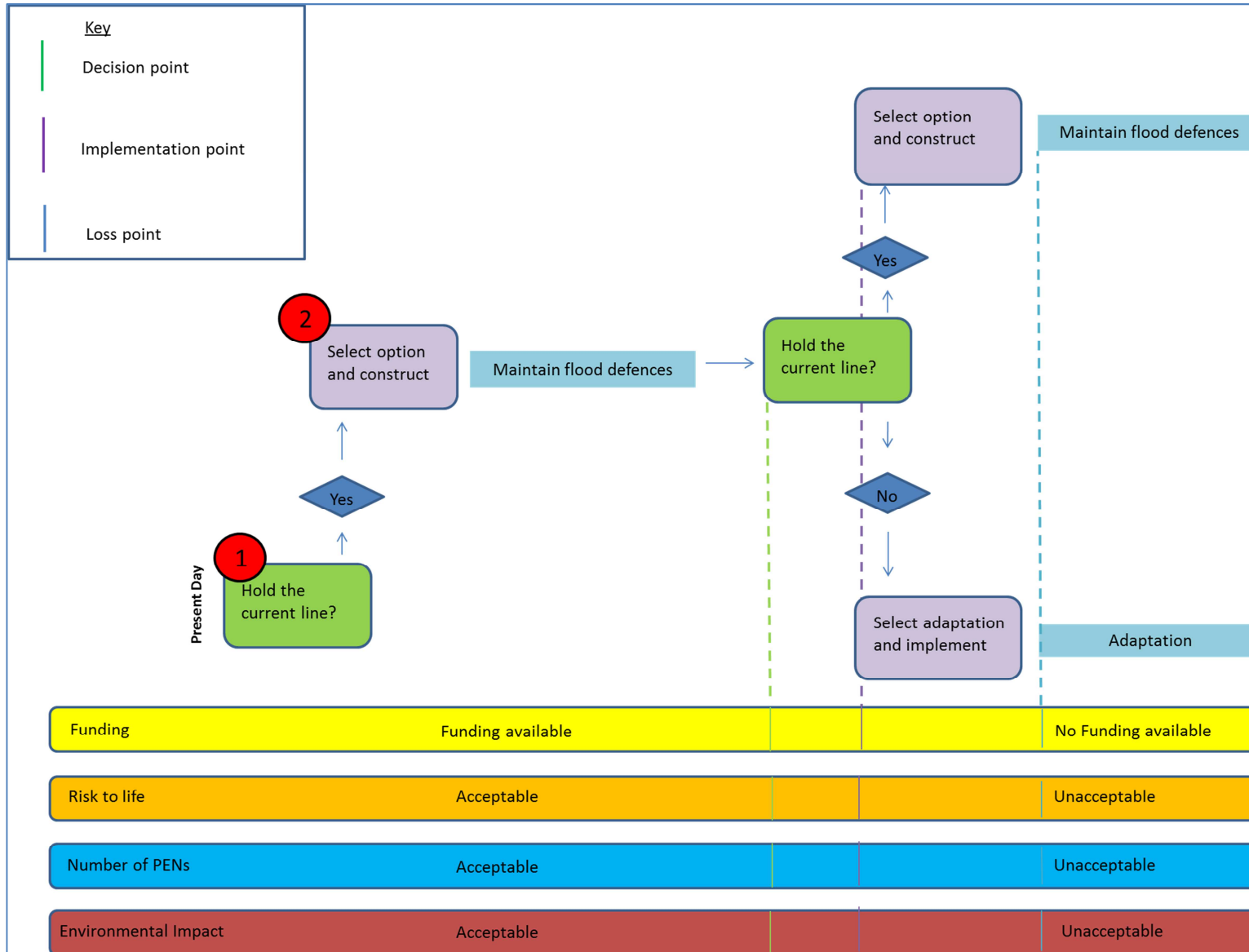
5.4.1 Introduction

Unit C is called South Hunstanton to Wolferton Creek and was known in the Wash SMP2 as PDZ2. It incorporates the low ground from the southern end of Hunstanton town to Wolferton Creek, including Heacham and Shepherd's Port. This Unit contains the large caravan parks at South Hunstanton, Heacham and Shepherd's Port, the Country Park south of Heacham and the RSPB-owned saline lagoons south of Shepherd's Port. Unit C is at risk of flooding. The coastal flood defence in Unit C is managed by the Environment Agency.

For Unit C, the first strategic decision point is in the short term (see **Figure 5.3** below). Doing nothing in Unit C would result in failure of the shingle ridge to the north of the Unit in approximately three years' time. The shingle ridge in the south would fail in approximately five years. The Strategy has confirmed that the current approach of maintaining beach levels with recycled beach material from Snettisham Scalp, ensuring that only as much material as is deposited in any one year is recycled, is sustainable from a social, environmental and economic perspective, based on the extensive ecological monitoring undertaken for these works, at least up to the point when the hard defences need to be replaced (expected to be around 2050), but only if sufficient funding continues to be available, from both national and local sources.

The required strategic decision therefore is how to continue flood defence to the properties and businesses, recognising that this may become unaffordable and unsustainable in the future.

Figure 5.3: Unit C Decision Tree



5.4.2 Longlist Options

The longlist of options for Unit C contained a range of options for Holding the Line, considering combinations for the choice of material (hard or soft) and the Standard of Protection provided (reduce, sustain or improve). The longlist also considered options for localised managed realignment.

The workshop and the associated longlist assessment concluded that the shortlist should focus on the frontline defence options.

The various Hold the Line options differ only slightly in terms of their social, environmental and economic impacts. The only variable relevant at the strategic level is the Standard of Protection that will be provided, and the associated level of funding contributions required from both national and local sources.

Table 5.3: Unit C Options Longlist

Name	How does it work	How is it predicted to affect the shoreline
Do Nothing		Erosion will continue and the defences will gradually deteriorate. The shingle ridge is estimated to deteriorate over a period of 3 to 5 years. The hard defences are estimated to deteriorate over 20 to 30 years.
Do Minimum	Continuation of current level of shingle recycling into the future, and repair of any breaches, without keeping pace with sea level rise, and minimal work to the existing hard defences (maintaining them for health and safety purposes)	This option will lead to gradual deterioration of the defences until the area will have become unsustainable for caravan parks or agricultural use in approximately 30 years.
Rock revetment	This option will manage beach levels and influence long shore transport.	Rock revetment. Rock will improve wave attenuation at the back of the beach. Erosion at the base of the rock is likely to occur.
Promenade and sea wall	This option is designed to absorb wave energy at the head of the beach when exposed.	As a result of building a promenade and sea wall there is likely to be some toe erosion at the base of the sea wall. The wall is likely to have a wave wall at the top to reflect waves.
Groynes	Groynes will limit the movement of material (either cross-shore, longshore or a combination of both).	This option encouraging the build-up of the beach from reducing sediment losses, and consequently is likely to reduce the wave energy approaching the shore through
Shore connected breakwaters	Shore connected breakwaters will manage and trap longshore sediment, and to help build beaches that can reduce the impact of waves	This option encouraging the build-up of the beach from reducing sediment losses, and consequently is likely to reduce the wave energy approaching the shore through
Offshore breakwaters	This option will influence wave direction and energy through reducing the height of the waves approaching the shore.	This option will reduce the wave energy approaching the shore and can be designed to generate accretion.
Annual recycling	As per the current regime to maintain beach levels with recycling beach material from Snettisham Scalp and bring in new material to nourish the beaches when there is insufficient material on Snettisham Scalp to feed the beaches to the north.	As per the existing management regime, recycling is a short term solution to reducing risk through reprofiling the beach to reduce the impact of waves and replacing lost material to improve the standard of protection.

