Saltfleet to Gibraltar Point Strategy

Habitats Regulations Assessment: Screening Report

July 2018

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Introduction

As part of the development of the Saltfleet to Gibraltar Point Strategy (the 'Strategy'), a Habitats Regulations Assessment (HRA) must be undertaken in accordance with The Conservation of Habitats and Species Regulations 2017 (the 'Habitats Regulations'), to assess the effects of the strategy on the integrity of internationally designated nature conservation sites.

This document presents the results of a screening exercise for likely significant effect, as the first stage of the HRA of the Strategy proposals. It has been structured as follows:

- Table 1 Summary of the proposals and locations involved
- Table 2 Designated sites and their associated features
- Table 3 Assessment of likely significant effects for the short term
- Table 4 Assessment of likely significant effects for the medium and long term
- Conclusions

Where likely significant effects have been identified, either as a result of the Strategy proposals themselves ('alone') or where there are cumulative effects with other plans and projects ('in combination'), these will need to be subject to a subsequent Stage 2 assessment of whether they will result in an adverse effect on the integrity of the relevant sites and their features (an "appropriate assessment").

An initial draft of the screening exercise was shared with Natural England and discussed with some of their officers who are responsible for this section of coast at a meeting on the 27th November 2017 (notes appended in Annex 1). The feedback has been incorporated into this revised screening and the subsequent Stage 2 appropriate assessment.

Approach to screening

The current campaign of annual beach nourishment and monitoring (2016-2020) is part of the *Lincolnshire Beach Management (LBM)* project. This follows on from the long-standing *Lincshore* scheme, which began in 1994. The current and previous campaigns have been subject to the Habitats Regulations, the assessment of which has involved the collation and assessment of information from a variety of sources. The baseline environmental conditions are reasonably well understood and documented, although there is some uncertainty about the pathways, destinations and quantities of nourishment material that is subsequently lost from the beaches.

There are complex interactions of tides, currents and topography along the Lincolnshire coastline, into The Wash and through to parts of the North Norfolk coast. This complexity will increase in the future due to predicted sea level rise as well as more frequent storm surge and other weather-related incidents that have the ability to fundamentally change the nature of large parts of the coast. Due to these variables and the uncertainty of the exact nature and timing of changes over such a long strategy period, the approach to the HRA has been to separate the short-term strategy from the medium and long-term elements:

- Short term: the next 5 10 years (up to 2025) essentially a continuation of the current approved programme (2016-2020) but the possibility of an increase in nourishment volumes from 2020 if monitoring indicates an increase in erosion. For this timeframe, baseline environmental conditions (designated sites and their features; coastal processes) are unlikely to change significantly. This period has therefore been assessed in more detail (Table 3) and has been based on the understanding and conclusions of the HRA for the 2016-2020 period (which is an interim project whilst the Strategy is completed).
- Medium term: 10-40 years' time (2026-2055) and long term (decades into the future) both of which incorporate two scenarios for either maintaining an open beach purely through annual nourishment and recycling, or introducing rock armour structures to help limit erosion and loss of material (combined with beach nourishment but only every 5 to 10 years rather than annually). The baseline environmental conditions are likely to change significantly during both these timeframes, especially due to predicted sea level rise and the current Shoreline Management Plan (SMP) policies to hold the line for most lengths of coast. This will result in coastal squeeze as well as potential changes in accretion, erosion and sediment pathways. Clearly there is far more uncertainty and difficulty in undertaking a HRA; consequently, the assessment of likely significant effect

for the medium and long term have been undertaken at a higher level and combined in a single table (Table 4) for ease of reference and comparison.

Where likely significant effects of the Strategy on individual sites and features have been identified, or where there is uncertainty as to whether an effect may occur and be significant, then there is no further need to consider potential in-combination effects with other plans and projects at the screening stage (though they will be considered as part of the appropriate assessment where relevant). Where significant effects have been discounted because there is no pathway or mechanism for <u>any</u> effect to occur, then there can be no in-combination effect and that element can be excluded from the appropriate assessment ('screened out'). Where there is a likely, but not significant, effect as a consequence of the Strategy proposals alone then there is a need to consider potential cumulative effects from other plans and projects that could lead to a significant effect. The following plans and projects have been included for this initial high level incombination assessment, where required:

- The Wash Shoreline Management Plan 2: Gibraltar Point to Old Hunstanton, 2010
- East Inshore and Offshore Marine Plan, 2014.
- East Lindsey Economic Action Plan (2018), which includes Skegness Foreshore Improvement Plan and Coastal Marina Project.
- Triton Knoll offshore windfarm.

Other plans that were considered relevant but excluded following review were:

- Flamborough Head to Gibraltar Point Shoreline Management Plan (SMP2), 2010. As the Strategy is implementing the proposals of this SMP, and the HRA is assessing the potential for significant effects of the Strategy on the integrity of the internationally designated nature conservation sites, the SMP has not been considered in-combination.
- Anglian River Basin District: Flood Risk Management Plan 2015-2021. This high-level plan identifies measures (existing and new) to counteract flooding from all sources and which are the responsibility of a range of organisations to deliver. The accompanying HRA concluded that none of the measures, either alone or in combination with other plans and projects, would lead to any likely significant effects that could not be avoided through a range of avoidance and mitigation measures. It acknowledged that associated lower tier strategies and individual projects would still have to be subject to HRA.
- Humber Estuary Flood Risk Management Strategy (Environment Agency 2011). Humber Estuary FRMS (Environment Agency, 2011) Volume 1 (Stages 1, 2 and 3) and Volume 2. This FRMS only considered the Humber Estuary SAC, SPA and Ramsar site. Although there are a few other designated sites nearby the estuary (such as the Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC), these were considered to be outside the zone of influence of the FRMS and were therefore excluded. Consequently, this FRMS has not been considered in-combination with the Strategy.
- Anglian River Basin Management Plan 2015. As with the Flood Risk Management Plan, the HRA for this high-level strategy concluded no likely significant effect either alone or in combination with other plans and projects and that there is no requirement to consider further stages of the HRA on the RBMP programme of measures. It was noted that this conclusion did not preclude the need for lower tier strategy and project appropriate assessment.
- Viking Link interconnector project A screening exercise was undertaken for Viking Link, which concluded that there would be no significant effect on any Natura 2000 sites. The analysis also confirmed that no risk was identified to the listed features or conservation objectives of any site. Consequently, this project has not been considered further in the assessment, in-combination with the Strategy.

Table 1. Strategy summary				
Type of permission/activity:	Coastal Flood Risk Management - Saltfleet to Gibraltar Point Strategy			
National grid reference:	Saltfleet Haven (NGR TF469934) to Gibraltar Point (NGR TF560572)			
Site location:	 The Strategy area is sub-divided into three zones to reflect the level of historic intervention since 1994, between Saltfleet and Gibraltar Point. These zones are similar to the Shoreline Management Plan (SMP) Policy Units as follows (see Figure 1): Zone A - Northern area - Saltfleet to Theddlethorpe (Meers Bank) (Shoreline Management Plan (SMP) Policy Unit N: South of Humberston Fitties to Theddlethorpe St Helen). Zone B - Central area - Mablethorpe (Meers Bank) to Skegness (Lifeboat Avenue) (SMP Policy Unit O: Theddlethorpe St Helen to Skegness south). Zone C - Southern area - Skegness (Lifeboat Avenue) to Gibraltar Point (SMP Policy Unit P: Skegness south to Gibraltar Point). 			
Strategy proposals:	The Strategy covers three timescales, which broadly equate to the SMP epochs (Strategy implementation will follow the current interim beach nourishment works, programmed for completion in summer 2020):			
	• Short term: the next 5 years (up to 2025), over which time a period of continued stability is expected to be needed and also recognising that any changes will take time to plan for and begin to implement.			
	• Medium term: 6 to 35 years' time (2026-2055), further implementation or consolidation of approach.			
	• Long term: decades into the future, with actual timescales triggered by events (e.g. sea level increase having reached certain levels) or circumstances (e.g. insufficient funding or resources available).			
	<u>Short-term</u>			
	Beach re-nourishment with present management, increasing volumes to maintain the defence standard to 0.5% (1 in 200 year):			
	'Lincshore', scheme).			
	 Current design for beach profile and crest level (4.50 mAOD + 0.3 m height tolerance) still valid based on an estimate of 0.1 m sea level rise during this period. 			
	 Protect the landward hard (e.g. sea walls, embankments) and soft (e.g. sand dunes) defences, which will be maintained as required. 			
	 Removal of any timber groynes found to be exposed within the project area although it should be noted that no old groynes have been found or removed since 2007. Reach recycling: Reuse material within the extent of proposed 			
	 Beach recycling. Re-use material within the extent of proposed works, as required. This is effectively the same approach that has already been approved for 			
	the period 2016 – 2020, whilst the Strategy is being developed.			
	Medium-term			
	Scenario $\overline{1 - Continue}$ to maintain open beach			
	Annual nourishment to maintain a 0.5% standard of protection but with an increase in beach levels and crest levels (4.80 mAOD) to accommodate an			

estimated sea level rise of 0.3 m. All works within Zone B including periodic nourishments that may be required between Ingoldmells and Skegness.

Scenario 2 – Install rock armour structures

If trigger points, such as experiencing predetermined increases in sea level and/or greatly exceeding predicted increases in nourishment volumes, are activated, there will be a need to install beach control structures to help retain material in situ. This would be completed over a 10 to 15 year period. Beach nourishments are still likely to be required every 5-10 years. Maintain a 0.5% standard of protection but with an increase in beach levels and crest levels (4.80 mAOD) to accommodate an estimated sea level rise of 0.3 m. All works within Zone B.

Both scenarios will also require the raising of landward defences to sustain the standard of protection in line with sea level rise.

In the medium term in Zones A and C, it is the preferred policy to hold the defences in their current position. The solution would comprise continuation of no active intervention but with a potential increase in monitoring activity until climate change triggers dictate that some intervention will be required. Currently beach level monitoring is carried out in these zones in association with the Environment Agency's beach monitoring programme. Future monitoring may involve more regular inspections of the coastal marsh and dune frontages. Interventions may include provision of some new embankments and raising of the existing defences.

Long-term

Scenario 1 – Continue to maintain open beach

Annual nourishment to maintain a 0.5% standard of protection but with an increase in beach levels and crest levels (5.00-5.50 mAOD) to accommodate an estimated sea level rise of up to 1.1 m. All works initially within Zone B including the potential for regular nourishment between Ingoldmells and Skegness. Nourishments may also be required in the northern part of Zone C but that will be dependent on how the baseline has changed in the interim.

Scenario 2 – Maintain beach profiles and structures

Ongoing maintenance of control structures including the need to raise their crest height as beach levels are raised (effective in 50+ years' time). Beach nourishment every 5 to 10 years. All works initially within Zone B. Nourishments may also be required in the northern part of Zone C although this will require further assessment at the time due to the likely change in baselines by then. Climate change and sea level rise of up to 1.1 m will require higher walls and a nourishment crest level of 5.00-5.50 mAOD.

In both scenarios Zones A and C are likely to require further interventions which would be subject to long term climate change triggers, i.e. measurable changes in sea level or storm damage to the marsh and dune systems.



Figure 1: Saltfleet to Gibraltar Point strategy area and zones





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Figure 2: Internationally designated nature conservation sites within the strategy area.

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Table 2. Designated sites and their associated features				
European site name and status:	0	Humber Estuary Special Area of Conservation (SAC)		
	0	Humber Estuary Special Protection Area (SPA)		
See Figure 2 for the location of	0	Humber Estuary Ramsar site		
these sites relative to the strategy	0	Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC		
area	0	Gibraltar Point SPA		
	0	Gibraltar Point Ramsar site		
	0	The Wash and North Norfolk Coast SAC		
	0	The Wash SPA		
	0	The Wash Ramsar site		
	0	North Norfolk Coast SAC		
	0	North Norfolk Coast SPA		
	0	North Norfolk Coast Ramsar site		
	0	Inner Dowsing, Race Bank and North Ridge Offshore SAC		
	0	Greater Wash SPA		

List of interest features (relevant to this type of permission):

This section identifies the designated interest features of the European sites considered within this screening assessment. Each interest feature is classified into relevant functional groups based on habitat requirements in accordance with the classifications provided in the 2010 Environment Agency Habitats Directive Handbook procedures. The purpose of using these functional groups of interest features is to enable efficient screening of large numbers of interest features with similar habitat requirements and the potential to be impacted in a similar way.

NB. The features are those that are currently listed for the designated sites¹. It is likely that the individual qualifying features will change over time, especially in the medium and longer terms, as sea level rise, coastal squeeze and changing weather patterns significantly affect the availability and/or quality of habitats. Even where suitable habitat remains for individual species it is likely that their behaviours, including migration pathways and destinations, will change over time.

SPA/Ramsar siteoAnnex 1 habitats (primary reason for site selection)1.10 Coastal habitatso Estuaries [1.12]
1.10 Coastal habitats o Estuaries [1.12]
1.11 Coastal habitats (sensitive to o Mudflats and sandflats not covered by seawater at low
abstraction) tide [1.12]
1.12 Estuarine & intertidal habitats o Annex 1 habitats (qualifying feature but not primary reason for
1.13 Submerged marine habitats site selection)
o Sandbanks which are slightly covered by seawater all the time
2.5 Anadromous fish [1.13]
2.12 Marine mammals o Coastal lagoons * [1.11]
o Salicornia and other annuals colonising mud and sand [1.12
3.4 Birds of lowland wet grasslands o Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)
3.5 Birds of lowland dry grasslands [1.12]
3.6 Birds of lowland freshwaters o Embryonic shifting dunes [1.10]
and their margins o Shifting dunes along the shoreline with Ammophila arenaria
3.7 Birds of farmland ('white dunes') [1.10]
3.8 Birds of coastal habitats o Fixed dunes with herbaceous vegetation ('grey dunes') * [1.10
3.9 Birds of estuarine habitats o Dunes with <i>Hippophae rhamnoides</i> [1.10]
3.10 Birds of open sea and o Annex 2 species (qualifying feature but not primary reason fo
offshore rocks site selection)
o Sea lamprey Petromyzon marinus [2.5]
o River lampetra fluviatilis [2.5]
of waterrowi in winter o Grey seal Hallchoerus grypus [2.12]
Nationally important broading ELL Birds Directive
nonulations in summer The SPA qualifying bird species are listed below in two groups
according to whether they qualify under Article 4.1 or 4.2 of Council

¹ These are all the qualifying features identified on JNCC citations, Natural England's SPA citations and Natural England site information.

Humber Estuary SPA/Ramsar is located partly within Zone A.	Directive 79/409/EEC on the conservation of wild birds. The designated population for each species is indicated, i.e. whether it is the breeding or non-breeding population, as well as the codes for the habitats that	
Humber Estuary SAC is located adjacent to Zone A.	 o Population, as well as the codes for the habitats that are typically used by each species. o Populations of European importance of regularly occurri Annex 1 bird species in any season (under Article 4.1 Directive 79/409/EEC): o Bittern <i>Botaurus stellaris</i> (breeding & wintering) [3.6, 3.8] o Marsh harrier <i>Circus aeruginosus</i> (breeding & wintering) [3 3.6, 3.9] o Hen harrier <i>Circus cyaneus</i> (wintering) [3.4, 3.6, 3.9] o Avocet <i>Recurvirostra avosetta</i> (breeding & wintering) [3.8, 3.9] o Avocet <i>Recurvirostra avosetta</i> (breeding & wintering) [3.8, 3.9] o Bar-tailed godwit <i>Limosa lapponica</i> (wintering) [3.4, 3.7, 3.8, 3.9] o Golden plover <i>Pluvialis apricaria</i> (wintering) [3.4, 3.7, 3.8, 3.9] o Ruff <i>Philomachus pugnax</i> (passage) [3.4, 3.6, 3.8, 3.9] o Shelduck <i>Tadorna tadorna</i> (wintering) [3.6, 3.8, 3.9] o Dunlin <i>Calidris alpina</i> (wintering & passage) [3.4, 3.7, 3.8, 3.9] o Black-tailed godwit <i>Limosa limosa islandica</i> (wintering & passage) [3.4, 3.7, 3.8, 3.9] 	
	 3.8, 3.9] An internationally important assemblage of birds (under Article 4.2 of Directive 79/409/EEC): In the non-breeding season the area regularly supports over 20,000 waterbirds, including wintering species listed above plus the following: teal <i>Anas crecca</i>, wigeon <i>Anas penelope</i>, mallard <i>Anas platyrhyncos</i>, turnstone <i>Arenaria interpres</i>, pochard <i>Aythya farina</i>, scaup <i>Aythya marila</i>, dark-bellied brent goose <i>Branta bernicla bernicla</i>, goldeneye <i>Bucephala clangula</i>, sanderling <i>Calidris alba</i>, ringed plover <i>Charadrius hiaticula</i>, oystercatcher <i>Haematopus ostralegus</i>, curlew <i>Numenius arquata</i>, whimbrel <i>Numenius phaeopus</i>, grey plover <i>Pluvialis squatarola</i>, greenshank <i>Tringa nebularia</i>, lapwing <i>Vanellus vanellus</i>. [3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10] 	

	Ramsar Convention Criteria
	 The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sandflats, saltmarshes, and coastal brackish/saline lagoons (Criterion 1 - Summary).
	• The site supports a breeding colony of grey seals <i>Halichoerus grypus</i> at Donna Nook. It is the second largest seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the site are the most north-easterly breeding site in Great Britain of the natterjack toad <i>Bufo calamita</i> (Criterion 3).
	 Waterfowl assemblage of international importance (as SPA) (Criterion 5).
	 Species/populations occurring at levels of international importance: shelduck, golden plover, knot, dunlin, black-tailed godwit, bar-tailed godwit, redshank (Criterion 6). The Humber estuary acts as an important migratory route for both river lamprey <i>Lampetra fluviatilis</i> and sea lamprey <i>Petromyzon marinus</i> between coastal waters and their spawning areas (Criterion 8).
Saltfleetby-Theddlethorpe Dunes	EU Habitats Directive
and Gibraltar Point SAC 1.10 Coastal habitats	 Annex 1 habitats (primary reason for site selection) Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [1.10]
Northern part of SAC located within Zone A and the southern part within Zone C.	o Fixed dunes with herbaceous vegetation (grey dunes) [1.10] o Dunes with sea buckthorn (<i>Hippophae rhamnoides</i>) [1.10] o Humid dune slacks [1.10]
	 Annex 1 habitats (qualifying feature but not primary reason for site selection) Embryonic shifting dunes [1.10]

Gibraltar Point SPA/Ramsar site 3.4 Birds of lowland wet grasslands 3.6 Birds of lowland freshwaters and their margins 3.7 Birds of farmland 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats 3.10 Birds of open sea and offshore rocks Dune, saltmarsh and freshwater marsh habitats Assemblage of rare wetland invertebrate species <i>Located wholly within Zone C.</i>	 EU Birds Directive Populations of European importance of regularly occurring Annex 1 bird species (under Article 4.1 of Directive 79/409/EEC): o Little tern Sterna albifrons (breeding) [3.8, 3.9, 3.10] o Bar-tailed godwit Limosa lapponica (wintering) [3.4, 3.7, 3.8, 3.9] Populations of European importance of regularly occurring migratory bird species (under Article 4.2 of Directive 79/409/EEC): o Sanderling Calidris alba (wintering) [3.8, 3.9] o Grey plover Pluvialis squatarola (wintering) [3.4, 3.7, 3.8, 3.9]; and o Knot Calidris canutus (wintering) [3.4, 3.7, 3.8, 3.9] An internationally important assemblage of birds (under Article 4.2 of Directive 79/409/EEC) including oystercatcher Haematopus ostralegus, knot Calidris canutus, grey plover Pluvialis squatarola and bar-tailed godwit Limosa lapponica [3.4, 3.7, 3.8, 3.0]
	 3.7, 3.8, 3.9] Ramsar Convention Criteria Dune and saltmarsh habitats representative of all stages of colonisation and stabilisation and a fine example of a freshwater marsh (Criterion 1); Assemblage of wetland invertebrate species, of which eight are listed as rare in the British Red Data Book (Criterion 2); Waterfowl assemblage of international importance (Criterion 5); and Bird species/populations occurring at levels of internationally importance: grey plover, sanderling, bar-tailed godwit and darkbellied brent geese. (Criterion 6).
The Wash and North Norfolk Coast SAC 1.10 Coastal habitats 1.11 Coastal habitats (sensitive to abstraction) 1.12 Estuarine & intertidal habitats 1.13 Submerged marine habitats 2.9 Mammals of riverine habitats 2.12 Marine mammals Located partly within Zone C at Gibraltar Point, but the majority of the site is to the south of Zone C extending into The Wash and east across to North Norfolk.	 EU Habitats Directive Annex 1 habitats (primary reason for site selection) Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>) [1.10] Large shallow inlets and bays [1.12] Mudflats and sandflats not covered by seawater at low tide [1.12] Samphire Salicornia and other annuals colonising mud and sand [1.12] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1.12] Sandbanks, which are slightly covered by sea water all the time [1.13] Reefs (<i>Sabellaria spinulosa</i>) [1.13] Annex 1 habitats (qualifying feature but not primary reason for site selection) Coastal lagoons [1.11] Annex 2 species (primary reason for site selection) Harbour seal Phoca vitulina [2.12] Annex 2 species (qualifying feature but not primary reason for site selection) Otter Lutra lutra [2.9]
The Wash SPA/ Ramsar site 3.1 Birds of uplands 3.4 Birds of lowland wet grasslands 3.6 Birds of lowland freshwaters and their margins 3.7 Birds of farmland 3.8 Birds of coastal habitats	 EU Birds Directive Populations of European importance of regularly occurring Annex 1 bird species (under Article 4.1 of Directive 79/409/EEC): o Little tern Sterna albifrons (breeding) [3.8, 3.9, 3.10] o Common tern Sterna hirundo (breeding) [3.6, 3.8, 3.9, 3.10] o Marsh Harrier Circus aeruginosus (breeding) [3.6, 3.7, 3.8]

 3.9 Birds of estuarine habitats 3.10 Birds of open sea and offshore rocks Large shallow estuarine bay and important estuarine habitats Estuarine processes and high productivity Located adjacent to Zone C, immediately south of the Wainfleet channel, where it abuts Gibraltar Point. 	 o Bar-tailed godwit <i>Limosa lapponica</i> (wintering) [3.4, 3.7, 3.8, 3.9] o Bewick's swan <i>Cygnus columbianus bewickii</i> (wintering) [3.4, 3.6, 3.7, 3.8] o Avocet <i>Recurvirostra avosetta</i> (wintering) [3.6, 3.8, 3.9] o Golden Plover <i>Pluvialis apric</i>aria (wintering) [3.1, 3.4, 3.7, 3.8, 3.9] o Whooper Swan <i>Cygnus cygnus</i> (wintering) [3.6, 3.7, 3.8, 3.9] o Whooper Swan <i>Cygnus cygnus</i> (wintering) [3.6, 3.7, 3.8, 3.9] o Populations of European importance of regularly occurring migratory bird species (under Article 4.2 of Directive 79/409/EEC): o Pintail <i>Anas acuta</i> [3.6, 3.8, 3.9] o Wigeon <i>Anas penelope</i> [3.6, 3.7, 3.8, 3.9] o Gadwall <i>Anas strepera</i> [3.6] o Pink-footed goose <i>Anser brachyrhynchus</i> [3.4, 3.6, 3.7, 3.8, 3.9] o Turnstone <i>Arenaria interpres</i> [3.8, 3.9] o Turnstone <i>Arenaria interpres</i> [3.8, 3.9] o Goldeneye <i>Bucephala clangula</i> [3.10] o Sanderling <i>Calidris alba</i> [3.8, 3.9] o Bunlin <i>Calidris alpina alpina</i> [3.4, 3.7, 3.8, 3.9] o Knot <i>Calidris cantus</i> [3.4, 3.7, 3.8, 3.9] o Cystercatcher <i>Haematopus ostralegus</i> [3.4, 3.7, 3.8, 3.9] o Curlew <i>Numenius arquata</i> [3.1, 3.4, 3.7, 3.8, 3.9] o Curlew <i>Numenius arquata</i> [3.1, 3.4, 3.7, 3.8, 3.9] o Shelduck <i>Tadorna tadorna</i> [3.6, 3.8, 3.9] o An internationally important assemblage of birds (under Article 4.2 of Directive 79/409/EEC): Over winter the area regularly supports 400,273 waterfowl (5 year peak mean 1991/2 – 1995/6), including Bewick's swan <i>Cygnus columbianus bewickii</i>, pink-footed goose, dark-bellied brent goose, shelduck, wigeon, 1995/6), including Bewick's swan <i>Cygnus columbianus bewickii</i>, pink-footed goose, dark-bellied brent goose, shelduck, wigeon, 1995/6), including Bewick's swan <i>Cygnus columbianus bewickii</i>, pink-footed goose, dark-bellied brent goose, shelduck, wigeon, 1995/6), including Bewick's swan <i>Cygnus columbianus bewickii</i>, pink-foo
	plover, knot, sanderling, dunlin, black-tailed godwit, bar-tailed godwit, curlew, redshank and turnstone.
	 Ramsar Convention Criteria A large shallow bay which is one of the largest and most important areas of estuarine mudflats, sand banks and saltmarsh in UK (Criterion 1); Inter-relationship between its various components forming the basis for the high productivity of the estuary (Criterion 3); Waterfowl assemblage of international importance (Criterion 5); and Bird species/populations occurring at levels of international importance: pintail, pink-footed goose, turnstone, dark-bellied brent goose, sanderling, dunlin, knot, oystercatcher, bar-tailed godwit, black-tailed godwit, curlew, golden plover, grey plover, ringed plover, lapwing, shelduck and redshank (Criterion 6).
North Norfolk Coast SAC & SPA/ Ramsar site 1.10 Coastal habitats 1.11 Coastal habitats (sensitive to abstraction) 2.4 Mosses and Liverworts	 EU Habitats Directive Annex 1 habitats (primary reason for site selection) Coastal lagoons (*Priority feature) [1.11] Perennial vegetation of stony banks [1.10] Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>) [1.10] Embryonic shifting dunes [1.10]
	o omitting duries along the shoreline with Ammophila arenana

 3.1 Birds of uplands 3.4 Birds of lowland wet grasslands 3.6 Birds of lowland freshwaters and their margins 3.7 Birds of farmland 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats 3.10 Birds of open sea and offshore rocks A particularly good example of a marshland coast with intertidal sand and mud, saltmarshes, shingle banks and sand dunes. Assemblage of nationally scarce vascular plants and invertebrates. Located approximately 18 km south-east to the closest point of Zone C, at Gibraltar Point. 	 ('white dunes') [1.10] o Fixed coastal dunes with herbaceous vegetation ('grey dunes') (*Priority feature) [1.10] o Humid dune slacks [1.10] Annex 2 species (qualifying feature but not primary reason for site selection) o Otter <i>Lutra lutra</i> [2.9] o Petalwort <i>Petalophyllum ralfsii</i> [2.4] EU Birds Directive Populations of European importance of regularly occurring Annex 1 bird species (under Article 4.1 of Directive 79/409/EEC): o Bittern <i>Botaurus stellaris</i> (breeding and wintering) [3.6] o Marsh harrier <i>Circus aeruginosus</i> (breeding) [3.4, 3.6, 3.7] o Avocet <i>Recurvirostra avosetta</i> (breeding) [3.8, 3.9] o Little tern <i>Sterna albifrons</i> (breeding) [3.8, 3.9, 3.10] o Common tern <i>Sterna sandvicensis</i> (breeding) [3.8, 3.9, 3.10] o Sandwich tern <i>Sterna sandvicensis</i> (breeding) Populations of European importance of regularly occurring migratory bird species (under Article 4.2 of Directive 79/409/EEC): o Wigeon <i>Anas penelope</i> [3.6, 3.7, 3.8, 3.9] o Park-footed goose <i>Anser brachyrhynchus</i> [3.4, 3.6, 3.7, 3.8, 3.9] o Cantot calidris canutus [3.4, 3.7, 3.8, 3.9] An internationally important assemblage of birds (under Article 4.2 of Directive 79/409/EEC): o Wigeon Anas penelope [3.6, 3.7, 3.8, 3.9] An internationally important assemblage of birds (under Article 4.2 of Directive 79/409/EEC):
	 Ramsar Convention Criteria One of the largest expanses of undeveloped coastal habitat of its type in Europe. It is a particularly good example of a marshland coast with intertidal sand and mud, saltmarshes, shingle banks and sand dunes. There are a series of brackish water lagoons and extensive areas of freshwater grazing marsh and reed beds. (Criterion 1). Supports at least three British Red Data Book and nine nationally scarce vascular plants, one British Red Data Book lichen and 38 British Red Data Book invertebrates. (Criterion 2); Waterfowl assemblage of international importance (Criterion 5); Bird species/populations occurring at levels of international importance: pink-footed goose, dark-bellied brent goose, wigeon, pintail, knot, sandwich tern, common tern, little tern (Criterion 6).
Inner Dowsing, Race Bank and North Ridge Offshore SAC 1.13 Submerged marine habitats Located approximately 1.5 km offshore from Zone B at its closest point.	 EU Habitats Directive Annex 1 habitats (primary reason for site selection) Sandbanks that are slightly covered by seawater all the time [1.13] Reefs (Sabellaria spinulosa) [1.13]

Greater Wash SPA 3.6 Birds of lowland freshwaters and their margins 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats 3.10 Birds of open sea and offshore rocks Located within all three zones, with its landward extent approximately 1.5 m above mean high water. It stretches from Bridlington Bay on the East Yorkshire coast to just below Great Yarmouth in Norfolk.	 EU Birds Directive Populations of European importance of non-breeding Annex 1 species (under Article 4.1 of Directive 79/409/EEC): Red-throated diver Gavia stellata [3.6, 3.10] Little gull Hydrocoloeus minutus [3.8, 3.9] Common scoter Melanitta nigra [3.8, 3.9, 3.10] Annex I tern species that use relatively restricted areas around their breeding colonies (within existing SPAs) for foraging [3.6, 3.8, 3.9, 3.10]
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Table 3. Assessment of likely significant effect for the short term (present to 2025)

This table identifies the potential hazards likely to affect the interest features (classified in terms of the functional groups defined in the preceding section) using the 2010 Environment Agency Habitats Directive Handbook procedures. This procedure was used to identify the relevant potential hazards (see the procedure for the definitions of each) associated with the strategy beach nourishment proposals and then, using a flood defence sensitivity matrix, identify which of the functional groups are likely to be sensitive to such hazards. This process provides a framework for considering (and screening in/out) the potential impacts of the short term strategy on a large number of interest features. It considers each individual European Site in turn, combining sites and interest features/functional groups where appropriate.

Approach:

- Protect the landward hard (e.g. sea walls, embankments) and soft (e.g. sand dunes) defences, which will be maintained as required.
- Removal of any timber groynes found to be exposed within the project area although it should be noted that no old groynes have been found or removed since 2007.
- Beach recycling: Re-use material within the extent of proposed works, as required.

In this Strategy timeframe it is anticipated that beach nourishment will be focussed on 'hotspots' within Zone B only.

Sensitive interest feature:	Potential hazard:	Potential exposure to hazard and mechanism of effect/impact if known:
 Humber Estuary SAC 1.10 Coastal habitats Embryonic shifting dunes Shifting dunes along the shoreline with Ammophila arenaria ('white dunes') Fixed dunes with herbaceous vegetation ('grey dunes') * Dunes with Hippophae rhamnoides 1.11 Coastal habitats (sensitive to abstraction) Coastal lagoons * 1.12 Estuarine & intertidal habitats Estuaries Mudflats and sandflats not covered by seawater at low tide Salicornia and other annuals colonising mud and sand Atlantic salt meadows (Glauco-Puccinellietalia maritimae) 1.13 Submerged marine habitats Sandbanks which are slightly covered by seawater all the time 	A - Habitat Loss B - Changes in physical regime C - Physical Damage D - Turbidity E - Habitat/ Community simplification F - Disturbance G - Competition from non- native species H - Change in flow or velocity regime I - Reduced surface water flooding J - Changed water chemistry	 Hazards A, C, D, E, F, G, H, I, J – No potential exposure and no potential impact pathways exist. The strategy proposes nourishment in Zone B only i.e. a minimum of 10 km to the south of the Humber Estuary SAC. Hazard B – Various studies (for example the Southern North Sea Sediment Transport Study (HR Wallingford, 2002²) and latest Shoreline Management Plan (Scott Wilson, 2009³) indicate that longshore drift along the frontage is predominantly southwards. Therefore, generally material from the nourishment area in Zone B will not be moved towards the SAC. It is possible that on occasions, material is moved northwards from the nourishment area, but there is no evidence for large amounts of material being moved towards the SAC, and it is unlikely that any would be moved north of Saltfleet Haven, which acts as a barrier to longshore transport. No likely significant effects on coastal; estuarine and intertidal; and submerged marine habitats (comprising all ten component interest features listed) within the Humber Estuary SAC. Any quantities of nourishment sediment that are moved northwards will be negligible – there is no predicted effect and therefore, no potential for an in-combination effect.
Humber Estuary SAC 2.12 Marine mammals o Grey seal <i>Halichoerus</i> grypus	B - Changes in physical regime C - Physical Damage F - Disturbance	Hazards C, F – No potential exposure and no potential impact pathways exist as SAC is located at least 10 km away from the closest point of any beach nourishment. There are no known grey seal haul out sites and no known usage of the shoreline by seals within any of the areas where nourishment is proposed i.e. no functionally linked land. Hazard B – Studies ^{2, 3} indicate that net longshore drift along the nourishment area in Zone B and further north to Saltfleet is predominantly southwards. Therefore, generally material from the nourishment area will not be moved towards the SAC. It is possible that on occasions, material is moved northwards from the nourishment area in Zone B, although there is no evidence for large amounts of material to move, and it is unlikely that material would be moved north of Saltfleet Haven, which acts as a barrier to longshore transport. Based on the available information, no impacts on grey seals or their habitats would occur, including at the principal site of Donna Nook, which is approximately 17 km north of Zone B.

 ² HR Wallingford (2002) Southern North Sea Sediment Transport Study, Phase 2. Sediment Transport Report

 Main Report. Report produced for Great Yarmouth Borough Council by HR Wallingford, CEFAS/UEA,
 Posford Haskoning and Dr D'Olier. Report EX 4526, August 2002.

 ³ Scott Wilson (2009) Flamborough Head to Gibraltar Point Shoreline Management Plan. Appendix C –

³ Scott Wilson (2009) Flamborough Head to Gibraltar Point Shoreline Management Plan. Appendix C – Assessment of coastal behaviour and baseline scenarios. Report produced for Humber Estuary Coastal Authorities Group (HECAG) November 2009.

		No likely significant effect on grey seals within the Humber Estuary SAC of the strategy alone, and no potential for any in-combination effects.
Humber Estuary SPA/Ramsar site 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats Refer to later section for consideration of birds associated with other habitat groups (combined for all of the SPAs and Ramsar sites)	A - Habitat Loss B - Changes in physical regime C - Physical Damage D - Turbidity E - Habitat/ Community simplification F - Disturbance G - Competition from non- native species H - Change in flow or velocity regime I - Reduced surface water flooding J - Changed water chemistry	 Hazards A, C, D, F, G, H, I, J – No potential exposure. A small part of the SPA and Ramsar is located within Zone A but the strategy only proposes nourishment in Zone B during the short term. Consequently, there are no pathways identified for these hazards to have any impacts on any coastal/estuarine birds. Individual schemes would need to assess whether the working areas contained functional habitat for the qualifying features. However, given that any construction related work is likely to place between April and September i.e. outside the period when the non-breeding species are present (and none are known to nest in Zone B), the beach nourishment works will have no effect on these birds. Hazard B, E – Studies reported in the SMP2 (2010) suggest that along the south bank of the Humber Estuary between Immingham and Donna Nook, sand moves westwards into the Estuary, whilst from Donna Nook the net transport is southwards towards Gibraltar Point. It is therefore considered unlikely that any material placed within Zone B and then subsequently eroded would be moved into the Humber Estuary SPA area and cause either changes to the physical regime or affect any coastal/estuarine birds. It is considered that a significant effect on the Humber Estuary SPA/Ramsar site is unlikely as a result of its distance from the nourishment area in Zone B, and the predominant southerly direction of longshore drift south of Donna Nook. No likely significant effect on coastal and estuarine birds (comprising the species/interest features listed within these functional groups) within the Humber Estuary SPA/Ramsar site. As there are considered to be no effects, there is also no potential for incombination effects.
Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC 1.10 Coastal habitats • Shifting dunes along the shoreline with Ammophila arenaria (white dunes) • Fixed dunes with herbaceous vegetation (grey dunes) • Dunes with sea buckthorn (Hippophae rhamnoides) • Embryonic shifting dunes (present as a qualifying	A - Habitat Loss B - Changes in physical regime C - Physical Damage D - Turbidity E - Habitat/ Community simplification F - Disturbance G - Competition	 Hazards A, C, D, F, G, H, I, J – No potential exposure or pathways identified for these hazards to have any direct impacts on these habitat types. The SAC is located within Zones A and B and the strategy proposes nourishment within Zone B only. Hazards A, B, E – Beach accretion and dune growth in that part of the SAC to the <u>north</u> of Zone B pre-dates any nourishment works in the area and evidence from beach profile analysis undertaken as part of the strategy development⁴ was unable to find any clear evidence of year on year movement of sand from the nourishment frontage.
feature, but not a primary	from non- native	Evidence from recent studies undertaken as part of the strategy development ³ shows that beaches downdrift of

⁴ Reported within the shoreline behaviour and response report and annexes that form part of the proposed strategy.

reason for the designation of the site). 1.11 Coastal habitats (sensitive to abstraction) o Humid dune slacks	species H - Change in flow or velocity regime I - Reduced surface water flooding J - Changed water chemistry	Lincshore/LBM do receive some of the eroded nourishment material. The potential increase in sediment being deposited in and around Gibraltar Point and The Wash due to a southerly longshore drift from the nourishment area may result in changes to the sediment dynamics within the SAC. The short-term strategy proposals will continue to introduce additional sediment to the system, some of which will continue to contribute to the growth of beaches south of Skegness and ultimately Gibraltar Point.
		Historical evidence ³ shows that this section of coastline has always been dynamic and influenced by a range of factors including changes to the nearshore banks, changes to the tidal prism of The Wash, sea level change, and sediment supply. The growth of the Gibraltar Point complex has been progressive, with the development of successive spits which have enveloped the previous spit and dune complex, pushing the shoreline position seawards and allowing the development of saltmarsh habitats and embryo dune habitats. This process has been observed from historical evidence (e.g. King and May, 2003 ⁵) and is now being replicated under the current situation whereby additional sediment has been added to the beach since the first recharge campaigns in 1994. This demonstrates that the current morphology of the Gibraltar Point complex and the habitats it supports is the result of both historical change and the introduction of additional sediment.
		The evolution and successional development of the dunes (shifting, fixed, embryonic: group 1.10) and intervening slacks (group 1.11) may therefore occur over a shorter time period than would have been the case if no nourishment had taken place.
		There is the possibility that there could be a small change in the beach composition at Gibraltar Point due to an increased proportion of sand compared to gravel (shingle) being deposited. However, this is likely to promote dune growth rather than inhibit it and is not anticipated to be a significant impact in terms of the listed dune habitat features.
		Whilst impacts on the northern section of the Saltfleetby – Theddlethorpe Dunes and Gibraltar Point SAC are considered to be negligible, it is anticipated that there will continue to be an additional input of sediment to the Gibraltar Point complex, via the offshore sandbanks although it has not been possible to quantify the amounts involved to date. Given the historic changes at the site pre- nourishment, with successive development of dune ridges and marsh, it is considered that any additional sediment from Lincshore/LBM will be making a relatively small but positive contribution to the development of dune habitats. However, recent observations by Lincolnshire Wildlife Trust (the site managers) suggest that ongoing accretion and associated landward movement of the "Millennium ridge" is
		diverting the course of the main creek and thereby causing erosion within the saltmarsh and sandflats. Natural England

⁵ King CAM and May VJ (2003) Volume 28. Coastal geomorphology of Great Britain. Chapter 8: Sand spits and tombolos – GCR site reports. Site: Gibraltar Point (GCR ID 1890) JNCC 1980 – 2007.

		regard this as a natural process and confirmed that this part of the site (Unit 2 of the SSSI) is in favourable condition, so there is no likely significant effect attributable to the current LBM campaign or Strategy proposals ⁶ .
		Based on current evidence, it is not considered that there would be a likely significant effect on coastal habitats within the Saltfleetby-Theddlethorpe component of the SAC as there is no pathway for movement of material. Consequently, there is no prospect of an in-combination effect either.
		For the Gibraltar Point component of the SAC, the additional sediment provided from beach nourishment is considered to be either positive or at least not having a likely significant adverse effect. The continuation of this approach in the short term will not result in any effects alone and therefore there is no risk of in-combination effects.
Gibraltar Point Ramsar site Dune and saltmarsh habitats representative of all stages of colonisation and stabilisation, and a fine	A - Habitat Loss B - Changes in physical regime	Hazards A, C, D, F, G, H, I, J – No potential exposure. The proposed nourishment works lie approximately 7.5km to the north of Gibraltar Point Ramsar site. There are no pathways identified for these hazards to have any direct impacts on these habitat types.
example of a freshwater marsh (Criterion 1). Assemblage of wetland invertebrate species, of which eight are listed as rare in the British Red Data Book (Criterion 2)	C - Physical Damage D - Turbidity E - Habitat/ Community simplification F - Disturbance G - Competition from non- native species H - Change in flow or velocity regime I - Reduced surface water flooding J - Changed water chemistry	Hazards A, B, E – There is potential for additional sediment to be added to the Gibraltar Point complex as a result of southward drift of material. The designation recognises that Gibraltar Point consists of an actively accreting sand dune system, saltmarsh and extensive intertidal flats. For the past 20 years this development has been affected by nourishment works along the Lincolnshire coastline, although the quantities and extent are unknown as this is not the only source of material. The short-term strategy proposals are likely to continue to contribute to dune development over the site as a whole, with further successional development likely. Evolution of the features may result in localised dune and saltmarsh erosion, such as is occurring at present where Greenshank Creek is currently being pushed landward. However, this is considered by Natural England ⁵ to be a natural process and confirmed that this part of the site (Unit 2 of the SSSI) is in favourable condition, so there is no likely significant effect attributable to the current LBM campaign or Strategy proposals.
		Saltmarsh habitat has developed in tandem with the formation of successive dune ridges. A range of plant communities is present reflecting the relative height and position of the marshes and how frequently they are inundated. Of particular note is the presence of NVC communities SM21 <i>Suaeda vera-Limonium binervosum</i> (including the <i>Frankenia laeveis</i> sub-community) and SM22 <i>Halimione portulacoides-Frankenia laeveis</i> , which have similar characteristics and a restricted national distribution. They typically occur close to the saltmarsh-dune interface on rather sandy silts, often over a base layer of shingle ⁷ .

 ⁶ DAS meeting with Natural England to discuss draft HR01, 27/11/17
 ⁷ Rodwell, J.S. (ed) 2000. *British Plant Communities* Volume 5. *Maritime communities and vegetation of open habitats*. Cambridge University Press, Cambridge.