Name	How does it work	How is it predicted to affect the shoreline
Defend (combinations)	<ul style="list-style-type: none"> Recycling combined with hard defences (taken from the sub options within option 2) at “hot spots” (regularly recycled spots). Combination of shingle ridge, hard defences and embankment – using the existing defences and adding hard defences where necessary to support the Standard of Protection required. Focused Standard of Protection improvements to 1 in 50 year for the most critical sub-units/locations. 	The impact of these options will differ depending on the combination selected. In general, beach recycling is likely to be more effective if it is supported by harder defence solutions that are designed to hold the material in place and encourage accretion. This could be achieved through a range of combinations and the preferred combination will be informed by further studies.
Realignment	This option involves realignment in front of the Country Park (to the north of Shepherd's Port). This option allows for the reduction of flood risk to local communities, and provides financial and environmental benefits. There is potential for significant national funding for the creation of new intertidal habitats, which could help to achieve higher standards of protection for the developed areas. This option would include active removal of parts of the shingle ridge, concrete revetment at Heacham Dam and the earth embankment. In its place, new earth embankments would be constructed to reduce the risk of flooding to people, properties and caravans in the areas to the north and south.	The sections of shoreline from South Hunstanton to Heacham and Snettisham to Shepard's Port would respond to the realignment. Further studies would be required to inform the impact on the shoreline. At the Country Park, the shore is likely to move further inland over time, increasing the intertidal area.

5.4.3 Short List of Options

This conclusion has informed the development of the shortlist for Unit C, which consists of a range of Hold the Line options for the frontline, defined by the Standard of Protection that is required (and associated investment level) and by how the Standard of Protection varies from north to south. The shortlisted options are presented in **Table 5.4**: Each of the Equal Improvements and Equal Standards options includes an initial investment to improve the Standard of Protection, followed by annual recycling and maintenance, ten-yearly recharge and refurbishment and replacement of hard structures as needed to sustain the new standard.

Table 5.4: Unit C Short List of Options

Name	How does it work	How it is predicted to affect the shoreline
Do minimum	Continue the current annual recycling and maintenance regime, but without any regular upgrades.	This option will lead to gradual deterioration of the defences until the area will have become unsustainable for caravan parks or agricultural use in approximately 30 years.
Sustain Defence Standard	Continue the current annual recycling and maintenance regime, plus ten-yearly recharge and refurbishments, plus replacement of the hard structures as required.	This will sustain the existing defence standard (which varies between 1:10 per year and 1:50 per year throughout the Unit).

Name	How does it work	How it is predicted to affect the shoreline
Equal Improvements 1	Initial limited improvement of all defences to 1:50 per year for the northern section and 1:20 per year for the southern section.	The impacts on the shoreline for all improvement options are likely to be similar. The improvements in the short term are likely to be made to existing defences such as the shingle ridge and the concrete revetments and sea walls. Into the long term, it is likely additional hard defences will be used to maintain the standard of protection, though the options will be subject to the review of full criteria once a trigger has been reached, the impacts of these defences have been discussed in the longlist above.
Equal Improvements 2	Initial significant improvement of all defences to 1:75 per year for the northern section and 1:50 per year for the southern section.	
Equal Standards 1	Initial improvement of all defences to a 1:50 per year standard.	
Equal Standards 2	Initial improvement of all defences to a 1:75 per year standard.	

5.4.4 Preferred Option

For Unit C, this Strategy presents the option that is preferred from a national perspective, whilst recognising that the ultimate choice of the option will strongly depend on the local decision on the level of flood defence that the community and businesses are willing to invest in. Following the appraisal, the rules which are defined by the Treasury, the most economically preferred option is Equal Improvements 2. As the shortlisted options do not vary significantly in terms of social, environmental and economic impacts (including impact on future decision pathways and flexibility to climate change), the Equal Improvements 2 option is also selected as the preferred strategic approach. It has to be noted that this is for the short and medium term, subject to regular review and until the next trigger for decisions is reached.

The Strategy recommends continuation of the ongoing annual monitoring and review, updated to reflect the key triggers for decisions. The Strategy also recommends the initiation of a five-yearly review to determine subsequent approach and investments. This review should be led by the Environment Agency and BCKLWN but work in close partnership with the other contributors and stakeholders as represented in the Advisory Group.

Equal Improvements 2 involves improving the Standard of Protection to a 1 in 50 chance of flooding in any one year around Snettisham and to a 1 in 75 chance of flooding in any one year around Hunstanton/Heacham. This approach would require a similar level of investment in both areas. There would be a requirement for an initial significant investment to improve the standard, followed by recycling, recharge and refurbishment as needed to maintain the Standard of Protection at the improved level (taking account of climate change). The overall result would be a significant reduction in the probability of flooding, and this reduction will be similar for both areas.

6 Assessment and Evaluation of Environmental Impacts

The following section provides a short summary of the overall impact of the preferred option for each unit on the key receptors and associated objectives (indicated by the text in italics). It is based on the detailed assessment of the options which is presented within the tables in **Appendix B**. The assessment was undertaken using the indicators selected during the earlier SEA stages and identified in **Table 3.3**.

6.1 Unit A

As the preferred option for Unit A is a piloting study consisting of various different flood management options, the following sections detail the impacts associated with the short list options identified in **Section 5.2**. Comparisons have been made between the options to identify an environmentally preferred order for the piloting options (detailed in **Section 6.1.9**). Impacts as result of beach renourishment which has been identified as a possible option alongside the piloting study are also presented in this section.

6.1.1 Population and communities

Protect and enhance local communities, properties and community assets

There are no homes, residential properties or community assets at risk of flooding in Unit A. The cliff top homes situated within Unit A would be at risk in the future if no action was taken. However, the decision pathway process ensures that this impact would be avoided through implementation of an appropriate approach. There would be a loss of areas of The Green (until a trigger point is reached) but Hunstanton would still be able to function as a local centre. As such it is considered that the measures included in the pilot study would not have a significant impact on homes, residential properties or community assets.

In addition there would be no impact due to changes in the cliff drainage or through the inclusion of beach nourishment at Unit A.

Reduce risks to life, safety and wellbeing

The implementation of all four proposed measures would result in a change in the nature of the cliff base at Hunstanton, an area which currently provides recreation amenity.

Implementation of base netting could create a health and safety risk if people were to use the netting to climb upon. Implementation of a rock sill or sandbags would create a trip hazard and in turn create a safety hazard in relation to be stranded at times of high tides. Implementation of gabion baskets would create a potential safety hazard should the baskets degrade and rocks become loose. The implementation of any of the options in the pilot study would result in a **moderate negative impact** on life, safety and wellbeing due to the hazards each option could create at the cliff base.

There would be no additional risks to life, safety and wellbeing brought about by the implementation of the cliff drainage or beach nourishment, therefore resulting in no impact.

Protect and enhance the local and wider economy, and features which support it

All four measures included in the pilot study are designed to allow erosion of Hunstanton Cliffs to continue, but to slow the rate of erosion when compared with the 'do nothing'

option. This would result in some degradation of tourism features within Hunstanton, which in turn would result in a **moderate negative impact** on the local tourism economy in the long term. However, if no options were implemented in Unit A, the impact on tourism and the local economy would be far greater.

However, each of the options will also allow recreation to continue on the beach in front of the cliff, although the gabion basket, rock sill and sand bag options will result in a loss of beach area. In addition, the addition of beach nourishment would help to maintain the usage of the beach area as a tourism feature. However, this is not considered significant enough to reduce the potential impacts on tourism and the economy as a result of erosion.

The visual amenity of the area will change as a result of the pilot study, with the larger scale options such as gabions having a more significant impact. Overall, it is considered that each of the options proposed would have a **minor negative impact** on the visual amenity of the cliff area.

6.1.2 Historic environment

Protect and enhance the historic environment and historic landscape character

Implementation of any of the four measures would slow but not halt erosion of Hunstanton Cliffs. As a result, the heritage assets including the Hunstanton Conservation Area, the Old Hunstanton Lighthouse setting and The Green would be affected in the longer-term. This would result in a **major negative impact**. However, triggers points are likely to be reached prior to this and further action taken to prevent the loss of these assets. Therefore the actual impact on the historic environment is considered to be a **minor negative impact**.

The overall impact of cliff drainage on the heritage assets in Unit A will vary depending upon the actual approach taken. However, the same issues as for the piloting study options will arise as erosion of the cliff will continue in the future.

Beach nourishment will not reduce coastal erosion and therefore the same impact identified above will remain should nourishment be undertaken in conjunction with any of the pilot study options.

The works associated with each of the options are unlikely to affect the historic landscape character within the Unit. In addition, due to their small scale they are unlikely to impact unidentified heritage assets which may be present in the beach area.