SM21 usually thrives in rabbit-grazed areas which help reduce the potential dominance of <i>Suaeda vera</i> and <i>Halimione</i> (now <i>Atriplex</i>) <i>portulacoides</i> . As part of the site condition monitoring process a number of surveys have reported on saltmarsh communities over the years ⁸ . They demonstrate that a range of communities are present from pioneer through to lower, mid and upper marsh. There has been no noticeable increase in SM21, SM22 or other indicators (e.g. <i>Suaeda vera</i> , SM16 <i>Festuca rubra-Glaux maritima</i> sub-community) that might suggest that there had been an increase in the amount of windblown sand across the site as a whole as well as reaching the fixed dune- saltmarsh interface.
The site includes a "fine example of freshwater marsh" ⁹ containing sedges <i>Carex</i> spp., rushes <i>Juncus</i> spp., and ferns, including adder's-tongue fern <i>Ophioglossum</i> <i>vulgatum</i> . This occurs between two dune ridges and until recently was protected at times of high spring tides and surge events by a seabank ("Bulldog Bank") constructed between the ridges in the late nineteenth century. The bank was breached in several places during the December 2013 surge and has not been repaired pending a decision on the future management of this part of the site (Kevin Wilson, Reserve Manager, <i>pers. comm.</i>). Consequently the freshwater marsh remains vulnerable to flooding during extreme events when water can come between the dunes from the open marshes and Wainfleet Channel to the south. Any additional beach nourishment material reaching the site during the short-term strategy period may contribute to the ongoing growth of some of the existing dune areas and formation of new ones. In turn, this process should result in saltmarsh development in the lee (although note the concerns identified above about some erosion associated with the landward movement of the Millennium ridge). These processes do not make the freshwater marsh any more vulnerable to inundation and in the long-term, if accretion continues, could reduce the frequency and severity of flooding in the absence of a repaired sea bank
It should be noted that an investigation is currently underway about the feasibility of re-connecting the freshwater marsh to coastal processes rather than maintaining it as a defended part of the site.
The site also supports an assemblage of wetland invertebrate species; both freshwater and saltmarsh. These are not anticipated to be affected by the short-term strategy, as an addition of sediment will continue the ongoing evolution of the site, which involves development of successive beach ridges, with intervening mud-rich areas. The current areas of marsh will remain unchanged, as these lie inland of the current dune ridge and are connected to the open coast via the Wainfleet Channel. Furthermore, recent invertebrate surveys indicate that

⁸ NVC reports for Gibraltar Point include: Holder (1999) Sand dune survey of Gibraltar Point National Nature Reserve, Lincolnshire, England; Posford Haskoning (2003) NVC survey of saltmarsh and other habitats in The Wash Coast European Marine Site; Ahern Ecology (2013) Condition monitoring of the saltmarsh feature of The Wash and the North Norfolk Coast SAC. Volume I: The Wash. Report prepared on behalf of Natural England; and TEP (2009) Gibraltar Point SSSI Lincolnshire NVC Survey.

⁹ Ramsar Information Sheet: UK11027 Gibraltar Point. Produced by JNCC: version 3.0, 13/06/2008.

		those found within the saltmarsh areas are generalists with the specialist taxa associated with the sea buckthorn dunes and there are no anticipated effects on the RDB ones listed in the Ramsar designation ¹⁰ .
		There is a low risk that increased volumes of sand accreting at Gibraltar Point could affect the composition of the site locally, resulting in the fronting beaches becoming more sand-rich with a smaller shingle component There is no evidence of this causing any negative effects on either dune succession or the associated vegetation communities; indeed, a regular supply of new sand is necessary to maintain this feature. However, an increase in sand could have a potential impact on the nesting behaviour and success of some ground-nesting birds (e.g. Little Tern), where shingle is believed to be a key habitat feature. The impacts of this are uncertain and considered elsewhere in this table.
		Based on current evidence, it is not considered that there would be a likely significant effect on dune habitats as the continued supply of sand is contributing to their maintenance. There is no potential for any significant effect to either the saltmarsh or freshwater habitats, or any of the RDB invertebrates. The continuation of beach nourishment in the short term will not result in any effects alone and therefore there is no risk of in-combination effects.
The Wash and North Norfolk Coast SAC 1.10 Coastal habitats • Mediterranean and thermo- Atlantic halophilous scrubs	A - Habitat Loss B - Changes in physical regime	Hazards A, C, D, F, G, H, I, J – No potential exposure. The short term strategy is for beach nourishment to continue within Zone B, which is updrift of both sites. There are no pathways identified for these hazards to have any impacts on these habitat types.
(Sarcocornetea fruticosi) 1.11 Coastal habitats	C - Physical	
 Coastal lagoons 1.12 Estuarine & intertidal habitats Large shallow inlets and bays Mudflats and sandflats not covered by seawater at low tide Samphire Salicornia and other annuals colonising mud and sand 	Damage D - Turbidity E - Habitat/ Community simplification F – Disturbance G - Competition from non- native species H - Change in	Hazards B, E – The Wash embayment is a natural sink for sediment and over at least the last 2,000 years there has been a net accretion of the intertidal flats and saltmarshes (Pye, 1995 ¹¹). The short-term strategy may result in some nourishment material being transported into The Wash, with potential impacts on coastal and submerged marine habitats. Any extension of Gibraltar Point (and associated bank features) may also affect saltmarshes immediately in its lee by enhancing its sheltering effect (<i>NB The SAC</i> boundary is on the seaward side of the Millennium ridge so does not include the saltmarsh habitat, which is within the Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC).
 Coastal lagoons 1.12 Estuarine & intertidal habitats Large shallow inlets and bays Mudflats and sandflats not covered by seawater at low tide Samphire Salicornia and other annuals colonising mud and sand Atlantic salt meadows (Glauco-Puccinellietalia maritimae) 1.13 Submerged marine habitats Sandbanks slightly covered by sea water all the time 	Damage D - Turbidity E - Habitat/ Community simplification F – Disturbance G - Competition from non- native species H - Change in flow or velocity regime I - Reduced surface water flooding J - Changed water chemistry	Hazards B, E – The Wash embayment is a natural sink for sediment and over at least the last 2,000 years there has been a net accretion of the intertidal flats and saltmarshes (Pye, 1995 ¹¹). The short-term strategy may result in some nourishment material being transported into The Wash, with potential impacts on coastal and submerged marine habitats. Any extension of Gibraltar Point (and associated bank features) may also affect saltmarshes immediately in its lee by enhancing its sheltering effect (<i>NB The SAC boundary is on the seaward side of the Millennium ridge so does not include the saltmarsh habitat, which is within the Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC).</i> 1.10: Mediterranean and thermo-Atlantic halophilous scrubs - this vegetation often forms an important feature of saltmarshes at the upper limit of tidal inundation, with extensive examples occurring in Norfolk and Essex where the drift-line slopes gradually and provides a transition to dune and shingle or at the base of sea defences. Dense patches of perennial glasswort <i>Sarcocornia perennis</i> and sea nurslane also form part of this habitat, typically where

 ¹⁰ DAS meeting with Natural England to discuss draft HR01, 27/11/17
 ¹¹ Pye K (1995) Controls on long-term saltmarsh accretion and erosion in The Wash, eastern England. Journal of Coastal Research 11(2), 337-356.

The Wash Ramsar site A large shallow bay which is one of the largest and most important areas of estuarine mudflats, sand banks and saltmarsh in UK (Ramsar Criterion 1).	responsive to significant changes in sediment supply (positively or negatively according to the composition and volume), which as well as affecting the habitat could indicate the potential for changes happening elsewhere on the site. It is therefore recommended that this feature within the Wash area is assessed through the appropriate assessment.
Inter-relationship between its various components forming the basis for the high productivity of the estuary (Criterion 3)	1.11: <u>Coastal lagoons</u> - there is not anticipated to be an impact on the coastal lagoons as these lie above high tide level and no potential impact pathways exist. Therefore, this feature can be screened out from further assessment.
	1.12: Large shallow inlets and bays - The Wash is the largest embayment in the UK and includes extensive areas of varying, but predominantly sandy, sediments subject to a range of conditions. Although there is potential for more sand to be added to the system, the scale of the feature and the background levels of sediment flux (estimated to be 6.8 million – 8.5 million tonnes per year suspended transport, and 14,000 tonnes bedload ^{12,13}) means that this is not anticipated to have a significant effect. Therefore, this feature can be screened out from further assessment.
	<u>Mudflats and sandflats not covered by seawater at low tide</u> – The Wash is the second-largest area of intertidal flats in the UK and the sandflats include a diversity of substrates There is potential for additional sand to enter the area and accumulate as a consequence of beach nourishment and although this is unlikely to be significant compared to the current scale and natural diversity, further consideration of potential impacts on this habitat within The Wash area is required through an appropriate assessment.
	Samphire Salicornia and other annuals colonising mud and sand – This pioneer saltmarsh vegetation develops at the lower reaches of saltmarshes where the vegetation is frequently flooded by the tide. Condition monitoring of saltmarshes within The Wash area of the SAC (i.e. the 2013 survey) identified a proportionate decrease in pioneer marsh from 26% in 2001/02 to 12.5% in 2013 ¹⁴ . An increase in coarse sand could lead to a loss of pioneer marsh as raising the level would lead to colonisation by other species. Consequently, it is considered that <i>Salicornia</i> pioneer communities within The Wash area should be screened in for further assessment.
	<u>Atlantic salt meadows</u> - This site was selected both for the extensive ungrazed saltmarshes of the North Norfolk Coast and for the contrasting, traditionally grazed saltmarshes around The Wash. There is unlikely to be an effect on the saltmarshes along the North Norfolk coast as there is no clear pathway for sediment to be transported there. Along

¹² Van Smirren J and Collins M B (1982) Short term changes in sedimentological and hydrographics characteristics over a sandy intertidal zone The Wash UK. Geo-Marine Letters 2, Issue 1-2, p 55-60, March – June 1982.

June 1982. ¹³ Ke X, Evans G and Collins M B (1996) Hydrodynamics and sediment dynamics of The Wash embayment, eastern England. Sedimentology 43, Issue 1, 157-174, February 1996.

¹⁴ Ahern Ecology (2013) Condition monitoring of the saltmarsh feature of The Wash and the North Norfolk Coast SAC. Volume I: The Wash. Report prepared on behalf of Natural England.

	The Wash coast, there is a low risk that an influx of sediment could affect the composition of the marshes along the north-eastern end. However, the 2013 saltmarsh survey (Ahern Ecology, 2013) identified an increase in the proportion of this habitat relative to other Annex 1 habitats from 63.5% to 74.4% since it was surveyed in 2001/02. As a consequence, it is considered that the beach nourishment undertaken to date has not had a significant effect on Atlantic salt meadows and this will not change as a consequence of the short-term strategy. Consequently, this feature can be screened out of the assessment.
	1.13: <u>Sandbanks slightly covered by sea water all the time</u> - on this site sandy sediments occupy most of the subtidal area, resulting in one of the largest expanses of sublittoral sandbanks in the UK. The subtidal sandbanks vary in composition and include coarse sand through to mixed sediment at the mouth of the embayment. The subtidal sandbank communities of The Wash appear to be highly dynamic, with different sediment states and their associated fauna fluctuating in their presence and distribution over time ¹⁵ . Changes in sediment composition and input volumes resulting from strategy implementation could affect the morphology of the sandbanks. Consequently, this habitat is screened in for appropriate assessment.
	Reefs (<i>Sabellaria spinulosa</i>) – these are both biogenic and geogenic and found in both intertidal and subtidal zones. As The Wash is primarily composed of soft sediments, where reef is present it provides important additional habitat for both attached and mobile species. The most notable subtidal reef-forming species is the tube-dwelling polychaete worm <i>Sabellaria spinulosa</i> . They are found within The Wash approaches where there is a high loading of suspended sand and many colonies are ephemeral. Intertidal blue mussel <i>Mytilus edulis</i> are located on flats and offshore banks whilst subtidal beds are ephemeral and have been recorded throughout The Wash. An IFCA research report ¹⁶ examined the extent and health of mussel, cockle and <i>Sabellaria</i> beds; physical damage through fishing activities is considered the greatest threat to <i>Sabellaria</i> whilst the much-reduced cockle beds (since 2007) appear to be suffering high mortality due to <i>Haplosporidian</i> protozoa. Mussel stocks remain relatively high when compared to the crash in population that occurred in the mid-1990s although there have been recent losses, believed to be due to high infestation rates of the copepod parasite <i>Mytilicola intestinalis</i> .
	Even without the existing nourishment scheme the suspended load of sediment believed to enter The Wash is extremely high (estimated to be 6.8 million – 8.5 million tonnes per year suspended transport ¹⁷ , ¹⁸) – this is also

¹⁵ APEM (2013). Analysis of Invertebrate Communities and Sediment Composition of the Subtidal Sandbanks of The Wash and North Norfolk Coast. *APEM Scientific Report.* APEM.

¹⁶ Eastern Inshore Fisheries and Conservation Authority Research Report 2012.

¹⁷ Van Smirren J and Collins M B (1982) Short term changes in sedimentological and hydrographics characteristics over a sandy intertidal zone The Wash UK. Geo-Marine Letters 2, Issue 1-2, p 55-60, March – June 1982.

¹⁸ Ke X, Evans G and Collins M B (1996) Hydrodynamics and sediment dynamics of The Wash embayment, eastern England. Sedimentology 43, Issue 1, 157-174, February 1996.

 likely to vary year on year. Although there is a low risk that additional suspended sand could mean a critical point is reached, it is considered unlikely, and therefore any additional suspended load as a consequence of the short term strategy is not anticipated to have a significant effect. Therefore this feature can be screened out from further assessment from the short-term works. The Wash Ramsar site The Ramsar site does not include any habitats that have not been covered under the SAC assessment. Therefore, those SAC habitats recommended for further consideration at the appropriate assessment stage will also cover the Ramsar features. It is concluded that there is potential for a likely significant effect on the following coastal, estuarine and intertidal, and submerged marine habitats within The Wash area (only) of The Wash and North Norfolk Coast SAC and the equivalent habitats of The Wash Ramsar site: Mudfilats and sandfilats not covered by seawater at low tide; Sangbanks Slightly covered by sea water all the time. Based on best available evidence, no likely significant effects are predicted on: The above habitats within the North Norfolk Coast area of the SAC; and All remaining designated habitats of The Wash and North Norfolk Coast area of the SAC (in all areas). 		
The Wash Ramsar site The Ramsar site does not include any habitats that have not been covered under the SAC assessment. Therefore, those SAC habitats recommended for further consideration at the appropriate assessment stage will also cover the Ramsar features.It is concluded that there is potential for a likely significant effect on the following coastal, estuarine and intertidal, and submerged marine habitats within The Wash area (only) of The Wash and North Norfolk Coast SAC and the equivalent habitats of The Wash Ramsar site:• Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocrnetea fruticosi</i>); • Mudflats and sandflats not covered by seawater at low tide; • Samphire Salicornia and other annuals colonising mud and sand; and • Sandbanks slightly covered by sea water all the time.Based on best available evidence, no likely significant effects are predicted on: • The above habitats within the North Norfolk Coast area of the SAC; and • All remaining designated habitats of The Wash and North Norfolk SAC (in all areas).		likely to vary year on year. Although there is a low risk that additional suspended sand could mean a critical point is reached, it is considered unlikely, and therefore any additional suspended load as a consequence of the short term strategy is not anticipated to have a significant effect. Therefore this feature can be screened out from further assessment from the short-term works.
It is concluded that there is potential for a likely significant effect on the following coastal, estuarine and intertidal, and submerged marine habitats within The Wash area (only) of The Wash and North Norfolk Coast SAC and the equivalent habitats of The Wash Ramsar site:• Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi);• Mudflats and sandflats not covered by seawater at low tide;• Samphire Salicornia and other annuals colonising mud and sand; and• Sandbanks slightly covered by sea water all the time.Based on best available evidence, no likely significant effects are predicted on: • The above habitats within the North Norfolk Coast area of the SAC; and • All remaining designated habitats of The Wash and North Norfolk SAC (in all areas).		The Wash Ramsar site The Ramsar site does not include any habitats that have not been covered under the SAC assessment. Therefore, those SAC habitats recommended for further consideration at the appropriate assessment stage will also cover the Ramsar features.
		 It is concluded that there is potential for a likely significant effect on the following coastal, estuarine and intertidal, and submerged marine habitats within The Wash area (only) of The Wash and North Norfolk Coast SAC and the equivalent habitats of The Wash Ramsar site: Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>); Mudflats and sandflats not covered by seawater at low tide; Samphire <i>Salicornia</i> and other annuals colonising mud and sand; and Sandbanks slightly covered by sea water all the time. Based on best available evidence, no likely significant effects are predicted on: The above habitats within the North Norfolk Coast area of the SAC; and All remaining designated habitats of The Wash and North Norfolk SAC (in all areas).

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	North Norfolk Coast SAC	A - Habitat	North Norfolk Coast SAC and Ramsar site
	1.10 Coastal habitats	Loss	Hazards A, C, D, F, G, H, I, J – No potential exposure as
	 Perennial vegetation of 	B - Changes in	they are remote from Zone B, located on the eastern side
	stony banks	physical	of The Wash. There are no pathways identified for these
	 Mediterranean and thermo- 	regime	hazards to have any direct impacts on these habitat types.
	Atlantic halophilous scrubs	C - Physical	
	(Sarcocornetea fruticosi)	Damage	Hazard B, E – It is considered unlikely that any significant
	 Embryonic shifting dunes 	D - Turbidity	volumes of nourishment material will reach and therefore
	 Shifting dunes along the 	E - Habitat/	impact on the North Norfolk Coast SAC area or Ramsar
	shoreline with Ammophila	Community	site. The Wash and its approaches are a key sink area for
	arenaria ('white dunes')	simplification	sediments, meaning that more sediment is retained in The
	 Fixed dunes with 	F –	Wash than is removed (Wash SMP, 2010 ¹⁹). Therefore,
	herbaceous vegetation	Disturbance	any sediment leaving the Lincolnshire coastline is likely to
	('grey dunes') ([*] Priority	G -	be moved and stored within The Wash. The sediment
	o feature)	Competition	transport pathway along the North Norfolk coast is also
	 Humid dune slacks 	from non-	westwards into The Wash, again meaning that any link
	1.11 Coastal habitats	native	between Lincolnshire and the North Norfolk Coast is
	(sensitive to abstraction)	species	unlikely to be significant in terms of sediment transport.
	 Coastal lagoons (*Priority 	H - Change in	, , , , , , , , , , , , , , , , , , , ,
	feature)	flow or velocity	No likely significant effect predicted on the designated
	,	regime	habitats of the North Norfolk Coast SAC and the listed
	North Norfolk Coast	I - Reduced	features of the North Norfolk Coast Ramsar site. As
	Ramsar site	surface water	there will be no effects at all there is no prospect of
	A particularly good example	floodina	any in-combination effects.
	of a marshland coast	J - Changed	···· , ··· · · ························
	with intertidal sand and mud.	water	
	saltmarshes shingle	chemistry	
	banks and sand dunes		
-	L	1	1

¹⁹ Environment Agency (2010) The Wash Shoreline Management Plan 2: Gibraltar Point to Old Hunstanton. Appendix C – Baseline Processes. Available online at <u>www.eacg.org.uk/</u>.

The Wash and North Norfolk Coast SAC 2.9 Mammals of riverine habitats • Otter Lutra lutra North Norfolk Coast SAC 2.9 Mammals of riverine habitats • Otter Lutra lutra	A - Habitat Loss B - Changes in physical regime C - Physical Damage D - Turbidity E - Habitat/ Community simplification F - Disturbance H - Change in flow or velocity regime J - Changed water chemistry	 Hazards A, C, D, E, H, J – No potential exposure. The northern boundary of The Wash and Norfolk Coast SAC is Gibraltar Point, while the closest part of the North Norfolk Coast SAC to the Lincolnshire coast is approximately 20 km away at Gore Point. Consequently, there are no potential pathways for direct impacts. Hazard F – a 2009-2010 Lincolnshire-wide otter survey²⁰ found no evidence of otters within the nourishment area in Zone B or its vicinity (note that the report highlights that survey effort in these locations has been low), although animals were found to be present on most of Lincolnshire's major waterways. Information provided by Norfolk Wildlife Trust²¹ suggests that otters are present in most rivers in Norfolk and will use coastal areas, extending their territory by up to 40 km. It is considered unlikely that otters are present within the proposed nourishment area given their habitat requirements and the availability of adequate food supply in the inland freshwater habitats.
		 Hazard B – previous sections identify the dynamic nature of sandbanks within the SAC and any changes relating to the short-term strategy (although none are considered likely to be significant above) could affect shellfish populations; a food source for otters. However, given the availability of alternative habitats and food sources in the inland freshwater habitats, any potential changes to inter/supratidal habitats that could affect shellfish populations are not considered to have a significant effect on otter populations. No likely significant effect predicted on otters within The Wash and North Norfolk Coast SAC and the North Norfolk Coast SAC.

²⁰ Collop, C. (2011) *Lincolnshire Otter Surveys 2009-2010. Final Report*. Lincolnshire Biodiversity Partnership and Environment Agency.

²¹ Norfolk Wildlife Trust, 2015. Wildlife in Norfolk, Species Explorer, Mammals, Otter. <u>https://www.norfolkwildlifetrust.org.uk/wildlife-in-norfolk/species-explorer/mammals/otter Accessed November</u> <u>2015</u>.

The Wash and North Norfolk Coast SAC 2.12 Marine mammals • Common seal <i>Phoca</i> <i>vitulina</i>	B - Changes in physical regime C - Physical Damage F - Disturbance	Hazards C, F – No potential exposure and no potential impact pathways exist. There are no known common seal haul out sites and no known usage of the shoreline by seals within Zone B. Hazard B – The extensive intertidal flats within The Wash and the North Norfolk Coast provide ideal conditions for common seal breeding and hauling-out. Recent surveys and analyses ²² indicates that pup production in The Wash has increased at around 9% per annum since surveys began in 2001; with the lowest numbers in the western region of The Wash. As pups swim almost immediately after birth, seals can breed on sheltered tidal areas where banks allow access to deep water. Scientific advices from the Special Committee on Seals (2012) notes that common seals normally feed within 40-50 km around their haul out sites. They take a wide variety of prey including sandeels, gadoids, herring and sprat, flatfish, octopus and squid ²³ . A potential impact of the strategy proposals could be to affect the areas of intertidal flats and any associated fish spawning grounds on which the seals may feed. However, no likely significant effects are predicted as any additional sand added to The Wash system is unlikely to have a significant impact compared to the vast suspended sediment loads already entering the embayment. There is also unlikely to be a significant sediment linkage to the North Norfolk Coast. As it is recognised that the seals may range widely in search of prey ²⁴ , any localised impacts of additional sediment on habitats and any associated fish spawning grounds are not anticipated to have a significant effect on these
		anticipated to have a significant effect on these populations. No likely significant effect predicted on common seals within the Wash and North Norfolk Coast SAC.

²² Thompson, D (2013) Distribution and abundance of harbour seals (*Phoca vitulina*) during the breeding season in The Wash, Report to Natural England covering surveys carried out in 2004 to 2013. Report RP0597. ²³ Special Committee on Seals (SCOS) (2012) Scientific Advice on Matters Related to the Management of Seal

Populations: 2012 ²⁴ Vertebrate Species Sheet 1365 Harbour seal *Phoca vitulina. Available online from JNCC.gov.uk.*

SPA/Ramsar species	A - Habitat	All hazards (A, B, C, D, E, F, H, I, J) – No potential
groups	Loss	exposure as these habitats (i.e. uplands; lowland wet
Birds associated with the	B - Changes in	grasslands; lowland freshwaters and their margins;
following habitats: 3.1, 3.4,	physical	farmland; and open sea and offshore rocks)
3.6, 3.7, 3.10	regime	would not be affected and therefore no potential impact
	C – Physical	pathways exist for birds utilising these habitats.
Humber Estuary	Damage	
SPA/Ramsar site	D - Turbidity	No likely significant effect predicted on birds* using
3.4 Birds of lowland wet	E - Habitat/	the following habitats:
grasslands	Community	• uplands
3.6 Birds of lowland	simplification	 lowland wet grasslands;
freshwaters and their	F - Disturbance	 lowland freshwaters and their margins;
margins	H - Change in	• farmland; and
3.7 Birds of farmland	flow or velocity	open sea and offshore rocks
3.10 Birds of open sea and	regime	(comprising the species/interest features listed within
offshore rocks	I - Reduced	these categories – see site details in preceding
	surface water	section) within the Humber Estuary SPA/Ramsar site.
Gibraltar Point SPA/Ramsar	flooding	Gibraltar Point SPA/Ramsar site. The Wash
site	J - Changed	SPA/Ramsar site and North Norfolk Coast SPA/Ramsar
3.4 Birds of lowland wet	water	site.
grasslands	chemistry	
3.6 Birds of lowland		*It is acknowledged that bird species utilise a range of
freshwaters and their		habitats and therefore the list of interest features screened
margins		out here includes species that are 'screened in', in the
3.7 Birds of farmland		following section when impacts on coastal and estuarine
3.10 Birds of open sea and		habitats are considered.
offshore rocks		
The Week CDA/ Democr		
The wash SPA/ Ramsar		
3 1 Birds of uplands		
3.1 Birds of lowland wot		
3.4 Birds of Iowiand wet		
3 6 Birds of lowland		
freshwaters and their		
marging		
3.7 Birds of farmland		
3 10 Birds of open sea and		
offshore rocks		
North Norfolk Coast SPA/		
Ramsar site		
3.1 Birds of uplands		
3.4 Birds of lowland wet		
grasslands		
3.6 Birds of lowland		
freshwaters and their		
margins		
3.7 Birds of farmland		
3.10 Birds of open sea and		
offshore rocks		

SPA/Ramsar species groups Birds associated with the following habitats: 3.8, 3.9, Gibraltar Point SPA/Ramsar site	A - Habitat Loss B - Changes in physical regime C - Physical Damage	Hazards A, C, D, F, G, H, I, J – No potential exposure as there are no pathways for these hazards to have any direct impacts on these birds. The short-term strategy is to undertake nourishment within certain 'hotspots' within Zone B, where there are no designated sites or supporting habitat.
 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats The Wash SPA/Ramsar site 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats 	D - Turbidity E - Habitat/ Community simplification F - Disturbance G - Competition	Hazard B, E – Gibraltar Point SPA/Ramsar site There is potential for additional sediment to be added to the Gibraltar Point complex as a result of southward drift of material from ongoing nourishment. This could result in changes in beach and sandflat/mudflat morphology and sediment composition. However, the contribution of
North Norfolk Coast SPA/ Ramsar site 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats	from non- native species H - Change in flow or velocity regime I - Reduced	nourishment material to changes in the characteristics and extent of habitat features over the last 20 years is unknown. The short-term strategy would represent a continuation of this historical process rather than leading to any gross changes in the diversity or functioning of habitats found within the site.
	surface water flooding J - Changed water chemistry	In terms of the small-scale detail, there will possibly be some localised change in beach composition due to an increased proportion of sand compared to shingle. This could have an impact on the availability of optimum nesting sites for Little Terns, where shingle is believed to be a key habitat feature. Although there are a number of factors that adversely impact the breeding success of Little Terns (notably predation and human disturbance) an assessment of what contribution any changes in substrate may be having is considered relevant and has been screened in for further assessment.
		There is also a potential risk that any increased sand inputs could affect muddy areas of the site. However, monitoring data ²⁵ indicates that at Gibraltar Point there are finer sediments present than those from within the nourishment area in Zone B, possibly indicating additional sediment sources beyond the simple longshore transport from the nourishment area to the north. In terms of the qualifying non-breeding species, Bar-tailed Godwit, Sanderling and Grey Plover feed primarily on polychaete worms, and Knot and Oystercatcher on bivalve molluscs. These prey items are found mainly in sandy substrates. It should also be noted that one of the reasons for the inclusion of these species as features is the fact that Gibraltar Point is used as a major high tide roost for birds that spend most of their feeding time in The Wash SPA. In particular, many thousands of Knot that are displaced from as far away as Wrangle fly up the coast to roost on the sandbank seaward of Greenshank Creek (K. Wilson, LWT Site Manager, <i>pers. comm.</i>). It is therefore considered that the historic and proposed short term beach nourishment strategy is not likely to have a significant effect on any of the non-breeding qualifying species of the SPA or Ramsar sites. These features have therefore been screened out from further assessment.
		Although there is potential for more sand to be added to The Wash embayment system, the scale of the feature and the background levels of sediment flux (estimated to be 6.8

Pending further consideration of the impacts of potential physical changes, it is considered that there is potential for a likely significant effect on birds using coastal and estuarine habitats within the Gibraltar Point SPA/Ramsar site (Little Tern only) and the Wash SPA/Ramsar site (all qualifying features). No likely significant effect predicted on birds of coastal and estuarine habitats within the North Norfolk Coast SPA/Ramsar site.
North Norfolk Coast SPA/ Ramsar site There is not believed to be a direct sediment link between the proposed nourishment in Zone B and the North Norfolk coast, due to The Wash acting as a sink for sediment and westwards transport of material along the North Norfolk coast. No significant changes in habitats are predicted and therefore, there is not anticipated to be a significant impact from the strategy proposals on the coastal or estuarine bird species and assemblages along the North Norfolk Coast SPA/ Ramsar site.
million – 8.5 million tonnes per year suspended transport, and 14,000 tonnes bedload ^{26,27}) means that this is not anticipated to have a significant effect on either intertidal or shoreline bird nesting sites and feeding grounds within the SPA/Ramsar site. However, there remains an element of uncertainty regarding potential localised impacts on birds using these coastal and intertidal habitats which requires further consideration, and these features have been screened in for further assessment.

 ²⁵ Franco, A., IECS, University of Hull (2015). Lincshore Coastal Defence Strategy: Environmental Monitoring 2014. Report to Royal Haskoning DHV, ZBB842-D-2015.
 ²⁶ Van Smirren J and Collins M B (1982) Short term changes in sedimentological and hydrographics

²⁶ Van Smirren J and Collins M B (1982) Short term changes in sedimentological and hydrographics characteristics over a sandy intertidal zone The Wash UK. Geo-Marine Letters 2, Issue 1-2, p 55-60, March – June 1982.

June 1982. ²⁷ Ke X, Evans G and Collins M B (1996) Hydrodynamics and sediment dynamics of The Wash embayment, eastern England. Sedimentology 43, Issue 1, 157-174, February 1996.

Inner Dowsing, Race Bank and North Ridge Offshore SAC 1.13 Submerged marine habitats • Sandbanks that are slightly covered by sea water all of the time • Reefs (Sabellaria spinulosa)	A - Habitat Loss B - Changes in physical regime C - Physical Damage D - Turbidity E - Habitat/ Community simplification	All Hazards – The strategy proposals to continue beach nourishment will not directly impact on the designated sandbanks and reefs of this European site, and indirect effects are unlikely due to the distance of the European site, which is located approximately 1 km offshore from the Zone B nourishment area. <u>Sandbanks that are slightly covered by sea water all of the</u> <u>time</u> - The Inner Dowsing, Race Bank and North Ridge site is located off the south Lincolnshire coast. Although there is a possibility that material from Zone B could be moved
	F - Disturbance H - Change in flow or velocity regime	offshore, it is unlikely that this would be deposited at a single sink area, therefore the effects over the short-term strategy period are anticipated to be small and undetectable given the natural dynamics and behaviour of these banks. The composition of the nourishment material will also be very similar to that already present on the banks. This feature has therefore been screened out from further assessment.
		<u>Reefs (Sabellaria spinulosa)</u> - Abundant Sabellaria spinulosa agglomerations have been recorded along the Lincolnshire coast south of Skegness at Lynn Knock and Skegness Middle Ground, just north of Docking Shoal bank; and at the southern edge of Silver Pit ²⁸ ²⁹ . It is possible that sand from Zone B will eventually be deposited at these locations. However, impacts are not anticipated to be significant, given that the sites are already in a highly dynamic area with high levels of suspended sediment and this feature has been screened out from further assessment.
		No likely significant effect predicted on submerged marine habitats (i.e. submerged sandbanks which are slightly covered by seawater all the time and reefs) within the Inner Dowsing, Race Bank and North Ridge Offshore SAC.

²⁸ Jessop, RW, Akesson, O & Smith LM (2012) Eastern Inshore Fisheries and Conservation Authority (IFCA) Research Report 2012.

²⁹ Roberts, G., Edwards, N., Neachtain, A., Richardson, H. & Watt, C. (2016). Core reef approach to *Sabellaria spinulosa* reef management in The Wash and North Norfolk Coast SAC and The Wash approaches. *Natural England Research Reports, Number 065*

 Greater Wash SPA	A - Habitat	Hazards A, C, D, G, H, I, J - There is anticipated to be a
3.6 Birds of lowland	Loss	continued loss of beach sediment offshore and southward
freshwaters and their margins	B - Changes in	drift of material. The contribution of nourishment material
3.8 Birds of coastal habitats	physical	to changes in the characteristics and extent of habitat
3.9 Birds of estuarine habitats	regime	features within the Greater Wash SPA over the last 20
3.10 Birds of open sea and	C - Physical	years is unknown, however, the contribution of relatively
offshore rocks	Damage	small volumes of sediment to a system of this scale and
	D - Turbidity	dynamism is not considered to be significant and is unlikely
	E - Habitat/	to affect the overall extent or functionality (e.g. turbidity,
	Community	flow, water chemistry etc) of offshore habitat that these
	Simplification	birds depend upon. The short-term strategy would
	F - Disturbance	then leading to any gross changes in the diversity or
	G - Composition	functioning of babitate found within the site
	from pon-	
	native	
	snecies	Hazard B E – The potential increase in sediment being
	H - Change in	deposited to the south of the nourishment area e.g. in and
	flow or velocity	around Gibraltar Point, due to a southerly longshore drift
	regime	from the nourishment area, may result in changes to the
	I - Reduced	sediment dynamics within the Greater Wash SPA, which
	surface water	extends to Great Yarmouth. However, the contribution of
	flooding	relatively small volumes of sediment to a system of this
	J - Changed	scale and dynamism is not considered to be significant and
	water	is unlikely to affect the overall extent or populations of prey
	chemistry	species that these birds depend upon.
		Hazard F – the short term strategy would require annual
		beach nourishment during the period when tern species are
		breeding. There is therefore a risk of disturbance to birds
		that are utilising nearby waters for feeding. However, given
		that the nourishment would be confined to discrete
		locations in Zone B, the amount of potential habitat that
		might be allected will be negligible compared to that
		available along the whole coastline. Furthermore, as there
		are no known breeding sites for the Annex T tern species
		are anticipated
		Based on best available evidence, it is considered that
		there will be no likely significant effects on breeding
		birds (Little Tern, Common Tern and Sandwich Tern) or
		non-breeding birds (Red-throated Diver. Common
		Scoter and Little Gull) within the Greater Wash SPA as
		a result of changes in disturbance, changes in physical
		regime or habitat/community simplification.

TABLE 4. LIKELY SIGNIFICANT EFFECT FOR MEDIUM AND LONG-TERM STRATEGY PROPOSALS

Approach

For both periods **scenario 1** entails a similar approach to that which has been undertaken since the Lincshore (now LBM) nourishment works began i.e. placement and profiling material that has been sourced from various offshore locations, supplemented with some localised recycling of material within the beaches where available. It is assumed that, in the absence of structures to retain the material more effectively, some material will continue to be lost from the nourishment beaches and taken offshore and further down the coast as a result of longshore drift. For this scenario, the issues are therefore similar to those considered for the short-term in Table 3: i) are there pathways for the material placement to cause direct effects on designated sites and features? and ii) could there be indirect effects due to sediment being transported to designated sites outside of the beach nourishment locations?

All works will initially be within Zone B including the potential for regular nourishment between Ingoldmells and Skegness. Nourishments may also be required in the northern part of Zone C in the longer-term but that will be dependent on how the baseline has changed in the interim.

Scenario 2 combines beach nourishment with the installation of beach control structures (rock groynes and 'fishtails') to retain as much material within the beach zones as possible. In this case it is assumed that there will be a reduction in sediment volume that is transported through longshore drift. For those features that require a supply of sediment from natural erosion, supplemented by that lost from beach nourishment locations, it has been assumed that there would be a likely significant effect of the scenario 2 strategy, notwithstanding the nature and scale is unclear given the predicted sea level rise and associated coastal squeeze that will occur during both time periods.

All beach nourishment works and the installation of rock armour structures (if required) will initially be within Zone B. Nourishments may also be required in the northern part of Zone C in the longer-term but that will be dependent on how the baseline has changed in the interim. Zones A and C will require further interventions in the longer term, which would be subject to long term climate change triggers, i.e. measurable changes in sea level or storm damage to the marsh and dune systems.

The assessment of likely significant effect in the medium to long term is based on the existing qualifying features and their current status and distribution within the study area. These are likely to change over such time periods so any future strategy revisions, as well as individual projects that are undertaken to implement the strategy, will require separate HRA appraisals.

Key to Zones and Policy Units referenced in the table

Saltfleet to Gibraltar Point Strategy

Zone A: Northern area – Saltfleet to Theddlethorpe (Meers Bank) Zone B: Central area – Theddlethorpe (Meers Bank) to Skegness (Lifeboat Avenue) Zone C: Southern area – Skegness (Lifeboat Avenue) to Gibraltar Point

Flamborough Head to Gibraltar Point Shoreline Management Plan

Policy Unit N: South of Humberstone Fitties to Theddlethorpe St Helen Policy Unit O: Theddlethorpe St Helen to Skegness south Policy Unit P: Skegness south to Gibraltar Point
	Medium-terr	Medium-term (2025-2055)		Long-term (2055-2115)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2	
Humber Estuary SAC 1.10 Coastal habitats 1.11 Coastal habitats (sensitive to abstraction) 1.12 Estuarine & intertidal habitats 1.13 Submerged marine habitats	No likely significant effect alone due to lack of pathways and mechanisms for interaction. The SAC is located 10 km to the north of Saltfleet Haven (the northern extent of Zone A). Nourishment material moves predominantly southwards. Any quantities that move towards the SAC will be small and would be unlikely to be deposited within the SAC due to the barrier of Saltfleet Haven. As there are no pathways for any effect alone there can be no likely significant effect in combination.	No likely significant effect alone due to lack of pathways and mechanisms for interaction. The installation of rock armour would be wholly within Zone B, south of Mablethorpe, so no risk of direct impacts. Most material would be retained within the nourishment areas and any that is lost is unlikely to be deposited within the SAC. As there are no pathways for any effect alone there can be no likely significant effect in combination.	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term), even with potentially large changes due to sea level rise.	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term), even with potentially large changes due to sea level rise.	
Humber Estuary SAC 2.12 Marine mammals Grey Seal	No likely significant effect alone due to lack of pathways and mechanisms for interaction. No potential for direct physical damage to habitat or disturbance during construction due to distance (i.e. 10 km away) from the breeding colony at Donna Nook (located north of Zone A) and no major haul out sites known within Zone B.	No likely significant effect alone due to lack of pathways and mechanisms for interaction. The installation of rock armour and placement of nourishment material would be wholly within Zone B, south of Mablethorpe, so no risk of any disturbance to seals. Most material would be retained within the nourishment areas and any	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term), based on current evidence. For this time period, where there is uncertainty about the effects of coastal squeeze and where any managed realignment might be required to mitigate and/or compensate for SMP policies, it would be	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term).	

	Medium-term (2025-2055)		Long-term	Long-term (2055-2115)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2	
	No indirect changes to the habitats within the SAC (see habitat features above). As there are no pathways for any effect alone there can be no likely significant effect in combination.	that is lost is unlikely to be deposited within the SAC. The rock armour and resultant crescent-shaped beaches (where fishtail structures are installed) could prove attractive for seals in the future, especially if their habitat to the north is de- graded due to sea level rise. As there are no pathways for any effect alone there can be no likely significant effect in combination.	necessary for any subsequent policy changes in the Strategy to be re-appraised. This would be required in response to the large changes in baseline conditions and coastal processes.		
Humber Estuary SPA/Ramsar site 3.4 Birds of lowland wet grasslands 3.6 Birds of lowland freshwaters and their margins 3.7 Birds of farmland 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats 3.10 Birds of open sea and offshore rocks	No likely significant effect alone due to lack of pathways and mechanisms for interaction. No potential for physical damage to habitat or disturbance during construction due to distance from the SPA boundary. Unlikely for any of the nourishment material to be deposited within the SPA so no indirect changes to the habitats within the SPA. Currently no supporting/functional habitat known within Zone B.	No likely significant effect alone due to lack of pathways and mechanisms for interaction. The installation of rock armour would be wholly within Zone B, south of Mablethorpe, so no risk of disturbance to birds. Most material would be retained within the nourishment areas and any that is lost is unlikely to be deposited within the SPA. Currently no supporting/functional habitat known within Zone B. As there are no pathways for any effect alone there can be	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term).	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term).	

	Medium-term (2025-2055)		Long-term (2055-2115)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	As there are no pathways for any effect alone there can be no likely significant effect in combination.	no likely significant effect in combination.		
Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC 1.10 Coastal habitats 1.11 Coastal habitats (sensitive to abstraction)	Uncertain effect alone – requires appropriate assessment The Gibraltar Point part of the SAC does receive some sediment from the beach nourishment works. In the short term it has been concluded that the volumes are relatively small and any impact is likely to be either neutral or potentially positive as part of the ongoing, accretion of the site. However, over the medium term time period it is possible that there could be negative effects and these need investigating through the appropriate assessment.	Likely significant effect alone – requires appropriate assessment The Gibraltar Point part of the SAC does receive some sediment from the previous/current beach nourishment works but it is not known how important this ongoing contribution could be during this timescale. The installation of rock armour could significantly reduce the amount of sediment reaching Gibraltar Point relative to present conditions and this could have a significant effect on the habitat features as sediment supply is required to maintain the features.	Uncertain effect alone – requires appropriate assessment The baseline conditions will have shifted significantly by this period, especially as the SMP policy is no active intervention / managed realignment for Policy Unit P, hold the line / managed realignment for Policy Unit O and hold the line for Policy Unit N. Nevertheless, on the assumption that there may be some of the current designated habitat features present in this zone, an assessment should be undertaken. Furthermore, there may be some continued direct impacts as a consequence of proposed nourishment in all zones during this period.	Uncertain effect alone – requires appropriate assessment The baseline conditions will have shifted significantly by this period, especially as the SMP policy is no active intervention / managed realignment for Policy Unit P, hold the line / managed realignment for Policy Unit O and hold the line for Policy Unit N. Nevertheless, on the assumption that there may be some of the current designated habitat features present in this zone, an assessment should be undertaken (unless NE is satisfied that over this timescale adaptation measures will be satisfactory / non-prescriptive and do not require the same habitats to be maintained?). Furthermore, there may be some continued direct impacts as a consequence of

	Medium-term (2025-2055)		Long-term (2055-2115)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
				proposed nourishment in all zones during this period.
Gibraltar Point Ramsar site Dune and saltmarsh habitats representative of all stages of colonisation and stabilisation, and a fine example of a freshwater marsh (Criterion 1). Assemblage of wetland invertebrate species, of which eight are listed as rare in the British Red Data Book (Criterion 2)	Habitats Uncertain – requires appropriate assessment Gibraltar Point receives some sediment from the beach nourishment works. In the short term it has been concluded that the volumes are relatively low and any impact is likely to be either neutral or potentially positive as part of the long-term accretion of the site. However, over a longer time period it is possible that there could be negative effects and these need investigating through the appropriate assessment. Invertebrates No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction. The RDB invertebrates are associated with freshwater and saltmarsh habitats and it is unlikely that beach nourishment sediment being deposited on the site is going to have any	Habitats Likely significant effect – requires appropriate assessment The Gibraltar Point part of the Ramsar site does receive some sediment from the beach nourishment works but it is not known how important this contribution could be during this timescale. The installation of rock armour could reduce the amount of sediment reaching Gibraltar Point and this may have a significant effect on the dune features. Invertebrates No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction. The RDB invertebrates are associated with freshwater and saltmarsh habitats and it is unlikely that a reduction in beach nourishment sediment being deposited on the site is going to have any measurable direct or indirect impacts.	Habitats Uncertain – requires appropriate assessment The baseline conditions will have shifted significantly by this period, especially as the SMP policy is no active intervention / managed realignment for Skegness to Gibraltar Point. Nevertheless, on the assumption that there may be some of the current designated habitat features present in this zone, and that there may be nourishment between Ingoldmells and Skegness, an assessment should be undertaken. Invertebrates No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term). The RDB invertebrates are associated with freshwater and saltmarsh habitats and it is unlikely that beach nourishment sediment being deposited on the site is going to have any measurable direct	Habitats Uncertain – requires appropriate assessment The baseline conditions will have shifted significantly by this period, especially as the SMP policy is no active intervention / managed realignment for Skegness to Gibraltar Point. Nevertheless, on the assumption that there may be some of the current designated habitat features present in this zone, and that there may be nourishment between Ingoldmells and Skegness, an assessment should be undertaken. Invertebrates No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term). The RDB invertebrates are associated with freshwater and saltmarsh habitats and it is unlikely that a reduction in beach nourishment sediment being deposited on the site is

	Medium-term (2025-2055)		Long-term (2055-2115)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	measurable direct or indirect impacts on these habitats.		or indirect impacts on these habitats.	going to have any measurable direct or indirect impacts.
The Wash and North Norfolk Coast SAC 1.10 Coastal habitats 1.11 Coastal habitats (sensitive to abstraction) 1.12 Estuarine & intertidal habitats 1.13 Submerged marine habitats The Wash Ramsar site A large shallow bay which is one of the largest and most important areas of estuarine mudflats, sand banks and saltmarsh in UK (Ramsar Criterion 1). <i>NB All relevant</i> <i>Ramsar habitats are covered</i> <i>by the features within The</i> <i>Wash and North Norfolk Coast</i> <i>SAC.</i>	 Uncertain – requires appropriate assessment Potential for a likely significant effect on the following coastal, estuarine and intertidal, and submerged marine habitats within The Wash area (only) of The Wash and North Norfolk Coast SAC and the equivalent habitats of The Wash Ramsar site: Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea</i> <i>fruticosi</i>); Mudflats and sandflats not covered by seawater at low tide; Samphire <i>Salicornia</i> and other annuals colonising mud and sand; and Sandbanks slightly covered by sea water all the time. Reefs (<i>Sabellaria</i> <i>spinulosa</i>) 	 Uncertain – requires appropriate assessment Potential for a likely significant effect on the following coastal, estuarine and intertidal, and submerged marine habitats within The Wash area (only) of The Wash and North Norfolk Coast SAC and the equivalent habitats of The Wash Ramsar site: Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>); Mudflats and sandflats not covered by seawater at low tide; Samphire <i>Salicornia</i> and other annuals colonising mud and sand; and Sandbanks slightly covered by sea water all the time. Reefs (<i>Sabellaria spinulosa</i>) 	 Uncertain – requires appropriate assessment The baseline conditions will have shifted significantly by this period, especially as the SMP policy is no active intervention / managed active intervention / managed realignment for Skegness to Gibraltar Point and possible realignment on some of the coast between Skegness and Theddlethorpe. Nevertheless, on the assumption that there may be some of the following habitat features present then an assessment should be undertaken: Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>); Mudflats and sandflats not covered by seawater at low tide; Samphire <i>Salicornia</i> and other annuals colonising mud and sand; and 	 Uncertain – requires appropriate assessment The baseline conditions will have shifted significantly by this period, especially as the SMP policy is no realignment for Skegness to Gibraltar Point and possible realignment on some of the coast between Skegness and Theddlethorpe. Nevertheless, on the assumption that there may be some of the following habitat features present then an assessment should be undertaken: Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>); Mudflats and sandflats not covered by seawater at low tide; Samphire <i>Salicornia</i> and other annuals colonising mud and sand; and Sandbanks slightly covered by sea water all the time.