6.1.3 Geology

Protect and enhance geological interest features

The pilot study options do not halt the erosion of the Hunstanton Cliffs SSSI, although they do slow down the rate of erosion when compared with the 'do nothing' option. Continued erosion of the cliff is key to maintaining its geological status. However, each of the options could cause the cliff to slump which may affect its geological condition. Overall it is considered that the pilot study approach would not have a significant impact on the geological features of the SSSI.

6.1.4 Water

Maintain water elements and improve where appropriate (or feasible)

During the scoping stage of the SEA all water bodies within Unit A were scoped out as requiring further assessment due to the scale of the impacts associated with potential options in this area. The pilot study options are all restricted to the cliff face/base and will

not affect the condition of the adjacent water bodies. Coastal processes along the coast will not be affected by any of the pilot study approaches. In addition, none of the options will prevent future measures being implemented to improve the condition of these water bodies.

6.1.5 Climate

Act to limit climate change impacts and vulnerability to future change

The pilot approach provides a flexible option, as each pilot study option can be substituted for one of the three alternative pilot measures within the preferred option, should the requirement of the Strategy or the pressure upon the Unit change with time. The measures would be interchangeable, and could be swapped depending on their success and / or changes in environmental conditions. This flexibility would reduce the Strategy's vulnerability to climate by increasing the strategy's adaptive capacity. However, there is an element of regret involved as each option would need to be removed, resulting in a **minor negative impact**.

All four of the measures of the pilot have low material requirements compared with the hard and soft defence options, and as a consequence have a comparably lower carbon footprint, not significantly greater than that of the do nothing option. This equates to **no significant impact** as a result of future climate change.

6.1.6 Landscape and seascape

Protect and enhance landscape / seascape character and visual amenity

The pilot study options would be of small scale and located at the cliff base or on the cliff face. This location and scale would mean they are not located in or visible from the North Norfolk AONB. The netting and rock options are considered to have **no significant impact** on landscape character due to their scale and that boulders are already an existing feature of the area. Gabions and sandbags represent a more significant change to the area and are considered to have a potential **minor negative impact**.

Beach nourishment would help to maintain the existing landscape character if used in combination with any of the pilot study options. However, it is unlikely to be sufficient enough to change the negative impacts associated with gabions and sandbags as these would still represent a new element in the landscape.

The seascape features of Unit A are sandy beaches backed by coastline, dunes and flood embankments; Hunstanton Cliffs are the only coastal cliffs within the seascape unit. The pilot study options comprise a range of imported materials including netting, gabion, rock sill and sandbags which are not in keeping with the seascape character. Netting is considered to be a smaller scale option with less visual intrusion than the other options.

All of the options are reversible, and as the option allows for switching between alternatives measures there is no permanence to any individual negative visual impact on seascape character. However, should one option be found to provide the necessary erosion protection, then this option would become the permanent solution for the Unit. This would therefore represent a permanent change to the seascape character, the scale of which is dependent on the option selected.

As a consequence, there would be a **minor negative impact** on seascape character as a result of the implementation of the rock sill, gabion baskets and sandbags.

Netting is considered to have **no significant impact**.

6.1.7 Critical infrastructure

Protect critical infrastructure assets

The pilot study options are of small scale and located at the cliff base. These options will ensure that existing critical infrastructure continues to be protected and therefore will have a **minor positive impact**.

6.1.8 Biodiversity, flora and fauna

Protect and where possible enhance, biodiversity features

All of the options proposed as part of the pilot study for Unit A will ensure the protection of UK BAP habitat (i.e. maritime cliff and slope). Beach nourishment will help maintain some habitats on site but could result in the loss of the small number of rock pools located along the cliff. This could result in a **minor negative impact** with relation to local biodiversity. This impact would remain the same for any of the pilot study options that beach nourishment was used with.

However, each of the proposed options could cause the cliff to slump which could affect the fulmar nesting habitat, resulting in a potential **major negative impact**. However, the monitoring of the pilot study would include measures for cliff slumping and actions would be taken before this issue could have a permanent impact on the fulmar colony. In addition, each of the pilot study options will not be undertaken across the whole length of the cliff and therefore some areas of the SSSI will be unaffected.

No other impacts on locally or nationally designated sites, habitats or faunal species are expected.

Cliff drainage options may have a temporary impact on the cliff which could affect the fulmar colony. However, these works could be timed so as to avoid the main nesting bird season (e.g. March to August) which would reduce the potential impact.

With regard to the internationally designated sites present within the study area, the table below details the first stage of the HRA (screening stage) for those sites which were identified during the Scoping stage of the SEA and which are relevant to Unit A.

Table 6.1 Unit A Habitats Regulations Assessment

Site Name	Designation	Potential impact from Coastal Management Activities
North Norfolk Coast	SPA	<p>The preferred option is likely to result in short term, temporary disturbance impacts as a result of construction. However, due to the high levels of disturbance in the Unit associated with tourism and other recreational activities, the bird usage of the Unit is considered to be low in comparison to the wider SPA. The works will be timed so as to avoid the key bird periods where possible (e.g. nesting and wintering bird seasons). In particular, the nesting bird season will be avoided so as to avoid impacts to the fulmar colony on the cliff. Best practice measures will also be implemented to manage construction impacts.</p> <p>Overall, no habitat which is used by bird species will be lost as a result of the works.</p>
	Ramsar	<p>The works would be restricted to the base of the cliff and no Ramsar habitats are located within the area of works. Given the localised nature of the works, no impacts to coastal processes are anticipated which could impact surrounding Ramsar habitats. In addition, no impacts on rare invertebrate species are anticipated.</p> <p>The preferred option is likely to result in short term, temporary disturbance impacts as a result of construction. However, due to the high levels of disturbance in the Unit associated with tourism and other recreational activities,</p>

Site Name	Designation	Potential impact from Coastal Management Activities
		<p>the bird usage of the Unit is considered to be low in comparison to the wider SPA. The works will be timed so as to avoid the key bird periods where possible (e.g. nesting and wintering bird seasons). In particular, the nesting bird season will be avoided so as to avoid impacts to the fulmar colony on the cliff. Best practice measures will also be implemented to manage construction impacts.</p> <p>Overall, no habitat which is used by bird species will be lost as a result of the works.</p>
	SAC	The works would be restricted to the base of the cliff and no SAC habitats are located within the area of works. Given the localised nature of the works, no impacts to coastal processes are anticipated which could impact surrounding SAC habitats.
The Wash	SPA	<p>The preferred option is likely to result in short term, temporary disturbance impacts as a result of construction. However, due to the high levels of disturbance in the Unit associated with tourism and other recreational activities, the bird usage of the Unit is considered to be low in comparison to the wider SPA. The works will be timed so as to avoid the key bird periods where possible (e.g. nesting and wintering bird seasons). The Wash is known for its wintering bird populations so consultation will be undertaken with Natural England to ensure that the works are timed appropriately. Best practice measures will also be implemented to manage construction impacts.</p> <p>Overall, no habitat which is used by bird species will be lost as a result of the works.</p>
	Ramsar	<p>The works are restricted to the existing defences and will not encroach into any of the Ramsar habitats.</p> <p>The preferred option is likely to result in short term, temporary disturbance impacts as a result of construction. However, due to the high levels of disturbance in the Unit associated with tourism and other recreational activities, the bird usage of the Unit is considered to be low in comparison to the wider SPA. The works will be timed so as to avoid the key bird periods where possible (e.g. nesting and wintering bird seasons). The Wash is known for its wintering bird populations so consultation will be undertaken with Natural England to ensure that the works are timed appropriately. In particular, the nesting bird season will be avoided so as to avoid impacts to the fulmar colony on the cliff. Best practice measures will also be implemented to manage construction impacts.</p> <p>Overall, no habitat which is used by bird species will be lost as a result of the works.</p>
The Wash and North Norfolk Coast	SAC	<p>The works are restricted to existing defences and will not encroach onto any of the SAC habitats.</p> <p>Common seal and otter are also not anticipated to be affected as they will not be located within the area of works.</p>

6.1.9 Summary

Table 6.2 below provides a visual comparison of the short list options, identifying the key positive and negative impacts associated with each approach. It is clearly evident that the main significant negative impacts are in relation to population and communities as a result of erosion continuing in the Unit. In addition, all of the options may have impacts on the historic environment and biodiversity, predominantly as a result of this continuing erosion.

Based on the detailed assessment undertaken to date of the short list options for Unit A, it is determined that all of the options are broadly similar in terms of their environmental impacts. Base netting will have slightly fewer negative impacts with regards to landscape and seascape character as it is considered to be a less intrusive option. It is therefore considered to be the environmentally preferred option and should therefore be the first option selected as part of the pilot study. The rock sill option was the next option to have the fewest impacts and could be used next in the pilot study. The remaining two options (gabions and sand bags) had similar impacts and there is no environmental order of preference for these options.

Table 6.2 Summary of Strategic Environmental Assessment process

Impact	Colour code
No impact anticipated	0
Minor positive	+
Moderate positive	++
Major positive	+++
Minor negative	-
Moderate negative	--
Major negative	---

SEA Receptor	Criteria	Base netting	Sand bags	Gabions	Rock sill
Populations and Communities	Will the option maintain the coherence and stability of the local communities, in particular the role of Hunstanton as a local centre, and support local development and regeneration intentions?	0	0	0	0
	Will the option protect homes, residential properties and community assets?	0	0	0	0
	Does it guard against increased risks to health and welfare, including public risk, especially disproportionate impacts on the elderly?	--	--	--	--
	Does the option reduce the risk to life associated with catastrophic breach or failure of the existing defence line?	+	+	+	+
	Will the option ensure the continued resilience of the local economy, in particular tourism elements but also minority sectors, and the frontage's contribution to the wider regional economy?	--	--	--	--
	Does it protect and enhance formal and informal recreational and amenity features?	-	-	-	-
Historic Environment	Is it likely to protect and enhance the site and setting of nationally-designated heritage and identified locally-important heritage features?	---	---	---	---
	Does the option provide suitable protection to undesignated, unidentified and potential assets, including historic landscapes?	+	+	+	+
Geology	Does the option protect and enhance nationally-designated sites of geological interest?	0	0	0	0
Water	Will it support the achievement or maintenance of good status for water bodies, with equivalent standards beyond 2027?	0	0	0	0
Climate	Is it likely to reduce vulnerability to the predicted effects of climate change in a flexible way where future management can be altered in the light of updated information on likely impacts?	-	-	-	-
	Is it likely to limit or reduce contributions to future climate change (for instance through low or positive carbon options)?	0	0	0	0
Landscape and Seascape	Will the option protect and contribute to the enhancement of the landscape character, including the AONB?	0	-	-	0
	Will the option protect and contribute to the enhancement of the seascape character?	0	-	-	-
Critical Infrastructure	Does the option protect the material, or function, of critical infrastructural assets?	+	+	+	+
Biodiversity, Flora and Fauna	Will the option affect protect and enhance internationally-designated conservation sites and their features?	0	0	0	0
	Will the option protect and enhance nationally-designated sites and their features and nationally	---	---	---	---

SEA Receptor	Criteria	Base netting	Sand bags	Gabions	Rock sill
	recognised habitats and species?				

6.2 Unit B

This section outlines the impacts associated with the proposed patch and repair option. Further detail of the assessment of this option (undertaken at longlist stage) is presented within **Appendix B**. Beach nourishment for this Unit is also considered within the sections below.

6.2.1 Population and communities

Protect and enhance local communities, properties and community assets

The preferred option will maintain the local flood defences and also improve the defences at a later stage. This could have a **minor positive impact** on the local communities, ensuring that residential properties throughout the Unit are protected. This would be achieved as the preferred option would ensure that the properties would not be at risk from erosion or future flooding. The Strategy maintains the same level of protection which is currently offered, but also takes into account the projected future impacts of climate change.

Reduce risks to life, safety and wellbeing

In the short term the amount of repair works needed to maintain the standard of protection would increase leading to more health and safety issues. This is considered to potentially result in a **moderate negative impact**. However, by maintaining the current flood defences and at a later stage improving them with a like for like replacement, there will be a **minor positive impact** in terms of reducing the risk to life along the entire Unit.

Protect and enhance the local and wider economy, and features which support it

The preferred option will help maintain the resilience of the local economy, in particular the Sea Life Centre, Amusements and Sports and Leisure Centre. However, the patch and repair approach is likely to cause regular disturbance to access along the frontage and could lead to a less attractive area. Overall it is considered that there will be a **minor negative impact** on the economy as a result of the option for Unit B.

Beach nourishment would help to maintain the recreation/tourism usage of the area. However, this impact is not considered enough to counteract the negative impact associated with disruption of the promenade as a result of the repair works. In the longer term, the replacement of the defences and the beach nourishment would maintain the recreational and tourism usage of the area.

6.2.2 Historic environment

Protect and enhance the historic environment and historic landscape character

Many of the historic features associated with the study area are located within this Unit. There are nine listed buildings within Hunstanton as well as Historic Environment Records (HER) for the whole Strategy area, and therefore there is potential for impacts on buried archaeology. As the preferred option involves maintenance to an existing structure, the potential to disturb the historic landscape and environment is low. Therefore it is considered that there will not be a significant impact as a result of the preferred option.

Although there are a number of wreck sites off the coast, these are not anticipated to be affected by the proposed approach as works will be continued to the existing onshore defences and coastal processes will not be affected.

6.2.3 Geology

Protect and enhance geological interest features

No geological interest features are located within Unit B and therefore no direct or indirect impacts are anticipated.

6.2.4 Water

Maintain water elements and improve where appropriate (or feasible)

During the scoping stage of the SEA all water bodies within Unit B were scoped out as requiring further assessment due to the scale of impacts associated with potential options in this area. The preferred option is related to maintaining existing defences and will therefore not affect the condition of the adjacent marine or river water bodies. In addition, the option will not prevent future measures being implemented to improve the condition of these water bodies.

6.2.5 Climate

Act to limit climate change impacts and vulnerability to future change

The preferred option has been designed to minimise spend throughout the assessment period and therefore offer flexibility if required. As the preferred option is predominantly patch and repair, it does offer some flexibility to adapting to sea level rise as a result of climate change. The like for like replacement of the defences in the longer term is less flexible as it involves the construction of hard defences. However, the time period involved does allow for the situation to be re-evaluated and appropriate measures taken. It therefore offers Unit B protection into the future and is considered to have a **minor positive impact**.

6.2.6 Landscape and seascape

Protect and enhance landscape / seascape character and visual amenity

Under the preferred option for Unit B the current landscape and seascape would be maintained, as the existing defences will be maintained and replaced with a like for like structure in the future. Therefore there will be a **minor positive impact** on these features. In addition, beach nourishment would help to maintain the landscape and seascape characters.

6.2.7 Critical infrastructure

Protect critical infrastructure assets

The preferred option in Unit B will retain and maintain the existing flood defences. The preferred option will therefore protect critical infrastructure assets (e.g. the WwTW and road network) in Unit B from flooding, resulting in a **minor positive impact**.

6.2.8 Biodiversity, flora and fauna

Protect and where possible enhance, biodiversity features

The preferred option will not have an impact on the beach or mudflat habitats in the Unit as the works are restricted to existing defences. Therefore it is considered that there will not be a significant impact on biodiversity as a result of the preferred option. In addition, beach nourishment would help to maintain the local biodiversity elements.

6.3 Unit C

This section details the impacts associated with the preferred option for Unit C, which is to improve the standard of protection across all of the defences.

6.3.1 Population and communities

Protect and enhance local communities, properties and community assets

The preferred option will maintain and improve the flood defences (at a later stage) which could have a **major positive impact** on the local communities. It would ensure that all residential properties throughout the Unit, which would otherwise be at risk from erosion or flooding in the future, would be protected.

Reduce risks to life, safety and wellbeing

By maintaining and improving the standard of protection of the defences along the Unit, there will be a **major positive impact** in terms of reducing risk to life.

Protect and enhance the local and wider economy, and features which support it

The preferred option for Unit C will help to maintain the resilience of the local economy, in particular the numerous caravan parks and other tourism assets. Overall, it is considered that there will be a **minor positive impact** on the local economy as a result of the option for this Unit. Recreation and amenity features in the area will also be protected through this option, resulting in a **minor positive impact**.

6.3.2 Historic environment

Protect and enhance the historic environment and historic landscape character

The majority of the known historic features associated with the study area are located within the other Units, i.e. not within this Unit. There are no designated features within the study area; however, there are HER for the whole Strategy area and therefore the potential remains for the works to impact on buried archaeology. As the preferred option involves works to existing structures, the potential to disturb any finds is very low. However, it has been determined that there could be a potential **minor negative impact** on unidentified historic environment features as a result of the preferred option where activities such as excavation are required.