	Medium-terr	n (2025-2055)	Long-term (2055-2115)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
			 Sandbanks slightly covered by sea water all the time. Reefs (Sabellaria spinulosa) 	 Reefs (Sabellaria spinulosa)
North Norfolk Coast SAC 1.10 Coastal habitats 1.11 Coastal habitats (sensitive to abstraction) North Norfolk Coast Ramsar site A particularly good example of a marshland coast with intertidal sand and mud, saltmarshes, shingle banks and sand dunes	No likely significant effect alone. These sites are located to the east of The Wash, so it is unlikely that any nourishment material ever reaches them. The Wash acts as a sink for both the Lincolnshire coastline to the north and the Norfolk one to the east. As there are no pathways for any effect alone there can be no likely significant effect in combination.	No likely significant effect alone. These sites are located to the east of The Wash so it is unlikely that any nourishment material ever reaches them. The Wash acts as a sink for both the Lincolnshire coastline to the north and the Norfolk one to the east. As there are no pathways for any effect alone there can be no likely significant effect in combination.	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term), even with potentially large changes due to sea level rise.	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term), even with potentially large changes due to sea level rise.
The Wash and North Norfolk Coast SAC Otter Lutra lutra North Norfolk Coast SAC Otter Lutra lutra	No likely significant effect alone. No risk of disturbance as otters will not be within any of the beach nourishment or recycling areas. Although animals will feed in the sea (primarily on shellfish) this source of food is minor compared to that exploited in rivers and other inland freshwater habitats.	No likely significant effect alone. No risk of disturbance as otters will not be within any of the beach nourishment or recycling areas. As there are no pathways for any effect alone there can be no likely significant effect in combination.	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term).	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term).

	Medium-terr	n (2025-2055)	Long-term (2055-2115)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	Any potential changes on shellfish numbers as a consequence of the scheme would not have a significant effect on otters. As there are no pathways for any effect alone there can be no likely significant effect in combination.			
The Wash and North Norfolk Coast SAC Common seal <i>Phoca vitulina</i>	No likely significant effect alone. No known haul out sites and no known usage of the shoreline by seals within the nourishment areas. Any additional sediment inputs into the areas that seals use of feeding will be negligible and will not affect spawning grounds of prey items. As there are no pathways for any effect alone there can be no likely significant effect in combination.	No likely significant effect alone. No known haul out sites and no known usage of the shoreline by seals within the nourishment areas. Any additional sediment inputs into the areas that seals use of feeding will be negligible and will not affect spawning grounds of prey items. As there are no pathways for any effect alone there can be no likely significant effect in combination.	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term).	No likely significant effect alone or in combination due to lack of pathways and mechanisms for interaction (see medium-term).
SPA/Ramsar species groups Birds associated with the following habitats: 3.1, 3.4, 3.6, 3.7, 3.10	No likely significant effect alone. No potential exposure	No likely significant effect alone. No potential exposure	Uncertain – requires appropriate assessment. The baseline conditions will	Uncertain – requires appropriate assessment. The baseline conditions will
Gibraltar Point SPA/Ramsar site	painways for direct or indirect impacts as the SMP policy is hold the line for this time period. Most of the	hold the line for this time period. Most of the habitats	this period, especially as the SMP policy is no active intervention / managed	this period, especially as the SMP policy is no active intervention / managed

	Medium-terr	n (2025-2055)	Long-term (2055-2115)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
 3.4 Birds of lowland wet grasslands 3.6 Birds of lowland freshwaters and their margins 3.7 Birds of farmland 3.10 Birds of open sea and offshore rocks The Wash SPA/ Ramsar site 3.1 Birds of uplands 3.4 Birds of lowland wet grasslands 3.6 Birds of lowland freshwaters and their margins 3.7 Birds of farmland 3.10 Birds of open sea and offshore rocks 	habitats are landward of the sea defences and there would be no significant effect on habitat used by birds of open sea and offshore rocks. As there are no pathways for any effect alone there can be no likely significant effect in combination.	are landward of the sea defences and there would be no significant effect on habitat used by birds of open sea and offshore rocks. As there are no pathways for any effect alone there can be no likely significant effect in combination.	realignment for Skegness to Gibraltar Point and possible realignment on some of the coast between Skegness and Theddlethorpe. Nevertheless, on the assumption that there may be some of the current bird features and habitats present in the areas that could be directly or indirectly affected, an assessment should be undertaken.	realignment for Skegness to Gibraltar Point and possible realignment on some of the coast between Skegness and Theddlethorpe. Nevertheless, on the assumption that there may be some of the current bird features and habitats present in the areas that could be directly or indirectly affected, an assessment should be undertaken.
North Norfolk Coast SPA/ Ramsar site 3.1 Birds of uplands 3.4 Birds of lowland wet grasslands 3.6 Birds of lowland freshwaters and their margins 3.7 Birds of farmland 3.10 Birds of open sea and offshore rocks				
SPA/Ramsar species groups	Gibraltar Point SPA/Ramsar site	Gibraltar Point SPA/Ramsar site	Gibraltar Point SPA/Ramsar and The Wash SPA/Ramsar	Gibraltar Point SPA/Ramsar and The Wash SPA/Ramsar

	Medium-term (2025-2055)		Long-term (2055-2115)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Birds associated with the following habitats: 3.8, 3.9, Gibraltar Point SPA/Ramsar site 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats North Norfolk Coast SPA/ Ramsar site 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats 3.9 Birds of estuarine habitats	Uncertain – requires appropriate assessment. There is potential for beach nourishment material to be deposited at Gibraltar Point and, depending on the volumes and location, this could affect some of the bird features including breeding Little Terns. The Wash SPA/Ramsar site Uncertain – requires appropriate assessment. There is some uncertainty regarding potential localised impacts on birds using these habitats due to sediment inputs at key feeding locations. North Norfolk Coast SPA/Ramsar No likely significant effect alone. No direct sediment link between the nourishment sites and the North Norfolk Coast as The Wash acts as a sink for material from the north. Additionally, there is a westward movement of sediment transport from North Norfolk.	Uncertain – requires appropriate assessment. There is potential for beach nourishment material to be deposited at Gibraltar Point and, depending on the volumes and location, this could affect some of the bird features including breeding Little Terns. The Wash SPA/Ramsar site Uncertain – requires appropriate assessment. There is some uncertainty regarding potential localised impacts on birds using these habitats. North Norfolk Coast SPA/Ramsar No likely significant effect alone. No direct sediment link between the nourishment sites and the North Norfolk Coast as The Wash acts as a sink for material from the north. Additionally, there is a westward movement of sediment transport from North Norfolk. As there are no pathways for any effect alone there can be	Uncertain – requires appropriate assessment. The baseline conditions will have shifted significantly by this period, especially as the SMP policy is no active intervention / managed realignment for Skegness to Gibraltar Point. Nevertheless, on the assumption that there may be some of the current designated bird features present in these sites, further investigation should be undertaken. North Norfolk Coast SPA/Ramsar No likely significant effect alone. No direct sediment link between the nourishment sites and the North Norfolk Coast as The Wash acts as a sink for material from the north. Additionally, there is a westward movement of sediment transport from North Norfolk. As there are no pathways for any effect alone there can be no likely significant effect in combination.	Uncertain – requires appropriate assessment. The baseline conditions will have shifted significantly by this period, especially as the SMP policy is no active intervention / managed realignment for Skegness to Gibraltar Point. Nevertheless, on the assumption that there may be some of the current designated bird features present in these sites further investigation should be undertaken. North Norfolk Coast SPA/Ramsar No likely significant effect alone. No direct sediment link between the nourishment sites and the North Norfolk Coast as The Wash acts as a sink for material from the north. Additionally, there is a westward movement of sediment transport from North Norfolk. As there are no pathways for any effect alone there can be no likely significant effect in combination.

	Medium-term (2025-2055)		Long-term (2055-2115)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	As there are no pathways for any effect alone there can be no likely significant effect in combination.	no likely significant effect in combination.		
Inner Dowsing, Race Bank and North Ridge Offshore SAC 1.13 Submerged marine habitats	Sandbanks that are slightly covered by water at all times No likely significant effect alone Although there is a possibility that nourishment material could be moved offshore, it is unlikely that this would be deposited at a single sink area, therefore the effects are anticipated to be small and undetectable given the natural dynamics and behaviour of these banks. Furthermore, the main sandbanks of this site are more than 14km offshore so unlikely to receive much material, if any. The composition of the nourishment material will also be very similar to that already present on the banks. Sabellaria spinulosa reefs Uncertain – requires appropriate assessment	Sandbanks that are slightly covered by water at all times No likely significant effect alone Although there is a possibility that material could be moved offshore, this will be less than under scenario 1 and it is unlikely that this would be deposited at a single sink area, therefore the effects are anticipated to be small and undetectable given the natural dynamics and behaviour of these banks. Furthermore, the main sandbanks of this site are more than 14km offshore so unlikely to receive much material, if any. The composition of the nourishment material will also be very similar to that already present on the banks. Sabellaria spinulosa reefs Uncertain – requires appropriate assessment	Sandbanks that are slightly covered by water at all times No likely significant effect either alone or in combination Sabellaria spinulosa reefs Uncertain – requires appropriate assessment due to potential in- combination effects with the East Inshore and Offshore Marine Plans and associated projects.	Sandbanks that are slightly covered by water at all times No likely significant effect either alone or in combination Sabellaria spinulosa reefs Uncertain – requires appropriate assessment due to potential in- combination effects with the East Inshore and Offshore Marine Plans and associated projects.

	Medium-term (2025-2055)		Long-term (2055-2115)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	due to potential in- combination effects.	due to potential in- combination effects.		
	It is possible that sand from the proposed works will eventually be deposited at these locations. Impacts alone are not anticipated to be significant given that the sites are already in a highly dynamic area with high levels of suspended sediment. However, it is not possible to screen out in- combination effects with the East Inshore and Offshore Marine Plans and associated projects.	It is possible that sand from the proposed works will eventually be deposited at these locations. Impacts alone are not anticipated to be significant given that the sites are already in a highly dynamic area with high levels of suspended sediment. However, it is not possible to screen out in-combination effects with the East Inshore and Offshore Marine Plans and associated projects.		
Greater Wash SPA 3.6 Birds of lowland freshwaters and their margins 3.8 Birds of coastal habitats 3.9 Birds of estuarine habitats 3.10 Birds of open sea and offshore rocks	No likely significant effect alone due to lack of pathways and mechanisms for interaction. No risk of nourishment activities in Zone B causing disturbance to breeding tern species as there are currently no known sites (this would need confirming at the time of individual projects). Insignificant changes to the sediment load and transport into the Greater Wash area that may impact prey species of the terns and non-	No likely significant effect alone due to lack of pathways and mechanisms for interaction. No risk of nourishment activities in Zone B causing disturbance to breeding tern species as there are currently no sites (this would need confirming at the time of individual projects). Insignificant changes to the sediment load and transport into the Greater Wash area that may impact prey species of the terns and non-breeding	No likely significant effect either alone or in combination based upon the current site features and the locations/habitats that they utilise although this would have to be checked against future baseline conditions given the timescale, likely sea level rise and the impacts of SMP policies. Any strategy review and/or implementation of individual schemes would need to take account of the effects of SMP policies and any change in	No likely significant effect either alone or in combination although this would have to be checked against future baseline conditions given the timescale, likely sea level rise and the impacts of any managed realignment and/or non-intervention. Any strategy review and/or implementation of individual schemes would need to take account of the likely change in locations used by nesting terns. Insignificant changes to the sediment load and transport into the Greater

Medium-term (2025-2055)		Long-term (2055-2115)	
Scenario 1	Scenario 2	Scenario 1	Scenario 2
breeding species (red- throated diver, little gull and common scoter). As there are no pathways for any effect alone there can be no likely significant effect in combination.	species (red-throated diver, little gull and common scoter). As there are no pathways for any effect alone there can be no likely significant effect in combination.	locations used by nesting terns. Insignificant changes to the sediment load and transport into the Greater Wash area that may impact prey species of the terns and non-breeding species (red-throated diver, little gull and common scoter).	Wash area that may impact prey species of the terns and non-breeding species (red- throated diver, little gull and common scoter).

Conclusions

The screening assessment has identified that some of the Strategy proposals, in some of the three timeframes, could have a likely significant effect (or the risk of this remains uncertain and hence the precautionary principle applies) on features of several European and Ramsar sites (see Table 5). Consequently, these need to be subject to an appropriate assessment.

Table	5.	European	site	qualifying	features	subject t	o	appropriate	assessment,	following
Stage	1.									

Feature/Environment Agency habitat or species group	Timescale/ scenario	Risk	Likely significant effect (LSE) alone	LSE in combination		
Saltfleetby-Theddlethorpe Dunes and Gibraltar Point Dunes SAC						
Shifting dunes along the shoreline with <i>Ammophilia arenaria</i> (white dunes)	Medium and long-term – both scenarios	Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1: nourishment only) Yes (scenario 2: control structures)	Uncertain		
Fixed dunes with herbaceous vegetation (grey dunes)		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1: nourishment only) Yes (scenario 2: control structures)	Uncertain		
Dunes with sea buckthorn (<i>Hippophae</i> <i>rhamnoides</i>)		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1: nourishment only) Yes (scenario 2: control structures)	Uncertain		
Embryonic shifting dunes		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1 in medium and long-term, and scenario 2 in long-term) Yes (scenario 2: control structures in medium-term)	Uncertain		
Humid dune slacks	sito	Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1: nourishment only) Yes (scenario 2: control structures)	Uncertain		

Feature/Environment Agency habitat or species group	Timescale/ scenario	Risk	Likely significant effect (LSE) alone	LSE in combination
Dune and saltmarsh habitats representative of all stages of colonisation and stabilisation and a fine example of a freshwater marsh	Medium and long-term – both scenarios	Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1 in medium and long-term and scenario 2 in long-term) Yes (scenario 2: control structures in medium-term)	Uncertain
Waterfowl assemblage and bird species/ populations occurring at levels of internationally importance: grey plover, sanderling, bar- tailed godwit and dark- bellied brent geese.	Long term – both scenarios	Change in volumes of downdrift material indirectly affecting supporting habitat features.	Uncertain	Uncertain
Gibraltar Point SPA	1			
Birds of lowland wet grasslands, lowland freshwaters and their margins, farmland, open sea and offshore rocks	Long term – both scenarios	Change in volumes of downdrift material indirectly affecting supporting habitat features.	Uncertain	Uncertain
Little Tern	Short term; medium and long term – both scenarios	Change in volumes of downdrift material indirectly affecting supporting habitat features.	Yes	N/A
The Wash and North No	orfolk Coast SAC	* and The Wash Ramsar site		
Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea</i> <i>fruticosi</i>)	Short term	Change in volumes of downdrift material indirectly affecting the habitat.	Yes	N/A
Mudflats and sandflats not covered by seawater at low tide		Change in volumes of downdrift material indirectly affecting the habitat.	Yes	N/A
Samphire Salicornia and other annuals colonising mud and sand		Change in volumes of downdrift material indirectly affecting the habitat.	Yes	N/A
Sandbanks slightly covered by sea water all the time.		Change in volumes of downdrift material indirectly affecting the habitat.	Yes	N/A
Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea</i> <i>fruticosi</i>)	Medium and long term – both scenarios	Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain	N/A
Mudflats and sandflats not covered by seawater at low tide		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain	N/A

Feature/Environment Agency habitat or species group	Timescale/ scenario	Risk	Likely significant effect (LSE) alone	LSE in combination
Samphire Salicornia and other annuals colonising mud and sand		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain	N/A
Sandbanks slightly covered by sea water all the time.		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain	N/A
Reefs (Sabellaria spinulosa)		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain	N/A
The Wash SPA and The	Wash Ramsar s	ite	-	
All waterbirds associated with estuarine and coastal habitats	All time periods and both scenarios	Change in volumes of downdrift material leading to loss / physical damage to supporting habitats.	Uncertain	N/A
Birds of lowland wet grasslands, lowland freshwaters and their margins, farmland, open sea and offshore rocks	Long term – both scenarios	Change in volumes of downdrift material leading to loss / physical damage to supporting habitats.	Uncertain	Uncertain
Inner Dowsing, Race Ba	ank and North Ri	idge SAC		
Reefs (Sabellaria spinulosa)	Medium and long term – both scenarios	Change in volumes of downdrift material indirectly affecting the habitat leading to loss / physical damage.	No	Uncertain

* The Wash area only

xxzStage 2 Habitats Regulations Assessment



Saltfleet to Gibraltar Point Strategy

Environment Agency record of appropriate assessment

Sent to Natural England for consultation

This is a record of the appropriate assessment required by Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (SI No. 2017/1012), undertaken by the Environment Agency in respect of the Saltfleet to Gibraltar Point Strategy. It follows the production of a Stage 1 assessment to identify which European sites and their associated qualifying features may be subject to likely significant effects. A draft of the Stage 1 assessment was discussed with officers from Natural England at a meeting on 27/11/17.

Document history

JOB NUMBER: ENVIMAN002226		DOCUMENT REF: ENVIMAN002226-CH2-DZ-L00-TN-Z-10142-S3-PO2.00-D001- EA1-LOD0-SGPS_ER_App_A_HRA_Stage_2					
Revision	Purpose Description		Originated	Checked	Reviewed	Authorised	Date
01	Client draft review with SEA ER		J Halls / C Morgan	S Duggan / S Isaac	M Cali	For internal EA review	17/05/2018
02	Updated HRA – Appropriate Assessment for client sign off		C Morgan	S Duggan	M Cali	For EA approval	19/07/2018
03	Issue to Natural England		C Morgan	S Duggan	M Cali	EA approval	30/07/2018

Permission, plan or project (PPP) details

Type of PPP:	Coastal Flood Risk Management Strategy
Environment Agency reference no:	ENVIMAN002226
National grid reference:	TF467934 to TF567569
Site reference:	Saltfleet to Gibraltar Point, Lincolnshire

1. Description of proposal

The strategy area extends from Saltfleet in the north to Gibraltar Point in the south and sits between the Humber Estuary strategy area to the north and The Wash strategy area to the south.

The Strategy area is sub-divided into three zones to reflect the level of historic intervention since 1994, between Saltfleet and Gibraltar Point (see Figure 1). These zones are similar to the Shoreline Management Plan (SMP) Policy Units, as follows:

- Zone A Northern area Saltfleet to Theddlethorpe (Meers Bank) (Shoreline Management Plan (SMP) Policy Unit N: South of Humberston Fitties to Theddlethorpe St Helen).
- Zone B Central area Mablethorpe (Meers Bank) to Skegness (Lifeboat Avenue) (*SMP Policy Unit O: Theddlethorpe St Helen to Skegness south*).
- Zone C Southern area Skegness (Lifeboat Avenue) to Gibraltar Point (*SMP Policy Unit P: Skegness south to Gibraltar Point*).

The proposed Strategy covers three timescales, which broadly equate to the SMP epochs:

- 1. Short term: the next 5-10 years (up to 2025), over which time a period of continued stability is expected to be needed, and recognition that any changes will take time to plan for and implement.
- 2. Medium term: 10 to 40 years' time (2026-2055), further implementation or consolidation of approach.
- 3. Long term: decades into the future, with actual timescales triggered by events (e.g. sea level rise reaches certain levels) or circumstances (e.g. insufficient funding or resources available).

Short-term

The short-term proposals are essentially a continuation of the current approved programme (2016-2020), but with provision for an increase in nourishment volumes if annual monitoring indicates an increase in erosion. For this timeframe, baseline environmental conditions (designated sites and their features; coastal processes) are unlikely to change significantly. It has therefore been possible to assess the proposals in more detail and with greater confidence compared to the other two periods. The assessment has been based on the understanding and conclusions of the HRA for the 2016-2020 period (the interim management prior to the Strategy implementation).

The proposals comprise continuing annual beach re-nourishment with present management, increasing volumes to maintain the defence standard at a 0.5% chance of occurring in any given year (1 in 200 year):

- All works within Zone B (as per the current Lincolnshire Beach Management (LBM), previously 'Lincshore', scheme).
- Current design for beach profile and crest level (4.50 mAOD + 0.3 m height tolerance) still valid based on an estimate of 0.1 m sea level rise during this period.
- Protect the landward hard (e.g. sea walls, embankments) and soft (e.g. sand dunes) defences, which will be maintained as required.
- Removal of any timber groynes found to be exposed within the project area although it should be noted that no old groynes have been found or removed since 2007.
- Beach recycling: re-use of material within the extent of proposed works, as required.

Medium-term

Scenario 1 – Continue to maintain open beach

Annual nourishment to maintain a 0.5% standard of protection but with an increase in beach levels and crest levels (4.80 mAOD) to accommodate an estimated sea level rise of 0.3 m. All

works would be within Zone B, including periodic nourishments that may be required between Ingoldmells and Skegness.