Although there are a number of wreck sites off the coast, these are not anticipated to be affected by the proposed approach as works will be located to the existing onshore defences.

6.3.3 Geology

Protect and enhance geological interest features

No geological interest features are located within the area of works for the preferred option and therefore no direct impacts are anticipated. Heacham Brick Pit SSSI is located further inland (approximately 2km from the defences), but will not be affected by the preferred option, other than being protected from future impacts of flooding. There will be no change to the features it supports as a result of this increased protection.

6.3.4 Water

Maintain water elements and improve where appropriate (or feasible)

Wolferton Lagoon Complex (water body ID GB560503316700) is located behind the existing coastal defences and there is no connectivity between the defence's area or the

water body. The preferred option involves annual recycling and longer term nourishment of the shingle ridge in front of the lagoons. These activities will not prevent sea water from entering the lagoons and therefore their existing condition will be maintained.

Ingol (water body ID GB105033053470) and Boat House Creek (water body ID GB105033047800) are two connecting water bodies which run behind the Wolferton Lagoon Complex. During the scoping stage of the SEA (presented in **Appendix A**) it was determined that the Ingol could potentially be affected by the hold the line options due to it being directly adjacent to the existing flood embankment. However, the preferred option involves works to the existing structures and best practice measures will be implemented to ensure there are no short term impacts to the water body. Operationally, the embankment will prevent saline intrusion from flooding into the Ingol and will therefore help to maintain the condition of the water body. In addition, there is no connectivity between the area of shingle recycling/nourishment further to the north and the water body.

The works to the embankment in the final sub-unit (C16 as shown on **Figure 1.1**) are approximately 20m from the Ingol and run along approximately 200m of its length. The potential for construction related effects, if not appropriately managed through best practice measures is therefore high. However, these works will all be subject to mitigation and monitoring which will avoid the potential contamination issues related to construction works. Operationally, the improvements to the embankment will not impact the condition of the Ingol as it will continue to function as it does currently.

The same assessment for the Ingol also applies to Boat House Creek with regard to the embankment works in sub-unit C16.

It is considered that the preferred option for Unit C will not impact Heacham River (water body ID GB105033053480) significantly given that is located away from the coastline and the majority of the water body would not be within the area of works. The outfall is the only area which has the potential to be affected, but this comprises a small area of the watercourse and would only be affected during the construction phase (a temporary effect). As the option will improve the current flood defences, this water body will not be subjected to any additional flooding and therefore its existing condition will be maintained.

Babingley River (water body ID GB105033047620) is located to the south of the study area, outside the area of coastal defences. There is no connectivity between this water body and the coastline and therefore no impact as a result of the preferred option is anticipated.

As the scheme is a coastal one it is unlikely to help the achievement of any mitigation measures, but will not prevent their implementation in the future.

6.3.5 Climate

Act to limit climate change impacts and vulnerability to future change

The proposed option has been designed to address effects arising from sea level rise and associated climate change related impacts, and therefore offers the Unit protection into the future.

The annual recycling and longer term nourishment of the shingle ridges within the Unit is a flexible option regarding climate change as levels can easily be reduced or increased should different levels of defence be required following monitoring of the Units flood defence requirements. However, the longer term improvement works to the flood walls are less flexible as they involve expensive engineering work and any removal of these defences would be costly and technically complicated. The time frame involved for these

works does add some flexibility as sea level impacts can be monitored during this period and maintenance works adapted in light of best available information. Overall it is considered that the preferred option could result in a **minor negative impact**.

6.3.6 Landscape and seascape

Protect and enhance landscape / seascape character and visual amenity

The preferred option for Unit C involves the maintenance of the existing flood defences with longer term improvements to maintain the Standard of Protection. These improvements will involve the raising of walls which will have an impact on the existing landscape character, although the walls are not a new element within the landscape. The actual level of impact on landscape character is dependent on the construction methodology and the height to which the walls will be raised.

The southern section of Unit C is located within the AONB and hence is a more sensitive landscape area than the remainder of the Unit. The continued recycling and nourishment of the shingle ridge in this area will not significantly affect the AONB features as it is not resulting in much physical change. Maintenance of the embankment will also not significantly change the characteristics of the AONB. Improvement works (raising and improving the slopes) to the embankment in the longer term (year 40) will represent a short term impact to the landscape but overall will not change the features of the AONB.

Due to the low sensitivity of the existing local seascape and presence of man-made features, the preferred option is unlikely to impact its character. The option is shore based and to existing structures which already restrict views into land.

Overall it is anticipated that the preferred option will have a **minor positive impact** on landscape character and the local seascape.

6.3.7 Critical infrastructure

Protect critical infrastructure assets

The preferred option will not have a negative impact on the critical infrastructure present in Unit C. The proposed option ensures that features such as the sewage treatment works and associated pipes, and car parks will be protected. The Strategy also protects the road network which connects the study area to other key settlements and therefore the preferred option will have a **minor positive impact**.

6.3.8 Biodiversity, flora and fauna

Protect and where possible enhance, biodiversity features

The preferred option in Unit C will ensure the protection of the saline lagoons which are an important bird habitat and also designated as a BAP habitat. The shingle recycling and nourishment could have impacts on vegetated shingle BAP habitat present in the southern extent of the Unit. However, this activity is already undertaken, subject to agreements with Natural England which consider these impacts and this agreement will need to be extended to cover the future management of the area. Therefore it is considered that this would not have a significant impact. No other impacts on locally or nationally designated sites, habitats or faunal species are expected.

With regards to the internationally designated sites present within the study area, **Table 6.3** below details the HRA Screening stage (See **Section 3.3**) for those sites which were identified during the Scoping stage of the SEA. It should be noted, that Dersingham Bog Ramsar and Dersingham Bog and Roydon Common SAC were scoped in on the basis that NAI could be considered active intervention option be adopted. Given that this is no

longer the option and due to the distance of the sites from the coastline (approximately 3km), these sites have now been screened out as requiring further assessment and therefore are not included in the table below.

Table 6.3 Unit C Habitats Regulations Assessment

Site Name	Designation	Potential impact from Coastal Management Activities
North Norfolk Coast	SPA	The most northerly extent of Unit C is located approximately 5km from the North Norfolk internationally designated sites. Therefore, no construction related impacts on the interest features of this are anticipated. In addition, the preferred option will help to maintain existing coastal processes by maintaining the defences in the short term. The longer term improvements are also not anticipated to impact coastal processes further along the coast.
	Ramsar	
	SAC	
The Wash	SPA	<p>The preferred option is likely to result in short term, temporary disturbance impacts as a result of construction. However, the shingle recycling is an ongoing activity along this stretch of coastline and would not represent additional disturbance over and above existing conditions. In addition, the works will be timed so as to avoid the key bird periods where possible. In particular, the nesting bird season will be avoided in areas which have been identified (through consultation with Natural England and RSPB) as providing suitable nesting habitat. Best practice measures (e.g. pollution prevention) will also be implemented to manage construction impacts.</p> <p>Overall, no habitat loss is anticipated as a result of the works and therefore the long term usage of the coastline in Unit C by birds is unlikely to be affected.</p>
	Ramsar	<p>The works are restricted to existing defences and will not encroach onto any of Ramsar habitats.</p> <p>The preferred option is likely to result in short term, temporary disturbance impacts as a result of construction. However, the shingle recycling is an ongoing activity along this stretch of coastline and would not represent additional disturbance over and above existing conditions. In addition, the works will be timed so as to avoid the key bird periods where possible (e.g. the nesting and wintering bird seasons). In particular, The Wash is known for its overwintering bird populations and discussions will be undertaken with Natural England to determine the optimum working window.</p> <p>Overall, no habitat loss is anticipated as a result of the works and therefore the usage of the coastline in Unit C by birds is unlikely to be affected.</p>
The Wash and North Norfolk Coast	SAC	<p>The works are restricted to the existing defences and will not encroach onto any of the SAC habitats. In addition, the works will ensure that continued protection of the coastal lagoons to the south of Snettisham.</p> <p>Common seal is also not anticipated to be affected as they will not be located within the area of works.</p> <p>The construction phase of the preferred option will be subject to environmental actions which would include any necessary measures to manage potential impacts to otters (e.g. management of site activities to avoid trapping animals).</p>

6.4 Assessment Summary

Based on **Sections 6.1 to 6.3** above, it can be clearly seen that the main negative impacts associated with the preferred options are to populations and communities, relating to recreation, health and safety and the economy. There is also the potential for localised impacts to the historic environment and biodiversity in relation to the preferred option for Unit A.