Scenario 2 – Install rock armour structures

If trigger points, such as experiencing predetermined increases in sea level and/or greatly exceeding predicted increases in nourishment volumes, are activated, there will be a need to install beach control structures to help retain material in situ. This would be completed over a 10 to 15-year period. Beach nourishments are still likely to be required every 5-10 years. This would maintain a 0.5% standard of protection, but with an increase in beach levels and crest levels (4.80 mAOD) to accommodate an estimated sea level rise of 0.3 m. All works would be within Zone B.

Both scenarios will also require the raising of landward defences to sustain the standard of protection in line with sea level rise.

In the medium term, in Zones A and C, it is the preferred policy to hold the defences in their current position. The solution would comprise continuation of no active intervention, but with a potential increase in monitoring activity until climate change triggers dictate that some intervention will be required. Currently, beach level monitoring is carried out in these zones in association with the Environment Agency's beach monitoring programme. Future monitoring may involve more regular inspections of the coastal marsh and dune frontages. Interventions may include provision of some new embankments and raising of the existing defences.

Long-term

Scenario 1 – Continue to maintain open beach

Annual nourishment to maintain a 0.5% standard of protection, but with an increase in beach levels and crest levels (5.00-5.50 mAOD) to accommodate an estimated sea level rise of up to 1.1 m. Seawall raising will be required in some locations beyond year 50, to act as a higher backstop against the increased beach levels. All works would initially be within Zone B, including the potential for regular nourishment between Ingoldmells and Skegness. Nourishments may also be required in the northern part of Zone C but that will be dependent on how the baseline has changed in the interim.

Scenario 2 – Maintain beach profiles and structures

Ongoing maintenance of beach control structures including the need to raise their crest height as beach levels are raised (effective in 50+ years' time). Beach nourishment every 5 to 10 years. All works would initially be within Zone B. Nourishments may also be required in the northern part of Zone C although this will require further assessment at the time due to the likely change in baselines by then. Climate change and sea level rise of up to 1.1 m will require higher walls and a nourishment crest level of 5.00-5.50 mAOD.

In both scenarios, Zones A and C will require further interventions which would be subject to long term climate change triggers, i.e. measurable changes in sea level or storm damage to the marsh and dune systems. Any interventions that would include works on the foreshore (such as Zone B type interventions) would require considerable consultation with respect to the environmental designations but it would be preferable to be prepared to do something in advance of any potential emergency response.



Figure 1: Zones identified within the Strategy area



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2. Summary of Stage 1 (likely significant effect) conclusion

At stage 1¹ it was not possible to rule out the likelihood of significant effects; those effects requiring appropriate assessment are summarised in Table 1 below.

Feature/Environment Agency habitat or species group	Timescale/ scenario	Risk	Likely significant effect (LSE) alone	LSE in combination			
Saltfleetby-Theddlethor	Saltfleetby-Theddlethorpe Dunes and Gibraltar Point Dunes SAC						
Shifting dunes along the shoreline with <i>Ammophilia arenaria</i> (white dunes)	Medium and long-term – both scenarios	Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1: nourishment only) Yes (scenario 2: control structures)	Uncertain			
Fixed dunes with herbaceous vegetation (grey dunes)	•	Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1: nourishment only) Yes (scenario 2: control structures)	Uncertain			
Dunes with sea buckthorn (<i>Hippophae</i> <i>rhamnoides</i>)		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1: nourishment only) Yes (scenario 2: control structures)	Uncertain			
Embryonic shifting dunes		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1 in medium and long- term, and scenario 2 in long-term) Yes (scenario 2: control structures in medium-term)	Uncertain			
Humid dune slacks		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1: nourishment only) Yes (scenario 2: control structures)	Uncertain			
Gibraltar Point Ramsar s	ite		1				
Dune and saltmarsh habitats representative of all stages of colonisation and stabilisation and a fine example of a freshwater marsh	Medium and long-term – both scenarios	Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain (scenario 1 in medium and long- term and scenario 2 in long-term) Yes (scenario 2: control structures in medium-term)	Uncertain			

Table 1. European site qualifying features subject to appropriate assessment, following Stage 1.

¹ Saltfleet to Gibraltar Point Strategy Habitats Regulations Assessment: Stage 1 Screening Report

Feature/Environment Agency habitat or species group	Timescale/ scenario	Risk	Likely significant effect (LSE) alone	LSE in combination
Waterfowl assemblage and bird species/ populations occurring at levels of internationally importance: grey plover, sanderling, bar-tailed godwit and dark-bellied brent geese.	Long term – both scenarios	Change in volumes of downdrift material indirectly affecting supporting habitat features.	Uncertain	Uncertain
Gibraltar Point SPA				•
Birds of lowland wet grasslands, lowland freshwaters and their margins, farmland, open	Long term – both scenarios	Change in volumes of downdrift material indirectly affecting supporting habitat features.	Uncertain	Uncertain
Little Tern	Short term; medium and long term – both scenarios	Change in volumes of downdrift material indirectly affecting supporting habitat features.	Yes	N/A
The Wash and North No	rfolk Coast SAC*	and The Wash Ramsar site		-
Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	Short term	Change in volumes of downdrift material indirectly affecting the habitat.	Yes	N/A
Mudflats and sandflats not covered by seawater at low tide		Change in volumes of downdrift material indirectly affecting the habitat.	Yes	N/A
Samphire Salicornia and other annuals colonising mud and sand		Change in volumes of downdrift material indirectly affecting the habitat.	Yes	N/A
Sandbanks slightly covered by sea water all the time.		Change in volumes of downdrift material indirectly affecting the habitat.	Yes	N/A
Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	Medium and long term – both scenarios	Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain	N/A
Mudflats and sandflats not covered by seawater at low tide		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain	N/A
Samphire Salicornia and other annuals colonising mud and sand		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain	N/A
Sandbanks slightly covered by sea water all the time.		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain	N/A
Reefs (Sabellaria spinulosa)		Change in volumes of downdrift material indirectly affecting the habitat.	Uncertain	N/A
The Wash SPA and The V	Nash Ramsar site			
All waterbirds associated with estuarine and coastal habitats	All time periods and both scenarios	Change in volumes of downdrift material leading to loss / physical damage to supporting habitats.	Uncertain	N/A

Feature/Environment Agency habitat or species group	Timescale/ scenario	Risk	Likely significant effect (LSE) alone	LSE in combination
Birds of lowland wet grasslands, lowland freshwaters and their margins, farmland, open sea and offshore rocks	Long term – both scenarios	Change in volumes of downdrift material leading to loss / physical damage to supporting habitats.	Uncertain	Uncertain
Inner Dowsing, Race Bank and North Ridge SAC				
Reefs (Sabellaria spinulosa)	Medium and long term – both scenarios	Change in volumes of downdrift material indirectly affecting the habitat leading to loss / physical damage.	No	Uncertain

* The Wash area only

3. Conservation objectives²

The appropriate assessment considers the implications of the proposal in view of the relevant European site's conservation objectives. The generic conservation objectives for the sites requiring appropriate assessment are summarised below in Tables 2 and 3. In addition, supplementary advice is available and referenced for individual sites. This describes in more detail the range of ecological attributes which are most likely to contribute to a site's overall integrity and the minimum targets each qualifying feature needs to achieve to meet the site's objectives.

Ramsar sites do not have conservation objectives but as their features overlap with the SACs and SPAs they are covered by those.

Table 2. Conservation objectives for SACs.

Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC

The Wash and North Norfolk Coast SAC

Inner Dowsing, Race Bank and North Ridge SAC

Generic objectives for all sites

With regard to the SACs and the natural habitats and/or species for which the sites have been designated and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring:

For Qualifying Habitats:

- The extent and distribution of qualifying natural habitats

- The structure and function (including typical species) of the qualifying natural habitats, and
- The supporting processes on which qualifying habitats rely.

For Qualifying Species:

- The extent and distribution of habitats of qualifying species

- The structure and function (including typical species) of habitats of qualifying species

- The supporting processes on which the natural habitats of qualifying species rely

² Generic conservation objectives are based on 'Natural England (2014) Conservation Objectives for European Sites in England Strategic Standard 01/02/2014 V1.0'

- The populations of qualifying species, and

- The distribution of qualifying species within the site.

<u>Supplementary objectives and advice for individual sites</u> Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC

http://publications.naturalengland.org.uk/publication/5300556352454656 (June 2014 - version 2) The Wash and North Norfolk SAC: Wash and North Norfolk EMS Regulation 33 Conservation Advice Package

http://publications.naturalengland.org.uk/publication/3244315?category=3229185 (2000 – uploaded in 2012)

Inner Dowsing, Race Bank and North Ridge SAC, Regulation 35 Conservation Advice Package http://publications.naturalengland.org.uk/publication/3288484?category=3212324 (January 2013)

Table 3. Conservation objectives for SPAs.

Gibraltar Point SPA (Version 2, 30/06/14)

The Wash SPA (Version 2, 30/06/14)

Generic Objectives for all sites

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- The extent and distribution of the habitats of the qualifying features

- The structure and function of the habitats of the qualifying features

- The supporting processes on which the habitats of the qualifying features rely
- The populations of the qualifying features, and
- The distribution of the qualifying features within the site.

Supplementary objectives and advice for individual sites

Gibraltar Point SPA as it part of the Wash and North Norfolk European Marine Site: <u>https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9008022</u> <u>&SiteName=gibra&countyCode=&responsiblePerson=&SeaArea=&IFCAArea</u> (September 2017)

The Wash SPA as part of the Wash and North Norfolk European Marine Site: <u>https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9008021</u> <u>&SiteName=the%20wash&countyCode=&responsiblePerson=&SeaArea=&IFCAArea (September</u> <u>2017)</u>

4. Site condition and conservation status of relevant qualifying features

Condition and other background information on these sites and features (Table 4) is primarily taken from Natural England's Designated Sites View webpages³. Details are available through:

- SSSI condition assessments for individual units
- Conservation Advice for Marine Protected Areas

Other sources include Site Improvement Plans⁴, the DAS meeting⁵ and European Marine Sites Conservation Advice⁶.

European site and qualifying features	Condition and conservation status
Saltfleetby-Theddlethorpe Dunes and Gibraltar Point Dunes SAC (medium and long-term, both scenarios)	Condition (all Gibraltar Point SSSI units)
Shifting dunes along the shoreline with Ammophilia arenaria (white dunes)	002 NNR Foreshore – Favourable 004 Seacroft Foreshore – Unfavourable recovering
Fixed dunes with herbaceous vegetation (grey dunes)	001 NNR Dunes - Unfavourable recovering 003 Seacroft Golf Course - Unfavourable declining
Dunes with sea buckthorn (Hippophae rhamnoides)	001 NNR Dunes - Unfavourable recovering 003 Seacroft Golf Course - Unfavourable declining
Embryonic shifting dunes	002 NNR Foreshore – Favourable 004 Seacroft Foreshore – Unfavourable recovering
Humid dune slacks	001 NNR Dunes - Unfavourable recovering 003 Seacroft Golf Course - Unfavourable declining
Gibraltar Point SPA and Gibraltar Point Ramsar site	Condition (Gibraltar Point SSSI units where stated)
Dune and saltmarsh habitats (Ramsar) representative of all stages of colonisation and stabilisation (medium and long term, both scenarios)	001 NNR Dunes - Unfavourable recovering 002 NNR Foreshore – Favourable 003 Seacroft Golf Course - Unfavourable declining 004 Seacroft Foreshore – Unfavourable recovering
Birds of lowland wet grasslands, lowland freshwaters and their margins, farmland, open sea and offshore rocks; comprising: (long term, both scenarios)	No Condition Assessment currently available for the birds. Within Gibraltar Point SSSI, 91.5% of the five units are in favourable or unfavourable recovering condition with 8.5% in unfavourable declining condition.
Grey plover (<i>Pluvialis squatarola</i>); Non-breeding (SPA/Ramsar) Sanderling (<i>Calidris alba</i>); Non-breeding (SPA/Ramsar) Bar-tailed godwit (<i>Limosa lapponica</i>); Non-breeding (SPA/Ramsar) Little tern (<i>Sterna albifrons</i>); Breeding (SPA) Dark-bellied brent goose (<i>Branta bernicla</i> <i>Bernicla</i>) (Ramsar); Wintering Red knot (<i>Calidris canutus islandica</i>); Wintering (Ramsar)	

Table 4. Site condition and conservation status of relevant qualifying features.

³ <u>https://designatedsites.naturalengland.org.uk/SiteSearch.aspx</u>

⁴ <u>http://publications.naturalengland.org.uk/category/4873023563759616</u>

- ⁵ DAS meeting with Natural England to discuss draft HR01, 27/11/17
- ⁶ <u>http://publications.naturalengland.org.uk/category/3229185</u>

European site and qualifying features	Condition and conservation status
Birds of coastal habitats, estuarine habitats, open sea and offshore rocks comprising: (short term; medium and long term, both scenarios)	Species of European Conservation Concern (SPEC 3): Unfavourable conservation status (declining) but not concentrated in Europe (not site specific).
Little tern (<i>Sterna albifrons</i>), Breeding (SPA) [23 pairs representing at least 1.0% of the breeding population in Great Britain (5 year mean, 1992-1996)]	Subject to annual monitoring and active intervention to minimise losses to predators and high tides. SPA target is 40 pairs, to match the figure at the time of designation, however numbers have not exceeded that figure since 2009.
Internationally important assemblages of birds	No site-specific condition information for assemblages.
The Wash and North Norfolk Coast SAC* and The Wash Ramsar	Condition (The Wash SSSI and Gibraltar Point SSSI units)
Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi) (SAC) (all time periods and both scenarios)	Within The Wash SSSI, there are 23 units where these communities could occur; 22 are favourable and one is unfavourable recovering. The latter is Wainfleet Upper Shore, just below Gibraltar Point.
Mudflats and sandflats not covered by seawater at low tide (SAC) (all time periods and both scenarios)	Within The Wash SSSI, there are 32 units that predominantly support this feature based on information obtained from MAGIC ⁷ and Natural England's Designated Sites View pages ⁸ . 23 are in Favourable Condition, eight unfavourable recovering and one unfavourable declining. The latter is Snettisham Lower Shore.
Samphire Salicornia and other annuals colonising mud and sand (SAC) (all time periods and both scenarios)	Occurs in the transition zone between the Atlantic salt meadows and mudflats/sandflats not covered by seawater at low tide. These habitats occur in the 32 units referred to above under the <i>mudflats and</i> <i>sandflats not covered by seawater</i> at low tide feature.
Sandbanks slightly covered by sea water all the time. (SAC) (all time periods and both scenarios)	Within The Wash SSSI, units 55 and 58 predominantly support this feature and are listed as favourable and unfavourable recovering respectively. This feature also occurs outside the SSSI, to the north-east in the deeper channels adjacent to Gibraltar Point and continuing east to North Norfolk.
Reefs (Sabellaria spinulosa) (SAC) (medium and long-term; both scenarios)	The reefs are currently in favourable condition.
Inter-relationship between the above habitats (Ramsar) (all time periods and both scenarios)	See above
The Wash SPA and The Wash Ramsar site	Condition

⁷ http://magic.defra.gov.uk/MagicMap.aspx

⁸ https://designatedsites.naturalengland.org.uk/SiteSearch.aspx

⁹ https://app.bto.org/webs-reporting/

European site and qualifying features	Condition and conservation status
Birds of lowland wet grasslands, lowland freshwaters	No Condition Assessment currently available for the
and their margins, farmland, open sea and offshore	birds or associated habitats. Within The Wash SSSI,
rocks comprising:	99.5% of the 60 units are in favourable (67.98%) or
(long term, both scenarios)	unfavourable recovering (31.61%) condition.
Avocet (Recurvirostra avosetta), Wintering (SPA)	The WeBS Alerts for The Wash SPA from 2009/10 ¹⁰
Bar-tailed godwit (Limosa lapponica), Non-breeding	indicate high alerts since classification for shelduck
(SPA/Ramsar)	and pintail and medium alerts for oystercatcher,
Bewick's swan (<i>Cygnus columbianus bewickii</i>), Non-	dunlin and redshank (Cook et al., 2013). For
Dreeding (SPA) Black tailed godwit (Limecg islandicg) Non brooding	shelduck, oystercatcher and redshank comparison of
(SPA/Ramsar)	suggests that the declines may be due to site-specific
Common scoter (<i>Melanitta niara</i>). Non-breeding	pressures.
(SPA)	F
Common tern (<i>Sterna hirundo</i>), Breeding (SPA)	
Curlew (Numenius arquata), Non-breeding	
(SPA/Ramsar)	
Dark-bellied brent goose (Branta bernicia bernicia),	
Dunlin (<i>Calidris alping alping</i>). Non-breeding	
(SPA/Ramsar)	
Gadwall (Anas strepera), Non-breeding (SPA)	
Goldeneye (Bucephala clangula), Non-breeding (SPA)	
Golden plover (Pluvialis apricaria	
Apricaria), Wintering (SPA/Ramsar)	
Grey plover (<i>Pluvialis squatarola</i>), Non-breeding	
(SPA/Ramsar) Knot (Calidric canutus) Non brooding (SPA/Pamsar)	
Lanwing (Vanellus vanellus) (Ramsar)	
Little tern (<i>Sternula albifrons</i>), Breeding (SPA)	
Marsh Harrier (<i>Circus aeruginosus</i>), Breeding (SPA)	
Oystercatcher (Haematopus ostralegus), Non-	
breeding (SPA/Ramsar)	
Pink-footed goose (Anser brachyrhynchus), Non-	
breeding (SPA/Ramsar)	
Pintail (Anas acuta), Non-breeding (SPA/Ramsar)	
(SPA/Ramsar)	
Ringed ployer (<i>Charadrius hiaticula</i>). Non-	
breeding/migratory (SPA/Ramsar)	
Shelduck (Tadorna tadorna), Non-breeding	
(SPA/Ramsar)	
Waterbird assemblage, Non-breeding (SPA/Ramsar)	
Whooper Swan (<i>Cygnus Cygnus</i>), Wintering (SPA)	
Wigeon (<i>Anas penelope</i>), Non-breeding (SPA)	Condition
Inner Dowsing, Race Bank and North Ridge SAC	Condition
(medium dhu long term, both scenarios)	No Marine Condition Assessment currently available
	Latest survey information and mapping indicates
	that the feature is both widespread and variable in
	its occurrence with some core areas and others that
	are more ephemeral (Roberts <i>et al.,</i> 2016).

*The Wash area only – no pathways for material to be deposited within the North Norfolk Coast

¹⁰ https://app.bto.org/webs-reporting/

5. Appropriate assessment: assessing the impacts alone

Designated features of the following sites were identified during the Stage 1 screening (see Section 2) as requiring further assessment due to uncertain or likely significant effects 'alone' from the short, medium and long-term proposals of the Strategy:

- Saltfleetby-Theddlethorpe Dunes and Gibraltar Point Dunes SAC
- Gibraltar Point Ramsar site
- Gibraltar Point SPA
- The Wash and North Norfolk Coast SAC
- The Wash Ramsar site
- The Wash SPA

Tables 5 to 9 in Section 7 assess whether the short, medium and long-term proposals are likely to have an adverse effect on the integrity of these European sites. The integrity of a site is 'the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of population of the species for which it is classified'.

6. Appropriate assessment: assessing the impacts in combination

An in-combination assessment was completed as part of the Stage 1 screening of likely significant effect for those hazards where there was considered no risk of there being any effect alone. It was concluded that there was the potential for in combination 'uncertain' effects with the:

- The Wash Shoreline Management Plan 2: Gibraltar Point to Old Hunstanton (East Anglia Coastal Group, 2010) The appropriate assessment for the Wash SMP identifies that its policies in Policy Development Zone 1 'Gibraltar Point to Wolferton Creek' are conditional (depending on the results of monitoring and research into climate change, the effect on designated habitat, shoreline response and the role of defences) and cannot conclude no adverse impacts on the internationally designated sites in the medium and long-term. Consequently, there is potential for in-combination impacts in the medium and long-term with the Strategy on The Wash SPA/Ramsar site, Gibraltar Point SPA/Ramsar site, The Wash and North Norfolk Coast SAC, and Saltfleetby-Theddlethorpe Dunes and Gibraltar Point Dunes SAC, that are assessed further in Tables 5 to 8 in Section 7.
- East Inshore and Onshore Marine Plan, 2014 A Habitats Regulations appropriate assessment was required for these plans, which concluded that the plans would have no adverse integrity on European sites, either alone or in-combination, provided that two mitigation measures are implemented. These constitute iterative plan review (IPR) involving implementing the plans with regard to ongoing monitoring and project level design developments, as well as ensuring that project level HRA is undertaken and can demonstrate compliance with the Habitats Regulations. Consequently, the Plan has not been considered further in the assessment, in-combination with the Strategy.
- East Lindsey Economic Action Plan (2018), which includes Skegness Foreshore Improvement Plan and Coastal Marina Project (examining the use of hard coastal flood defences to create a marina on the coast in Skegness or Mablethorpe). As the HRA has not been developed for the Improvement Plan or Marina Project yet, it will only be possible to fully assess the potential for in-combination impacts of these and the Strategy at project level, when the design/nature of medium and long-term Strategy proposals has been confirmed (particularly with regard to Scenario 2, if progressed) and when an HRA of the relevant Economic Action Plan is available.
- Triton Knoll Offshore Windfarm A HRA (January 2012) was produced, which considers impacts on European sites, including The Wash and North Norfolk Coast SAC (screened out of Stage 1), and the Inner Dowsing, Race Bank and North Ridge SAC, which are assessed within this Strategy HRA. Taking into account impact predictions, evidence from other sites, uncertainties and whether there is reasonable cause for concern, the wind farm (the 'Initial Development Area'), together with mitigation and monitoring as proposed, was identified as not having an adverse effect on the integrity of any of the above sites, either alone or in combination with other projects. However, some relevant indirect and potentially significant impacts were identified from the Triton Knoll development, which could have incombination impacts on the Inner Dowsing, Race Bank and North Ridge SAC with the Strategy, and are therefore considered further in Table 9.

The following European sites were identified as requiring further assessment at Stage 1 due to uncertain 'in-combination' effects from the medium and long-term proposals of the Strategy:

- Saltfleetby-Theddlethorpe Dunes and Gibraltar Point Dunes SAC
- The Wash and North Norfolk Coast SAC
- Gibraltar Point Ramsar site
- Gibraltar Point SPA
- The Wash Ramsar site

- The Wash SPA
- Inner Dowsing, Race Bank and North Ridge SAC

Tables 5 to 9 in Section 1.7 assess whether the medium and long-term Strategy proposals are likely to have an adverse effect on the integrity of these European sites in-combination with other plans.