The following significant negative impacts have been identified:

- Unit A (based on the use of netting):
 - Moderate negative impacts to health and welfare as a result of the increased risk associated with any of the pilot study options;
 - Moderate negative impacts on the local economy as a result of continued coastal erosion impact Hunstanton centre in the long term;
 - Minor negative impacts on recreation and amenity as a result of the loss of sections of Hunstanton centre in the long term;
 - Major negative impacts on the historic environment due to erosion in the long term impacting key features and the Conservation Area;
 - Minor negative impact relating to adapting to climate change as a result of regret in implementing an option; and
 - Major negative impact to the Hunstanton Cliffs SSSI fulmar colony due to cliff slumping.
- Unit B:
 - Moderate negative impact to health and safety as a result of increased damage in the long term requiring further repair works; and
 - Minor negative impact on the local economy due to impacts on tourism as a result of the increased need to repair the promenade in the longer term.
- Unit C:
 - Minor negative impact on unknown buried archaeology should improvement works to the existing defences require excavation works.

It should be noted that the impacts associated with the pilot study approach in Unit A are related to continued coastal erosion. The option does in fact slow down erosion compared to the do nothing option and all of the options considered for this Unit did not significantly reduce erosion. The pilot study provides flexibility in the future to develop options which could resolve the issues resulting from the erosion of the cliff. Therefore it is considered that whilst negative impacts have been identified with the pilot study these impacts would occur without implementation of the Strategy. In addition, the implementation of a cliff drainage option alongside the piloting approach is likely to reduce the potential for cliff slumping as this issue is connected to groundwater processes rather than as a result of erosion from waves.

All of the preferred options will help to protect the local population. Due to the improvement of the standard of protection proposed in Unit C, the largest positive impacts are associated with this Unit, as people, properties, business, tourism and recreation features will all be protected.

The following significant positive impacts have been identified:

- Unit A:
 - Minor positive impact as a result of a reduction of risk to life from a catastrophic failure;
 - Minor positive impact in relation to undesignated historic environment assets; and
 - Minor positive impact as a result of the continued protection of critical infrastructure.
- Unit B:
 - Minor positive impact to local communities and properties due to maintenance of existing defences;
 - Minor positive impact in relation to adaptability to climate change as no new structures are being created until the long term;
 - Minor positive impacts on landscape and seascape character; and
 - Minor positive impact to local critical infrastructure.
- Unit C:

- Major positive impact to local communities and properties through increased protection;
- Major positive impact on life, safety and wellbeing as a result of improvements;
- Minor positive impact on local economy due to protection of caravan parks and tourism features;
- Minor positive impacts on landscape and seascape character; and
- Minor positive impact on critical infrastructure as standard of protection is improved.

6.5 Mitigation, Management and Monitoring

This section outlines the mitigation, management and monitoring measures which have been identified in relation to the potential impacts identified during the assessment of the preferred options for each Unit.

6.5.1 Unit A

Given the nature of the piloting study and the uncertainties regarding the effectiveness of the options to manage erosion issues, it is recommended that further monitoring and review of the study also includes project level environmental assessment of the proposed options. It is likely that more detailed optioneering will be required as the Strategy is implemented and trigger points are reached. This optioneering should include an assessment of the proposed options against the SEA criteria identified in this document.

Impacts on geological and nationally designated biodiversity features are one of the main implications of the preferred option in Unit A. The Hunstanton Cliffs SSSI is a very sensitive site, with an inherent need to avoid or actively minimise potential impacts. Coastal defences and engineering are operations which could damage the SSSI features, and Natural England's assent will be required before activities can commence.

The main focus of monitoring related to the Strategy will be the Hunstanton Cliffs SSSI, to ensure that both the geological and ecological features of the site are not significantly affected by the pilot study. A monitoring programme will be created in partnership with Natural England which will enable the regular monitoring of the condition of the SSSI and its habitats/species for which it is known to support. This will include monitoring of the fulmar colony to ensure that any cliff slumping does not affect its viability. Details of the monitoring programme will be developed during the detailed design stage of the pilot study to ensure that all approaches/goals are appropriate to the selected option. Should any impacts be identified, discussions with Natural England will be held and a suitable course of actions agreed in advance. This may require removal of the defences and implementation of one of the other pilot study options.

6.5.2 Unit B

The preferred option for Unit B could result in more frequent disruption during repair works which could have both recreational and health and safety issues. However, best practice measures will be put in place during construction works to manage these health and safety risks. In addition, these works are likely to be small scale and could be undertaken outside of the key tourism period so as to further reduce disturbance impacts. Recreational impacts will also be managed during construction through increased communication with local residents and other users of the Unit.

6.5.3 Unit C

Unit C has a history of ecological monitoring (see **Appendix C**) performed annually to ensure there is no negative effect resulting from the re-cycling from Snettisham Scalp on the national and international nature designations of the area; as a result the main implication for the preferred option Unit C is regarding the potential impact regarding archaeological finds. However, the detailed design of the preferred option will be supported by archaeological experts. In addition, if determined necessary a watching brief will be implemented during the construction phase, in agreement with the County Archaeologist.

6.5.4 Monitoring

As previously identified ongoing monitoring will be undertaken of the three Units in relation to triggers and future decision making. In particular, the piloting study approach in Unit A will involve regular monitoring to determine when an alternative defence option needs to be implemented.

This monitoring will include an assessment of environmental effects (e.g. condition of historic environment features, monitoring of the SSSI condition) to ensure that key features such as the Hunstanton Cliffs SSSI will not be significantly affected.

6.6 Residual Impacts

Whilst the mitigation measures detailed above may not be able to prevent impacts to the geological and ecological features of the SSSI, they will allow study of the site throughout the implementation of the pilot approach. However, as slumping of the cliff cannot be prevented, the predicted impact on the SSSI remains the same as prior to mitigation. However, the flexibility of the pilot study allows for any changes in the condition of the Hunstanton Cliffs SSSI to be easily identified and appropriate action taken to prevent significant deterioration.

The proposed mitigation for managing impacts to the historic environment will result in a reduction of impacts throughout the Strategy area.

7 Cumulative and In-combination Impacts

7.1 Unit Level

Given the nature of the pilot study proposed for Unit A and that multiple approaches can be undertaken over the Strategy period there is the potential for cumulative effects to occur. This is particularly the case with regards the landscape and seascape character of the area, as well as impacts to the Hunstanton Cliffs SSSI.

The change in defence approaches as a result of the pilot study is likely to result in impacts to the local landscape and seascape character. Over the 100 year Strategy period, it could result in an inconsistent frontage viewed both from the land and sea. However, the time period between each option being implemented is likely to result in a reduction of the impact.

In addition, the removal of defences should they not be effective could put additional pressure on the cliffs and accelerate the cliff slumping. Monitoring of this issue will need to be undertaken and appropriate measures built into the detailed design of subsequent approaches to ensure that the cliff is not significantly impacted.

7.2 Strategy Level

The SEA receptors cannot be considered in isolation from one another, as there are a variety of inter-relationships that exist. For example, any impacts on water quality as a result of the construction phase could have an impact on local tourism, the local community, the landscape character of the area, and ecology. However, in relation to this scheme, such impacts are considered to be short term, and through the implementation of best practice guidance, would be minimised.

The potential negative impacts arising from the preferred options have been identified in **Section 6** and relate to populations and communities, historic environment, geology and biodiversity, flora and fauna. **Table 7.1** below provides a summary of the impacts across the Units. In particular, there could be impacts on recreation, biodiversity, historic environment and the local economy as a result of the coastal erosion in Unit A. Whilst these impacts are on more than one receptor it is as a result of the cliff erosion which cannot be prevented. Further, the biological impacts are as a result of impacts to the Hunstanton Cliffs SSSI which is designated for both elements.

The implementation of the preferred options across all three Units will result improved flood and erosion management across the Strategy area. This will result in the continuation of Hunstanton as a local centre. However, the need for patch and repair activities in Unit B and the annual recycling proposed for Unit C could have a cumulative effect with regard to recreation and amenity. However, all of these activities can be timed so as to avoid the key tourism period, reducing the amount of people likely to be affected. In addition, regular communication across the Strategy area regarding the proposed works will help to raise local community awareness.

Whilst there are likely to be impacts experienced beyond the immediate study area, these are considered within each of the receptor assessments by considering appropriate zones of influence (for instance the area over which changes to the coastal landscape might be seen). Apart from these, there are not expected to be any wider or transboundary impacts of implementing the preferred options in the three units.

Table 7.1 Summary of impacts

Impact	Colour code
No impact anticipated	0
Minor positive	+
Moderate positive	++
Major positive	+++
Minor negative	-
Moderate negative	---
Major negative	---

SEA Receptor	Criteria	Unit A	Unit B	Unit C
Populations and Communities	Will the option maintain the coherence and stability of the local communities, in particular the role of Hunstanton as a local centre, and support local development and regeneration intentions?	0	+	+++
	Will the option protect homes, residential properties and community assets?	0	+	+++
	Does it guard against increased risks to health and welfare, including public risk, especially disproportionate impacts on the elderly?	--	+	+++
	Does the option reduce the risk to life associated with catastrophic breach or failure of the existing defence line?	+	+	+++
	Will the option ensure the continued resilience of the local economy, in particular tourism elements but also minority sectors, and the frontage's contribution to the wider regional economy?	--	-	+
	Does it protect and enhance formal and informal recreational and amenity features?	-	-	+
Historic Environment	Is it likely to protect and enhance the site and setting of nationally-designated heritage and identified locally-important heritage features?	---	0	0
	Does the option provide suitable protection to undesignated, unidentified and potential assets, including historic landscapes?	+	0	-
Geology	Does the option protect and enhance nationally-designated sites of geological interest?	0	0	0
Water	Will it support the achievement or maintenance of good status for water bodies, with equivalent standards beyond 2027?	0	0	0
Climate	Is it likely to reduce vulnerability to the predicted effects of climate change in a flexible way where future management can be altered in the light of updated information on likely impacts?	-	+	-
	Is it likely to limit or reduce contributions to future climate change (for instance through low or positive carbon options)?	0	+	-
Landscape and Seascape	Will the option protect and contribute to the enhancement of the landscape character, including the AONB?	0	+	+
	Will the option protect and contribute to the enhancement of the seascape character?	0	+	+
Critical Infrastructure	Does the option protect the material, or function, of critical infrastructural assets?	+	+	+

SEA Receptor	Criteria	Unit A	Unit B	Unit C
Biodiversity, Flora and Fauna	Will the option affect protect and enhance internationally-designated conservation sites and their features?	0	0	0
	Will the option protect and enhance nationally-designated sites and their features and nationally recognised habitats and species?	---	0	0

8 Opportunities

The following potential additional opportunities have been identified as a result of the WECMS preferred options:

- Opportunities for public art along the promenade, cliff top and beach throughout all the Units.
- Community education opportunities due to the location of the Hunstanton Cliffs SSSI.
- Signboards detailing the internationally and nationally designated sites could be erected throughout the Units to enhance local community and users of the area education as to the importance of the sites.
- Signboards detailing the historic value of Hunstanton could be erected near the cliffs to raise awareness of the key features present within the town.

9 Conclusion and Next Steps

9.1.1 Conclusion

The SEA process has been undertaken throughout all of the development stages of the WECMS and its options, which has enabled a fully integrated socio-environmental assessment of the various options and the early identification of potential issues and opportunities. The SEA process provided evidence on where the Strategy was likely to have a significant effect on environmental receptors which allowed for environmental input into the Strategy design process.

The complexities of problems within the WECMS study area extend to the interaction between the importance of tourism to the region's economy and the lack of funding as well as conflicts such as the need to balance the Hunstanton Cliffs SSSI in Unit A between the other value assets at the top of the cliffs such as the lighthouse and the Chapel of St Edmunds.

The assessment has identified that the main negative environmental impacts arising from the scheme would be on local populations and communities as a result of localised recreational impacts, health and safety risks and local economy impacts. In addition, there will be impacts on biodiversity as a result of the pilot study in Unit A and the potential for cliff slumping to occur.

The following significant negative impacts have been identified:

- Moderate negative impacts to health and welfare as a result of the increased risk associated with any of the pilot study options;
- Moderate and minor negative impacts on the local economy in Units A and B as a result of continued coastal erosion and the long term increased need to repair the promenade;
- Minor negative impacts on recreation and amenity as a result of the loss of sections of Hunstanton centre in the long term;
- Major negative impacts on the historic environment due to erosion in the long term impacting key features and the Conservation Area;
- Minor negative impact relating to adapting to climate change as a result of regret in implementing an option;
- Major negative impact to the Hunstanton Cliffs SSSI fulmar colony due to cliff slumping.
- Moderate negative impact to health and safety in Unit B as a result of increased damage in the long term requiring further repair works; and
- Minor negative impact on buried archaeology should improvement works to the existing defences require excavation works.

The preferred options for the Units will have positive impacts on all of the SEA receptors in one form or another. The highest positive impacts are in relation to improving the defences within Unit C which will protect houses and reduce health and safety risks.

The following significant positive impacts have been identified:

- Minor positive impact as a result of a reduction of risk to life from a catastrophic failure across all Units;
- Minor positive impact in relation to undesignated historic environment assets in all Units;

- Minor positive impact to local communities and properties in Units B and C;
- Minor positive impact in relation to adaptability to climate change as no new structures are being created until the long term;
- Minor positive impacts on landscape and seascape character in Units B and C;
- Minor positive impact to local critical infrastructure in all Units.
- Major positive impact on life, safety and wellbeing as a result of improvements in Unit C; and
- Minor positive impact on local economy due to protection of caravan parks and tourism features in Unit C.

The long term impact of the management of the cliffs (Unit A) will need to be considered alongside the sustainability of the Hold the Line policy for Hunstanton Town (Unit B), and potential adaptation options for the low lying areas between Hunstanton and Wolferton Creek (Unit C).

Table 9.1 below summarises the mitigation and monitoring outlined in **Section 6.5** to alleviate the impacts outlined above.

Table 9.1 Mitigation and monitoring proposed

Frontage unit	Mitigation proposed	Monitoring proposed
Unit A	<ul style="list-style-type: none"> • Dependant on the outcomes of the monitoring programme – may involve the removal of sea defences and the implementation of an alternative pilot study option. 	<ul style="list-style-type: none"> • Environmental assessment, using this ER as a basis, will be required as the Strategy is implemented, as the pilot study develops. • A monitoring programme of the geological and ecological features of the Hunstanton Cliffs SSSI produced in partnership with Natural England.
Unit B	<ul style="list-style-type: none"> • Best practice measure in place during construction to reduce health and safety risk to beach users. • Works undertaken outside of tourist season to reduce impact on beach users. • Communication with local residents / tourists used during construction. 	
Unit C	<ul style="list-style-type: none"> • Detailed design will be reviewed by an archaeological expert to ensure archaeological assets are not impacted. • An archaeological watching brief will be put in place for construction if required. • Detailed design will be reviewed with reference to impacts on the conservation designations of the area 	<ul style="list-style-type: none"> • An ecological monitoring programme based on the existing annual monitoring (See Appendix C) undertaken for the beach recycling will continue in agreement with Natural England.

9.1.2 Next steps

The SEA Regulations set specific requirements for consultation with statutory consultees, i.e. Natural England and English Heritage, the public and other 'interested parties'. The draft Strategy will be consulted on, alongside this assessment of the social and environmental impacts of the preferred options. This is anticipated to take place over 6 weeks from July to September 2014.

In the light of comments received during the consultation and stakeholder engagement period, the Strategy will be amended if necessary, and the assessments of impacts will be updated or revised. Any revisions to the Strategy will be documented in a 'Statement of Environmental Particulars', a document summarising all amendments to the Strategy that have been made as a result of the SEA process. The final approved Strategy will be adopted by BCKLWN. This is expected to take place in 2015. A post adoption statement

will also be prepared, providing interested parties with details of the location of all documents relevant to the Strategy and its assessment, as well as summarising the reasons for choosing a selected option, monitoring arrangements, and environmental and stakeholder issues raised and addressed.