7. Stage 2 Habitats Regulations Assessment tables

Table 5. Appropriate Assessment for Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC and Gibraltar Point Ramsar habitat features.

Qualifying Feature	Predicted Risk	Potential Impact on Conservation Objective	Will scale of impact lead to adverse effect on integrity of the site alone?	Will scale of impact lead to adverse effect on integrity of the site in combination?	Can adverse effects be avoided or mitigated?		
Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC							
Gibraltar Point Ramsar (habitats only)						
 Similing duries along the shoreline with Ammophilia arenaria (white dunes) Fixed dunes with herbaceous vegetation (grey dunes) Dunes with sea buckthorn (<i>Hippophae rhamnoides</i>) Embryonic shifting dunes Humid dune slacks Dune and saltmarsh habitats representative of all stages of colonisation and stabilisation (<i>Ramsar</i>) 	downdrift material indirectly affecting the habitats (medium to long-term risk only)	distribution of dune habitats and associated plant communities. Changes to the supporting processes (including dynamic coastal processes) on which qualifying habitats rely. Changes to structure and function (including typical species) of qualifying dune habitats.	Scenario 1 – continue to maintain open beach (medium and long-term) The proposal to continue beach re-nourishment is not a change in management policy and the current condition of the dune habitats based on the results of the Lincshore (now LBM) monitoring since the mid-1990s suggest that adverse effects are not currently occurring. However, this could change in the medium and/or long term as increasing volumes of material will be required to increase the beach profile and crest in Zone B to accommodate predicted sea level rise. Although there is uncertainty in determining the impacts of beach nourishment as limited information is available on the natural behaviour and distribution of sediments in the absence of nourishment activity, it is likely that the volumes proposed in the medium and long-term, will increase sediment being deposited at beaches downdrift of Lincshore/LBM. Since nourishment of the beaches started, around 17 million m ³ of sand has been added to the beaches, and at the end of 2017, just 9 million m ³ of this has remained on the beach (above mean low water) (2018 SFGP Coastal Processes Report) [note these figures are precautionary and in any one year, between 60 and 100% of nourishment could be lost from Zone B]. The potential increase in sediment being deposited in and around Gibraltar Point and The Wash due to a southerly longshore drift from the nourishment area may result in changes to the sediment dynamics within the SAC. However, historical evidence shows that this section of coastline has always been dynamic and influenced by a range of factors, including changes to the nearshore banks, changes to the tidal prism of The Wash, sea level change, and sediment supply. The growth of the Gibraltar Point complex has been progressive, with the development of successive spits which have enveloped the previous spit and dune complex, pushing the shoreline position seawards and allowing the development of sattmarsh habitats and embryo dune habitats. This process has been o	from other plans or developments	Medium and long-term – Yes. The Strategy will retain flexibility in its design to ensure that it will avoid adversely affecting the qualifying interests with appropriate monitoring, scheme level design, mitigation and safeguarding. Strategic level monitoring (together with proposed improvements to sediment transport models, and improved monitoring of changes in beach and dunes, particularly to the south of Skegness) will be undertaken to better understand geomorphological changes and sediment dynamics along the coastline, which will inform a scheme level HRA. The monitoring programme will be agreed with Natural England, and will include review and appropriate intervention/design changes (e.g. refinements to sediment sampling strategies, implementation of 'softer' approaches in the medium and long- term etc) if required when agreed trigger levels are reached/early warning system and/or alternative mechanisms for sediment release (in conjunction with SMP mitigation measures). We could also use LIDAR on a detailed survey (e.g. quad bike mounted GPS) rather than just single profile measurements to enable volume changes to be properly measured. A more detailed scheme-level HRA will be undertaken in consultation with Natural England, which will		

Qualifying Feature	Predicted Risk	Potential Impact on Conservation Objective	Will scale of impact lead to adverse effect on integrity of the site alone?	Will scale of impact lead to adverse effect on integrity of the site in combination?	Can adverse effects be avoided or mitigated?
			 Whilst impacts on the northern section of the Saltfleetby – Theddlethorpe Dunes and Gibraltar Point SAC are considered negligible, it is anticipated that there will continue to be additional input of sediment to the Gibraltar Point complex, via the offshore sandbanks although it has not been possible to quantify the amounts involved to date. Given the historic changes at the site pre-nourishment, with successive development of dune ridges and marsh, it is considered that any additional sediment from Lincshore/LBM will be making a relatively small but positive contribution to the development of dune habitats. However, recent observations by Lincolnshire Wildlife Trust (the site managers) suggest that ongoing accretion and associated landward movement of the "Millennium ridge" at the southern end of the SAC is diverting the course of the main creek and thereby causing erosion within the saltmarsh and sandflats. Natural England¹¹ regard this as a natural process and confirmed that this part of the site (Unit 2 of the SSSI) is in favourable condition (and has not been subject to further assessment). Evolution of the features may result in some localised dune and saltmarsh erosion, such as is occurring at present where Greenshank Creek is currently being pushed landward. However, this is considered by Natural England to be a natural process and therefore there would be no associated adverse impacts on the integrity of the dune habitats. Scenario 2 – install rock armour structures (medium-term) and maintain beach profiles/structures (long-term) In addition to the impacts highlighted under beach nourishment above, Scenario 2 may involve the introduction of rock armour structures (and possible provision of new defences/embankments in Zone C). These new beach control structures would be designed and installed (based on the results of monitoring) to manage sediment retention and movement (alongshore/offshore), with the objective of reducing sand mobility.		more precisely describe the potential effects of the works proposed (Scenario 1 or 2) in the medium and long-term, together with project level mitigation measures, when specific details of the scale and nature of any upgrading works are known. The actual location of the qualifying features with respect to the current site boundaries will inevitably change and agreement will be required on this and the overall extent as part of any over-arching climate change adaptation process for the whole coastline. Additionally, the specification for nourishment could be modified to a higher content of slightly coarser sediment, since the 2017 monitoring has indicated that it is the finer sediments that are being redistributed as part of the general southward movement of sediments. Survey of saltmarsh and dune slack topography, and formulation of a feasibility plan at scheme level.

¹¹ DAS meeting with Natural England to discuss draft HR01, 27/11/17

Qualifying Feature	Predicted Risk	Potential Impact on Conservation Objective	Will scale of impact lead to adverse effect on integrity of the site alone?	Will scale of impact lead to adverse effect on integrity of the site in combination?	Can adverse effects be avoided or mitigated?
Gibraltar Point SPA and R	Ramsar				
Gibraltar Point SPA and R Grey plover (<i>Pluvialis</i> <i>squatarola</i>); Non-breeding Sanderling (<i>Calidris alba</i>); Non-breeding Bar-tailed godwit (<i>Limosa</i> <i>lapponica</i>); Non-breeding Little tern (<i>Sterna</i> <i>albifrons</i>); Breeding Dark-bellied brent geese (<i>Branta bernicla bernicla</i>); wintering Knot (<i>Calidris canutus</i> <i>islandica</i>); wintering	Ramsar Change in volumes of downdrift material indirectly affecting the supporting habitat for SPA birds (long-term risk only)	Reduction in extent and distribution of saltmarsh, beach and sandflats which provides feeding habitat for grey plover, sanderling, bar- tailed godwit and little tern, and wide beaches/shingle ridges provide nesting habitat for little tern. Reduction in the populations of grey plover, sanderling, bar-tailed godwit and little tern. Change in the distribution of grey plover, sanderling, bar- tailed godwit and little tern. within the site. No conservation objectives available for knot and dark- bellied brent geese in 2014 Natural England European Site Conservation Objectives for the SPA.	No in long-term (scenario 1) Uncertain in long-term (scenario 2). Scenario 1 – continue to maintain open beach (long-term) Predicted sea level rise will result in increasing requirements for beach nourishment, with potential for additional sediment to be added to the Gibraltar Point complex due to the southward drift of material. The designation recognises that Gibraltar Point consists of an actively accreting sand dune system, saltmarsh and extensive intertidal flats. For the past 20 years this development has been affected by nourishment works along the Lincolnshire coastline. The long-term proposals are likely to continue to contribute to dune development over the whole site (including growth of the spit and the ness, which relies on a continued supply of sediment), with further successional development likely. Increased dune development may benefit the SPA species and in particular, the little terns, which benefit from wider higher beaches/shingle areas for nesting. It has previously been suggested that finer sand from nourishment may smother the shingle habitats and be less conducive for little terns to nest. Previous work by Blott and Pye (2004) suggests that it is the finer sediments that tend to be moved, and sediment sampling as part of their study did not show any noticeable southward migration of coarse upper beach material. However, a review of the monitoring data for breeding birds at Gibraltar Point (between 2005 and 2017) indicates that predation and high tides are the principal reasons that limit the expansion and productivity of the colony. As the amount of suitable habitat has always been variable with population fluctuations of little terns changing significantly from year to year (with difficulty attributing any changes to the nourishment operations, which have been carried out for the last >20 years), no adverse impacts are anticipated on the SPA/Ramsar birds from continuing beach nourishment in the Strategy area. Additionally, available data suggests that species which have a preferenc	combination? No The Wash SMP identifies potential for some loss of intertidal habitat (confined to saltmarsh and mudflats) due to coastal squeeze, which may affect SPA bird species. However, the Wash SMP specifies that if loss of intertidal habitat is expected, and if drivers for habitat compensation remain, then managed realignment will be provided to offset losses. Additionally, the nourishment as part of the Strategy is not considered to result in the loss of saltmarsh and mudflat feeding and roosting habitat for SPA/Ramsar birds, and any current changes to saltmarsh (e.g. occurring at Greenshank Creek) are considered natural and not attributable to the nourishment operations.	Short-term – N/A Medium-term – N/A Long-term - Yes. The Strategy retains flexibility in its design in the long-term to ensure that will avoid adversely affecting the qualifying interests with appropriate scheme level design, and mitigation. Adoption of early warning monitoring programme to identify any decline in quality or extent of supporting habitats that can be attributed to changes in sediment supply from the beach recharge programme. This will include annual review and analysis of breeding bird data from the wardens at Gibraltar Point, particularly with respect to little tern numbers and productivity. Where effects are identified, remedial actions will need to be taken. A more detailed scheme-level HRA will be undertaken in consultation with Natural England, which will more precisely describe the potential effects of the works in Zone B proposed in the long-term, together with project level mitigation measures, when specific details of the scale and nature of any upgrading works are known (if Scenario 2 is implemented).
			and Knot) are performing particularly well. Evolution of the features may result in some localised dune and saltmarsh erosion, such as is occurring at present where Greenshank Creek is currently being pushed landward. However, this is considered by Natural England to be a natural process and therefore there would be no associated adverse impacts on SPA birds affecting the integrity of the site.		C will be designed and implemented in consultation with Natural England to ensure that it avoids adverse impacts on habitat supporting SPA birds. Scheme level mitigation measures will be identified and implemented to avoid adverse effects, and will include
			Saltmarsh habitat has developed in tandem with the formation of successive dune ridges, which is likely to benefit the SPA birds for roosting and feeding, particularly Dark-bellied brent geese. Recent observations by Lincolnshire Wildlife Trust (the site managers) suggest that ongoing accretion and associated landward movement of the "Millennium ridge" is diverting the course of the main creek and thereby causing erosion within the		appropriate timing of any works to avoid periods of key bird usage in identified sensitive locations.

Table 6. Appropriate Assessment for Gibraltar Point SPA and Gibraltar Point Ramsar bird features.

Qualifying Feature	Predicted Risk	Potential Impact on Conservation Objective	Will scale of impact lead to adverse effect on integrity of the site alone?	Will scale of impact lead to adverse effect on integrity of the site in combination?	Can adverse effects be avoided or mitigated?
			saltmarsh and sandflats. Natural England regard this as a natural process and confirmed that this part of the site (Unit 2 of the SSSI) is in favourable condition (and has not been subject to further assessment).		
			Scenario 2 – maintain beach profiles/installed structures (long-term) In addition to the impacts highlighted under beach nourishment above, Scenario 2 may involve the introduction of rock armour structures (and possible provision of new defences/embankments in Zone C). These new beach control structures would be designed and installed (based on the results of monitoring) to manage sediment retention and movement (alongshore/offshore), with the objective of reducing sand mobility.		
			Although the retention of additional sand by the new structures has the potential to interrupt hydrological continuity and the successional transition between marine habitats and the dunes, the new structures would only be implemented if it could be demonstrated that they will not adversely reduce the supply of sand to the dune system around Gibraltar Point. Consequently, it is unlikely that there would be any impacts on the dynamic nature of the site, and would not affect the extent, distribution and function of the supporting habitats, which the birds use for feeding, roosting and nesting (but in the absence of monitoring, these effects remain uncertain). Further work will be required to reduce any uncertainty once further details of the location, scale and nature of the structures are known.		
Little Tern	Change in volumes of downdrift material	Reduction in extent and distribution of the habitats	No in short-term (Beach re-nourishment with present management, increasing volumes to maintain defence standard)	No The Wash SMP identifies potential for some	Short-term – N/A
	indirectly affecting the	of the qualifying features.	Population fluctuations of little terns at Gibraltar Point are the result of a complex	loss of intertidal habitat (confined to	Medium and long-term - Yes. The
	supporting habitat.	Changes to the structure	interaction of factors with no single factor predominating from year to year.	saltmarsh and mudflats) due to coastal	Strategy retains flexibility in its design to
	/	and function of the habitats	However, a review of the monitoring data for breeding birds at Gibraltar Point	squeeze, which may affect little terns.	ensure that it will avoid adversely
	(short, medium and long-	of the little terns	(between 2005 and 2017 – see Appendix A) indicates that predation and high tides	However, the Wash SMP specifies that it loss	affecting the little terns with appropriate
	(enninsk)	Changes to the supporting	As the amount of suitable babitat has always been variable with population	for habitat compensation remain, then	necessary) scheme level design and
		processes on which the	fluctuations of little terns changing significantly from year to year, and	managed realignment will be provided to	mitigation.
		habitats of the little terns	nourishment operations have been carried out for the last >20 years, no adverse	offset losses. Additionally, the nourishment	Adoption of early warning monitoring
		rely	impacts on the integrity of the site are anticipated from continuing short-term	as part of the Strategy is not considered to	programme to identify any decline in
			beach nourishment in the Strategy area.	result in the loss of saltmarsh and mudflat	quality or extent of supporting habitats
		Reductions in the	No in modium and long town (connexis 1)	feeding habitat for little terns, and any	that can be attributed to changes in
		impacts on the number of	Uncertain in medium and long-term (scenario 1)	at Greenshank Creek) are considered natural	programme. This will include annual
		nesting pairs and		and not attributable to the nourishment	review and analysis of breeding bird data
		productivity) of the little	Scenario 1 – continue to maintain open beach (medium and long-term)	operations.	from the wardens at Gibraltar Point,
		terns, and	Increased dune development may benefit the SPA species and in particular, the		particularly with respect to little tern
			little terns, which benefit from wider higher beaches/shingle areas for nesting.		numbers and productivity, and further
		change in the distribution of	However, there is also the possibility that finer sand from nourishment may		monitoring to improve understanding of
		site	Increased dune development may benefit the SPA species particularly the little		nule terri s preferred flestillig sites.
		5.00	terns, which benefit from wider higher beaches/shingle areas for nesting. There is		A more detailed scheme level HRA will be
			also the possibility that finer sand from nourishment may smother the shingle		undertaken in consultation with Natural
			habitats and be less conducive for little terns to nest. Previous work by Blott and		England, which will more precisely
			Pye (2004) suggests that it is the finer sediments that tend to be moved, and		describe the potential effects of the works
			sediment sampling as part of their study did not show any noticeable southward		in Zone B proposed in the long-term,
			migration of coarse upper beach material. However, a review of the monitoring		together with project level mitigation

Qualifying Feature	Predicted Risk	Potential Impact on Conservation Objective	Will scale of impact lead to adverse effect on integrity of the site alone?	Will scale of impact lead to adverse effect on integrity of the site in combination?	Can adverse effects be avoided or mitigated?
			data for breeding birds at Gibraltar Point (between 2005 and 2017) indicates that predation and high tides are the principal reasons that limit the expansion and productivity of the colony. As the amount of suitable habitat has always been variable with population fluctuations of little terns changing significantly from year to year, and nourishment operations have been carried out for the last >20 years, no adverse impacts on the integrity of the site are anticipated from continuing beach nourishment in the Strategy area. <u>Scenario 2 – install rock armour structures (medium-term) and maintain beach profiles/structures (long-term)</u> In addition to the impacts highlighted under beach nourishment above, Scenario 2 may involve the introduction of rock armour structures (and possible provision of new defences/embankments in Zone C). These new beach control structures would be designed and installed (based on the results of monitoring) to manage sediment retention and movement (alongshore/offshore), with the objective of reducing sand mobility. Although the retention of additional sand by the new structures has the potential to interrupt hydrological continuity and the successional transition between marine habitats and the dunes, the new structures would only be implemented if it could be demonstrated that they will not adversely reduce the supply of sand to the dune system around Gibraltar Point. Consequently, it is unlikely that there would be any impacts on the dynamic nature of the site, and would not affect the availability of feeding and nesting habitat for little terns (but in the absence of menitoring the action of the site and hould not affect the availability of feeding and nesting habitat for little terns (but in the absence of		measures, when specific details of the scale and nature of any upgrading works are known. At scheme level, any interventions in Zone C will be designed and implemented in consultation with Natural England to ensure that it avoids adverse impacts on habitat supporting SPA birds (with consideration of 'softer' approaches in the medium and long-term if required). Scheme level mitigation measures will be identified and implemented to avoid adverse effects, and will include appropriate timing of any works to avoid periods of key bird usage in identified locations.
			work (including scheme level HRA) will be required to reduce any uncertainty once further details of the location, scale and nature of the structures are known.		
Table 7. Assessment for The Wash and North Norfolk Coast SAC habitat features.

Qualifying Feat	ture	Predicted Risk	Potential Impact on Conservation Objective	Will scale of impact lead to adverse effect on integrity of the site alone?	Will scale of impact lead to adverse effect on integrity of the site in combination?	Can adverse effects be avoided or mitigated?
The Wash and North Norfolk Coast SAC						
 The Wash and Mediterrane thermo-Atla halophilous (Sarcocorne fruticosi) Mudflats an sandflats no by seawater tide Samphire Sc and other at colonising m sand Sandbanks s covered by sall the time. Reefs (Sabel spinulosa) 	North Nor ean and intic scrubs tea d it covered at low alicornia inuals inud and slightly sea water <i>llaria</i>	folk Coast SAC Change in volumes of downdrift material indirectly affecting the habitat. (medium to long-term risk)	Reduction in extent and/or distribution of habitats and associated plant communities. Changes to the supporting processes on which qualifying habitats rely. Changes to structure and function (including typical species) of qualifying habitats.	No (medium and long-term) – Mediterranean and thermo-Atlantic halophilous scrubs and samphire Uncertain (medium and long-term) – Mudflats and sandflats not covered by seawater at low tide, reefs and sandbanks Scenario 1 – continue to maintain open beach (medium and long-term) Mediterranean and thermo-Atlantic halophilous scrubs Predicted sea level rise and associated requirements to increase the beach profile and crest will increase volumes of material required and may alter geomorphological processes and sediment dispersal, which will require long- term monitoring. However, the actual contribution that recharge sediments make to the development and maintenance of this habitat is currently unknown. As monitoring of these saltmarsh plants since the mid-1992 has shown their extent to be increasing, no adverse impacts are anticipated. The existing nourishment regime is not understood to be impacting on the distribution, extent or structure of these habitats, which are currently in favourable condition status (with the exception of Wainfleet Upper Shore, just below Gibraltar Point, which is in unfavourable recovering). Consequently, no adverse effects on Mediterranean and thermo-Atlantic halophilous scrubs are anticipated over the duration of the Strategy under Scenario 1. Mudflats and sandflats not covered by seawater at low tide The current condition of these habitats and the results of the Lincshore (now LBM) monitoring since the mid-1990s suggest that adverse effects on Currently occurring. However, there is uncertaintly in determining the impacts of beach nourishment as no information is available on the natural behaviour and distribution of sediments in the absence of nourishment activity. It is likely that the volumes proposed in the medium and long-term, will increase in sediment being deposited in and around The Wash due to a southerly longshore drift from the nourishment aree and changes to the sediment dynamics (although the ultimate fate of the material is uncertain). However, a proportion of the downdr	Uncertain in medium and long-term The Wash SMP identifies potential for some loss of intertidal habitat due to coastal squeeze, which has the potential for in-combination 'uncertain' effects with the Strategy. [The Wash SMP specifies that if loss of intertidal habitat is expected, and if drivers for habitat compensation remain, then managed realignment will be provided to offset losses.]	 Short-term – N/A Medium and long-term - Yes. The Strategy retains flexibility its design to ensure that it will avoid adversely affecting the habitats with appropriate monitoring, scheme level design, mitigation and safeguarding. Strategic level monitoring (together with proposed improvements to sediment transport models) will be undertaken to better understand geomorphological changes and sediment dynamics along the coastline, which will inform a scheme level HRA. The monitoring programme will be agreed with Natural England, and will include review and appropriate intervention/design changes (e.g. refinements to sediment sampling strategies, implementation of 'softer' approaches in the medium and long-term etc) if required when agreed trigger levels are reached/early warning system and/or alternative mechanisms for sediment release (in conjunction with SMP mitigation measures). Early warning monitoring with associated design changes and/or alternative mechanisms for sediment release (in conjunction with SMP mitigation measures). The actual location of the qualifying features with respect to the current site boundaries will inevitably change and agreement will be required on this and the overall extent as part of any over-arching climate change adaptation process for the whole coastline. At scheme level, Strategy implementation times in a spart of any induction with Natural England to ensure it avoids adverse impacts on these habitats.
		1	1			

Qualifying Feature	Predicted Risk	Potential Impact on Conservation Objective	Will scale of impact lead to adverse effect on integrity of the site alone?	Will scale of impact lead to adverse effect on integrity of the site in combination?	Can adverse effects be avoided or mitigated?
			adverse impact on samphire and other annuals over the duration of the Strategy under Scenario 1.		
			Sandbanks slightly covered by seawater all the time The increases in volumes of material required in the medium and long-term may alter sediment dispersal, which could affect the morphology of the sandbanks, which will require long-term monitoring. However, the actual contribution that recharge sediments make to the development and maintenance of this habitat is currently unknown as the communities of The Wash appear to be highly dynamic. APEM (2013) note that between 1991 and 2011, the overall sediment types have not changed over time but there is, not surprisingly, some inter-year variation at particular locations. Studies that have looked into the impact of previous nourishment schemes (e.g. Emu 2012) have been unable to directly associate changes to the banks and channels with the nourishment, due to the large changes that occur naturally. The APEM report confirms that there have been no gross changes in the habitat or fauna that it supports. It is therefore anticipated that any future changes to sediment deposition in the medium to long-term are unlikely to affect the sandbanks over the duration of the Strategy		
			under Scenario 1 but there remains an element of uncertainty that will require future monitoring. Reefs (Sahellaria spinulosa)		
			The increases in volumes of material required in the medium and long-term may alter sediment dispersal, which could affect the reefs, which will require long- term monitoring. <i>Sabellaria</i> appear to favour silty cobbley habitats rather than sandy habitats (English Nature 2001). Conditions favourable for <i>Sabellaria</i> are silty sand and cobble/shell often on areas where sand supply might be high, such as the edges of sand banks and where there are sand waves (English Nature 2001). Although they require some degree of sediment transport for their tube- building and can tolerate temporary sediment disturbance/smothering, they		
			have a low tolerance to burial from prolonged periods of increased levels of sedimentation (as cited in OSPAR Commission 2013). The actual contribution that recharge sediments make to the development and maintenance of this habitat is currently unknown and <i>Sabellaria</i> are known to be able to colonise a range of sediment types (English Nature 2001). APEM (2013) note that between 1991 and 2011, the overall sediment types have not changed over time but there is, not surprisingly, some inter-year variation at particular locations. It is therefore anticipated that any future changes to sediment deposition in the medium to long-term are unlikely to affect the reefs (which develop in dynamic		
			sedimentary environments), over the duration of the Strategy under Scenario 1 but there remains an element of uncertainty that will require future monitoring.		
			Scenario 2 – Install rock armour structures (medium-term) and maintain beach profiles/structures (long-term) In addition to the impacts highlighted under beach nourishment above, the introduction of rock armour structures (and possible provision of new defences/embankments in Zone A) has potential to reduce the volumes of sand lost downdrift and the supply of sand to the habitats around The Wash and offshore reefs. There is therefore an element of uncertainty that will require future monitoring.		