Implementation of the Strategy will be subject to the availability of funding, but will be led by BCKLWN, working with the Environment Agency. It is likely that a number of schemes will be required in a series of phases to deliver the Strategy's aims. Each of these will be subject to detailed design and assessment bearing in mind much detail remains to be resolved, which will offer further opportunities for environmental and social enhancement to be built in, and for negative impacts to be minimised or designed out.

10 Glossary and Abbreviations

Term	Definition
Adaptation	A change in the way that a feature, such as a community or a habitat, functions to fit a changed environment.
Area of Outstanding Natural Beauty (AONB)	A precious landscape whose distinctive character and natural beauty are so outstanding that it is in the nation's interest to safeguard them. AONBs were created by the legislation of the National Parks and Access to the Countryside Act of 1949.
Biodiversity	Biodiversity is a term which simply means "the variety of life on earth". This variety can be measured on at the genetic level, the species level, and at the ecosystem level.
Biodiversity Action Plan (UKBAP)	This sets out a programme for conserving the UK's biodiversity through targets for a range of specific habitats with the aim of reducing loss of biodiversity.
Climate change	Long-term change in the patterns of average weather. Its relevance to shoreline management concerns its effect on sea levels, current patterns and storminess.
Competent Authority	An authority or authorities identified under the Habitats, Birds or Water Framework Directives (or transposing legislation), responsible for responsible for the application of the rules of the Directive.
Department for Food, Environment and Rural Affairs (Defra)	Government department responsible for flood management policy in England and Wales. Incorporates the former Ministry of Agriculture, Fisheries and Food.
Ecological status	Under the WFD, ecological status applies to surface water bodies and is based on the following quality elements: biological quality, general chemical and physico-chemical quality, water quality with respect to specific pollutants (synthetic and non synthetic), and hydromorphological quality. There are five classes of ecological status (high, good, moderate, poor or bad). Ecological status and chemical status together define the overall surface water status of a water
EU Bathing Water directive	The aim of this directive is to protect public health and the environment from faecal pollution at bathing waters. It sets a number of microbiological and physico-chemical standards that bathing waters must either comply with ('mandatory' standards) or endeavour to meet ('guideline' standards).
EU Habitats directive	European legislation on the conservation of habitats.
Good Ecological Status (GES)	GES is the WFD default objective for all water bodies and is defined as a slight variation from undisturbed natural conditions. The elements that make up Ecological Status include: <ul style="list-style-type: none"> biological elements (including fish, macro-invertebrates, macrophytes and diatoms); and supporting elements (made up of hydromorphology, ammonia, pH, phosphates, dissolved oxygen and 18 pollutants including some heavy metals and pesticides).
Good Ecological Potential (GEP)	GEP is the WFD objective for artificial or heavily modified water bodies (AWB/HMWBs). AWB/HMWBs are composed of the same elements as non AWB/HMWBs. AWB/HMWBs are designated for specific uses, such as recreation, flood risk management, and urbanisation. Water bodies are designated as AWB/HMWBs when: <ul style="list-style-type: none"> the level of modification in these water bodies means the biology is not able to achieve GES; and the use(s) for which the water body has been modified are still needed and cannot be achieved through 'other means.' <p>The AWB/HMWB designation accepts that the biology of the water body has been impacted by its modification and so the alternative objective of GEP is set. GEP is the best ecology an AWB/HMWB can achieve without compromising the use for which it was designated.</p>

Term	Definition
Historic environment	All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and deliberately planted or managed flora.
Hold The Line (HTL)	Hold the existing defence line by maintaining or changing the standard of protection.
Indicators	Used to support the appraisal of options against criteria.
Integrated	An approach that tries to takes all issues and interests into account during the development of an approach, thereby designing out impacts rather than relying on later mitigation of predicted effects.
Listed Building	A building or other structure officially designated as being of special architectural, historical or cultural significance.
Local Development Framework (LDF)	A collection of local development documents that outlines how a local authority will manage planning in their area.
Managed Realignment (MR)	Allowing or enabling the shoreline to move, with associated management to control or limit the effect on land use and environment. This can take various forms, depending on the nature of the shoreline and the intent of management to be achieved.
Mean low water	The average of all low waters observed over a sufficiently long period (usually approximately 19 years).
Mitigation	Practical measures taken to offset the impact of an option on physical assets. The term mitigation has a specific meaning for particular types of physical asset: <ul style="list-style-type: none"> • For wildlife, mitigation may be any process or activity designed to avoid, reduce or remedy adverse environmental impacts of the Strategy. • For the historic environment, mitigation may be 'preservation by investigation' for archaeological features, or 'preservation by recording' followed by stage abandonment, demolition or re-location for Listed Buildings. There is no effective mitigation for the loss of historic landscapes.
Mudflat	Low-lying muddy land that is covered at high tide and exposed at low tide
No Active Intervention (NAI)	No investment in coastal defences or operations. It can apply to unprotected cliff frontages and to areas where investment cannot be justified, potentially resulting in natural or unmanaged realignment of the shoreline.
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.
Outfall	Man-made object designed to control the outlet of a river, drain or sewer where it discharges into a body of water.
Quality element (specifically under the WFD)	A feature of an aquatic (surface water) ecosystem that can be described as a number for the purposes of calculating an ecological quality ratio, such as the concentration of a pollutant; the number of species of a type of plant. It is the collective term for those sub-categories of water body status which form the basis for consideration under the WFD. Specifically they are: <ul style="list-style-type: none"> • Biological elements • Physico-chemical elements; and • Hydromorphological elements.
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.

Term	Definition
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 will 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).
Scheduled Monument	A 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.
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 endeavour to meet ('guideline' standards). To be superseded in 2013 by the WFD
Shoreline Management Plan	A non-statutory plan that provides a large-scale assessment of the risks associated with coastal processes and presents a policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner over a 100 year time period.
Special Protection Area (SPA)	A statutory designation for internationally important sites, set up to establish a network of protected areas of birds. SPAs are designated under the EU Birds directive (79/409/EEC)
Special Site of Scientific Interest (SSSI)	A statutory designation under the Wildlife and Countryside Act 1981. Notified by Natural England (formerly English Nature), representing some of the best examples of Britain's natural features including flora, fauna, and geology.
Standard of Protection (SoP)	The level of protection that a flood or erosion defence provides. This is typically expressed as the frequency of the storm that the defence is expected to withstand. For example, a defence can have a standard of protection of 1 per cent per year.
Stakeholder	Individuals or groups that are or could become interested in, involved in or affected by our policies and activities. Stakeholders include regulators, statutory bodies, professional organisations, local organisations and members of the public.
Strategic Environmental Assessment (SEA)	The term "Strategic Environmental Assessment" is used in United Kingdom guidance to mean an environmental assessment under the European environmental legislation which requires an 'environmental assessment' to be carried out for certain plans and programmes and which are considered likely to have significant effects on the environment. SEA provides a systematic appraisal of the potential environmental consequences of high-level decision-making (i.e. 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.
Water Framework Directive (WFD)	A European Directive that aims to establish a framework for the protection of inland surface waters, transitional waters (estuaries), coastal waters and groundwater.
Water Framework Directive (WFD) objectives	The objectives set out in Article 4 of the Water Framework Directive together with objectives set out in paragraphs 2 and 3 of Article 7 of the Directive and which are required to be met. Relevant objectives are identified in this report.

AONB	Area of Outstanding Natural Beauty
BAP	Biodiversity Action Plan
CAMS	Catchment Abstraction Management Strategies
CFMP	Catchment Flood Management Plan
Defra	Department for Environment, Food and Rural Affairs
HTL	Hold the Line
MR	Managed Realignment
NAI	No active intervention
NCA	National Character Area
NNR	National Nature Reserve
PRoW	Public Rights of Way
RBD	River Basin District
RBMP	River Basin Management Plan
SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment
SM	Scheduled Monument
SMP	Shoreline Management Plan
SPA	Special Protection Area
SSSI	Site of Special Scientific interest
STW	Sewage Treatment Works
BCKLWN	Borough Council of King's Lynn and West Norfolk
WFD	Water Framework Directive
WwTW	Wastewater Treatment Works

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