Table 8. Assessment for The Wash SPA and The Wash Ramsar bird features.

Qualifying Feature	Predicted Risk	Potential Impact on Conservation Objective	Will scale of impact lead to adverse effect on integrity of the site alone?	Will scale of impact lead to adverse effect on integrity of the site in combination?	Can adverse effects be avoided or mitigated?
The Wash SPA and The Was	h Ramsar				-
	I				
Waterbirds of coastal and	Increase or decrease in	Changes to the extent and	No in short-term (Beach nourishment with present management, increasing	Uncertain in medium and long-term	Short-term – N/A
estuarine habitats	volumes of downdrift	distribution of the habitats of	Volumes to maintain detence standard)	The wash Sivip Identifies potential for some	Madium and Isua tauna Maa Tha
comprising:	affecting the hebitat	the qualitying features	Ine 2015 HKA review of non-breeding bird status in the webs count zones	IOSS OF Intertidal habitat due to coastal	Medium and long-term - Yes. The
Avocet (Recurvirostru	anecting the habitat.	Charges to the structure and		squeeze, which may affect SPA birds, and has	strategy retain nexibility in its design
avosetta), wintering (SPA)	(chart modium and lang	function of the hebitate of the	The breading hirds in The Week CDA will not be affected by the chart term	offects with the Strategy in the medium and	to ensure that it will avoid adversely
(appendice) Nep brooding	(Short, mealum and long-	function of the habitats of the	The breeding birds in the Wash SPA will not be affected by the short-term	long torm	anecting the waterbirds with
(SPA (Pamcar)	term risk)	qualitying reatures	ostablished little tern colonies on The Wash south of Gibraltar Point	long-term.	dosign and mitigation
(SPA/Railisal) Rowick's swop (Cuanus		Changes to the supporting		The Wash SMD specifies that if loss of	uesign, and mitigation.
columbianus howickii) Non		processes on which the	Notwithstanding the lack of data about whether heach neurishment material	intertidal babitat is expected, and if drivers for	A Monitoring and Mitigation Plan will
brooding (SPA)		babitate of the qualifying	is reaching these locations, the available data suggests that species which	habitat componsation romain then managed	he propared and include habitat and
Black tailed godwit (Limesg		fosturos roly	have a profession for candiar substrates because of their fooding	realignment will be provided to offset losses 1	associated bird count monitoring in this
islandica) Non-breeding		leatures rely	requirements (e.g. Bar-tailed Godwit) are performing particularly well. There	realignment will be provided to onset losses.]	part of the site to identify any trends in
(SPA /Pamsar)		Changes to the population of	is no indication that species associated with muddler sediments (e.g. Dunlin)		numbers and distribution
(SFA) Natisal) Common scoter (Melanitta		each of the qualifying	and which are declining are doing so because of changes in the composition		
nigra) Non-breeding (SPA)		features and	of intertidal substrate. For species that are closely associated with cockle		A more detailed scheme-level HRA will
Common tern (Sterna			and/or mussal bads (Ovstercatcher and Knot) the trends are for increasing		he undertaken in consultation with
hirundo) Breeding (SPA)		Changes to the distribution of	numbers. In conclusion, it is anticipated that the short-term Strategy		Natural England, which will more
Curlew (Numenius arquata)		the qualifying features within	proposals will have no adverse impact on the SPA hirds		nrecisely describe the notential effects
Non-breeding (SPA/Bamsar)		the site	proposals will have no adverse impact on the SFA birds.		of the works in the medium and long-
Dark-bellied brent goose			No (medium and long-term) – Breeding birds		term together with project level
(Branta bernicla bernicla)			Uncertain (medium and long-term) – Non-breeding birds		mitigation measures when specific
Non-breeding (SPA/Ramsar)					details of the location, scale and nature
Dunlin (<i>Calidris alpina</i>			Scenario 1 – continue to maintain open beach (medium and long-term)		of any upgrading works are known.
alpina). Non-breeding			The breeding birds in The Wash SPA will not be affected by the medium and		
(SPA/Ramsar)			long-term proposals as common terns nest at Freiston and Frampton, and		
Golden plover (<i>Pluvialis</i>			there are no established little tern colonies on The Wash south of Gibraltar		
apricaria			Point (although there is a potential for changes to feeding habitat).		
Apricaria), Wintering					
(SPA/Ramsar)			Changes in the volumes of beach nourishment material may affect some of		
Grey plover (<i>Pluvialis</i>			the supporting habitats of the qualifying non-breeding birds. However,		
squatarola), Non-breeding			notwithstanding the lack of data about whether beach nourishment material		
(SPA/Ramsar)			is reaching these locations, the available data suggests that species which		
Knot (<i>Calidris canutus</i>), Non-			prefer sandier substrates because of their feeding requirements (e.g. Bar-		
breeding (SPA/Ramsar)			tailed Godwit) are performing particularly well. There is no indication that		
Lapwing (Vanellus vanellus)			species associated with muddier sediments (e.g. Dunlin), and which are		
(Ramsar)			declining, are doing so because of changes in the composition of intertidal		
Little tern (Sternula			substrate. For species that are closely associated with cockle and/or mussel		
albifrons), Breeding (SPA)			beds (Oystercatcher and Knot), the trends are for increasing numbers. In		
Marsh Harrier (Circus			conclusion, it is anticipated that the medium and long-term Strategy		
aeruginosus), Breeding (SPA)			proposals will have no adverse impact on the SPA birds.		
Oystercatcher (Haematopus					
ostralegus), Non-breeding			Scenario 2 – install rock armour structures (medium-term) and maintain		
(SPA/Ramsar)			beach profiles/structures (long-term)		
Pink-footed goose (Anser			The breeding birds in The Wash SPA will not be affected by the medium and		
brachyrhynchus), Non-			long-term proposals as common terns nest at Freiston and Frampton, and		
breeding (SPA/Ramsar)			there are no established little tern colonies on The Wash south of Gibraltar		
			Point (although there is a potential for changes to feeding habitat).		

Qualifying Feature	Predicted Risk	Potential Impact on Conservation Objective	Will scale of impact lead to adverse effect on integrity of the site alone?	Will scale of impact lead to adverse effect on integrity of the site in combination?	Can adverse effects be avoided or mitigated?
Pintail (Anas acuta), Non- breeding (SPA/Ramsar) Redshank (Tringa totanus), Non-breeding (SPA/Ramsar) Ringed plover (Charadrius hiaticula), Non-breeding, migratory (SPA/Ramsar) Sanderling (Calidris alba), Non-breeding (SPA/Ramsar) Shelduck (Tadorna tadorna), Non-breeding (SPA/Ramsar) Turnstone (Arenaria interpres), Non-breeding (SPA/Ramsar) Waterbird assemblage, Non- breeding (SPA/Ramsar) Whooper Swan (Cygnus Cygnus), Wintering (SPA) Wigeon (Anas penelope), Non-breeding (SPA)			In addition to the impacts highlighted under beach nourishment above, the introduction of rock armour structures (and possible provision of new defences/embankments in Zone A) has potential to reduce the volumes of sand lost downdrift and the supply of sand to the habitats around The Wash, which has the potential to affect the non-breeding waterbirds. However, the new structures would only be implemented if it could be demonstrated that they will not adversely reduce the supply of sand to the Wash. Consequently, it is unlikely that there would be any impacts on the dynamic nature of the SPA/Ramsar site, and is unlikely to affect the availability of feeding, roosting and nesting habitat for the non-breeding birds. There does however remain an element of uncertainty that will require future monitoring.		
Birds of lowland wet grasslands, lowland freshwaters and their margins, farmland, open sea and offshore rocks comprising: Avocet (<i>Recurvirostra</i> <i>avosetta</i>), Wintering (SPA) Bar-tailed godwit (<i>Limosa</i> <i>lapponica</i>), Non-breeding Bewick's swan (<i>Cygnus</i> <i>columbianus bewickii</i>), Non- breeding Black-tailed godwit (<i>Limosa</i> <i>islandica</i>), Non-breeding Common scoter (<i>Melanitta</i> <i>nigra</i>), Non-breeding Common tern (<i>Sterna</i> <i>hirundo</i>), Breeding Curlew (<i>Numenius arquata</i>), Non-breeding Dark-bellied brent goose (<i>Branta bernicla bernicla</i>), Non-breeding Dunlin (<i>Calidris alpina</i> <i>alpina</i>), Non-breeding Gadwall (<i>Anas strepera</i>), Non-breeding Goldeneye (<i>Bucephala</i> <i>clangula</i>), Non-breeding Golden plover (<i>Pluvialis</i>	Change in volumes of downdrift material indirectly affecting the supporting habitat.	Reduction in extent and distribution of the habitats of the qualifying features. Reductions in the populations of the qualifying features Change in the distribution of the qualifying features within the site.	 No in short-term (Beach re-nourishment with present management, increasing volumes to maintain defence standard) The 2015 HRA review of non-breeding bird status in the WeBS count zones immediately below Gibraltar Point concluded no adverse effect. The breeding birds in The Wash SPA will not be affected by the short-term proposals as common terns nest at Freiston and Frampton, and there are no established little tern colonies on The Wash south of Gibraltar Point. Notwithstanding the lack of data about whether beach nourishment material is reaching these locations, the available data suggests that species which prefer sandier substrates because of their feeding requirements (e.g. Bartailed Godwit) are performing particularly well. There is no indication that species associated with muddier sediments (e.g. Dunlin), and which are declining, are doing so because of changes in the composition of intertidal substrate. For species that are closely associated with cockle and/or mussel beds (Oystercatcher and Knot) the trends are for increasing numbers. In conclusion, it is anticipated that the short-term Strategy proposals will have no adverse impact on the SPA birds. No (medium and long-term) – Breeding birds Scenario 1 – continue to maintain open beach (medium and long-term) The breeding birds in The Wash SPA will not be affected by the medium and long-term proposals as common terns nest at Freiston and Frampton, and there are no established little tern colonies on The Wash south of Gibraltar Point (although there is a potential for changes to feeding habitat). Changes in the volumes of beach nourishment material may affect some of the supporting habitats of the qualifying non-breeding birds. However, 	Uncertain in medium and long-term The Wash SMP identifies potential for some loss of intertidal habitat, which may affect SPA birds and will require further monitoring and review.	Short-term – N/A Medium and long-term - Yes. The Strategy retain flexibility in its design to ensure that it will avoid adversely affecting the birds with appropriate monitoring, scheme level design and mitigation. A Strategic Monitoring and Mitigation Action Plan will be prepared and include habitat and associated bird count monitoring in this part of the site to identify any trends in numbers and distribution. The monitoring programme will be agreed with Natural England, and will include review and appropriate intervention if required, if changes to the SPA birds considered to be brought about through strategy implementation, occur. A more detailed scheme-level HRA will be undertaken in consultation with Natural England, which will more precisely describe the potential effects of the works in the medium and long- term, together with project level mitigation measures, when specific details of the location, scale and nature of any upgrading works are known.

Qualifying Feature	Predicted Risk	Potential Impact on	Will scale of impact lead to adverse effect on integrity of the site	Will scale of impact lead to adverse effect	Can adverse effects be avoided or
		Conservation Objective	alone?	on integrity of the site in combination?	mitigated?
Anricaria) Wintering			is reaching these locations, the available data suggests that species which		
(SPA/Ramsar)			prefer sandier substrates because of their feeding requirements (e.g. Bar-		
Grey plover (<i>Pluvialis</i>			tailed Godwit) are performing particularly well. There is no indication that		
squatarola), Non-breeding			species associated with muddier sediments (e.g. Dunlin), and which are		
Knot (Calidris canutus), Non-			declining, are doing so because of changes in the composition of intertidal		
breeding			substrate. For species that are closely associated with cockle and/or mussel		
Lapwing (Vanellus vanellus)			beds (Oystercatcher and Knot) the trends are for increasing numbers. In		
(Ramsar)			conclusion, it is anticipated that the medium and long-term Strategy		
Little tern (Sternula			proposals will have no adverse impact on the SPA birds.		
albifrons), Breeding					
Marsh Harrier (Circus			Scenario 2 – install rock armour structures (medium-term) and maintain		
aeruginosus), Breeding (SPA)			beach profiles/structures (long-term)		
Oystercatcher (Haematopus			The breeding birds in The Wash SPA will not be affected by the medium and		
ostralegus), Non-breeding			long-term proposals as common terns nest at Freiston and Frampton, and		
Pink-footed goose (Anser			there are no established little tern colonies on The Wash south of Gibraltar		
brachyrhynchus), Non-			Point (although there is a potential for changes to feeding habitat).		
breeding					
Pintail (Anas acuta), Non-			In addition to the impacts highlighted under beach nourishment above, the		
breeding			introduction of rock armour structures (and possible provision of new		
Redshank (Tringa totanus),			defences/embankments in Zone A) has potential to reduce the volumes of		
Non-breeding			sand lost downdrift and the supply of sand to the habitats around The Wash,		
Ringed plover (Charadrius			which has the potential to affect the non-breeding birds. However, the new		
hiaticula), Non-breeding,			structures would only be implemented if it could be demonstrated that they		
migratory (SPA/Ramsar)			will not adversely reduce the supply of sand to The Wash. Consequently, it is		
Shelduck (Tadorna tadorna),			unlikely that there would be any impacts on the dynamic nature of the		
Non-breeding			SPA/Ramsar site, and is unlikely to affect the availability of feeding, roosting		
Waterbird assemblage, Non-			and nesting habitat for the non-breeding birds. There does however		
breeding			remain an element of uncertainty that will require future monitoring.		
Whooper Swan (Cygnus					
Cygnus), Wintering (SPA)					
Wigeon (Anas penelope),					
Non-breeding					

Table 9. Assessment for Inner Dowsing, Race Bank and North Ridge SAC habitat features.

Qualifying Feature	Predicted Risk	Potential Impact on Conservation Objective	Will scale of impact lead to adverse effect on integrity of the site alone?	Will scale of impact lead to adverse effect on integrity of the site in combination?	Can adverse effects be avoided or mitigated?
Inner Dowsing, Race Ban	k and North Ridge SAC				
Reefs (Sabellaria spinulosa)	Increase or decrease in volumes of downdrift material indirectly affecting the habitat. (medium and long-term risk)	Reduction in extent and/or distribution of reefs.	No in medium and long-term (Scenario 1) Uncertain in medium and long-term (Scenario 2) Scenario 1 – continue to maintain open beach (medium and long-term) Predicted sea level rise and associated requirements to increase the beach profile and crest will increase volumes of material required as well as alter geomorphological processes and sediment dispersal. The current status of <i>Sabellaria</i> reefs suggest that they are widespread and comprise core areas as well as more ephemeral locations. Given their extent and distribution it is unlikely that sediment supply from the nourishment areas is either contributing to their formation or maintenance, or having any adverse effect through smothering. It is therefore considered unlikely that the effects of carrying out beach nourishment would lead to a reduction in extent and/or distribution of <i>Sabellaria</i> reefs – no adverse effect on the integrity of the site. In the medium and long term, it is assumed that the sourcing of increasing volumes of beach nourishment material may potentially affect the reefs, which would require further consideration once the source of the material has been identified. It is assumed that the site of sourced material would either require licensing or be from an already licensed site that has been subject to both Environmental Impact Assessment and HRA and is therefore not considered further in this assessment. Scenario 2 – install rock armour structures (medium-term) and maintain beach profiles/structures (long-term) In addition to the impacts highlighted under beach nourishment above, the introduction of rock armour structures (and possible provision of new defences/embankments in Zone A) has potential to reduce the volumes of sand lost downdrift and offshore and the supply of sand to the reef habitats. There does remain an element of uncertainty that will require future monitoring and review, and Scheme level HRA (once the location, scale and nature of any new structures is known).	Uncertain in medium and long-term The Triton Knoll project identifies potential for some indirect effects on this SAC through increased suspended sediment concentrations during construction, which although are not considered adverse as the sediment will be dispersed quickly, could have in-combination impacts with the beach nourishment activities, if not timed appropriately, as well as any impacts associated with Scenario 2, which will require further monitoring and review.	 Short-term - N/A Medium to long-term - yes Any in-combination effects with the Triton Knoll development can be avoided through continued consultation with the Triton Knoll developers to ensure nourishment and beach activities are not undertaken at the same time as the foundation installation of the windfarm. A more detailed scheme-level HRA will be undertaken in consultation with Natural England should Scenario 2 be progressed, which will more precisely describe the potential effects of the works in the medium and long-term, together with project level mitigation measures, when specific details of the location, scale and nature of any upgrading works associated with Scenario 2 are known.

8. Stage 2 Habitats Regulations Assessment summary

This assessment has been carried out considering the likely effects of the implementation of the proposals identified in the draft Strategy, either alone and/or in-combination, on the site integrity of seven European sites:

- Saltfleetby-Theddlethorpe Dunes and Gibraltar Point Dunes SAC
- Gibraltar Point Ramsar site
- Gibraltar Point SPA
- The Wash and North Norfolk Coast SAC
- The Wash Ramsar site
- The Wash SPA
- Inner Dowsing, Race Bank and North Ridge SAC

Based on our current understanding of the Strategy proposals and our knowledge of the European sites within and adjacent to the Strategy area, it is concluded that with the implementation of appropriate mitigation and monitoring (together with flexibility in the design of future medium and long-term schemes), the Strategy will not adversely affect the integrity of any European sites. Although this conclusion remains valid through all epochs, in the medium to long term, there is an increasing residual uncertainty as to how the dynamic coastline and marine environment will change in response to climate change (e.g. sea level rise), which will require continued monitoring and review.

In the **short term (2021-2025)**, the present physical and environmental monitoring regime undertaken for the LBM project will be continued, to monitor the effects of the ongoing and proposed programme of annual beach nourishment and provide a continuous historical baseline dataset. The scope and results of this monitoring programme will continue to be reviewed annually through the submission of an Annual Report to the MMO (this is a condition of the current marine licence) who in turn formally consult on the report with statutory bodies (e.g. Natural England, Eastern IFCA, CEFAS). The report is also issued directly to the Lincolnshire Wildlife Trust for information and comment. This annual monitoring programme (details of which are included in the Annual Monitoring Report¹²) comprises:

- Annual beach profile monitoring (undertaken each year to identify where beach levels have reduced and require nourishment and provides valuable data regarding shoreline dynamics).
- Environmental monitoring:
 - particle size analysis assessing the range, size and distribution of sediments and their associated physical and chemical properties.
 - marine benthic invertebrates e.g. intertidal invertebrates living within beach sediments and subtidal epifaunal invertebrates.
- Review of available fish/shellfish data: cockle stock estimates.

Potential changes to this monitoring regime may also be required for the proposed annual beach nourishment works in the short term. These may arise from project level HRA and assent from Natural England and any new conditions imposed by the MMO for the future marine licence; the scope of which cannot yet be identified.

In preparing for works in the **medium to long-term (2026 onwards)**, a detailed programme of monitoring and modelling (computational, physical and environment) will be required to

¹² Cesar CP and Peaty S (2018) Lincshore 2010-2017 Environmental Annual Monitoring Report: 2017. Prepared by the Estuarine & Coastal Monitoring & Assessment Service, Environment Agency

understand, as far as possible, any changes to the European sites that may arise from the proposed scenarios, focusing on the predicted movement/losses of material downdrift, and on mitigation or management measures required to avoid adverse effects on integrity of the sites. In particular, the introduction of beach control structures and associated changes to the present management regime, will need to be extensively tested prior to implementation by means of modelling and assessment. Structures will also be introduced on a phased basis, using trials (where appropriate), continued monitoring and review. This will ensure that the location, position and dimensions of any introduced structures will be optimised and tested to ensure that these provide the required function before wider scale implementation.

Key to this will be the initial development of a <u>Strategic Monitoring and Mitigation Action Plan</u>, prior to Strategy implementation, building on the existing LBM monitoring regime (see above), to identify the actions needed to avoid/manage any adverse effects that could be attributable to the implementation of the Strategy either alone or in combination with other plans and projects. This Action Plan will be developed and then implemented <u>at the outset of the strategy implementation</u> (i.e. whilst the short-term proposals are being implemented and prior to any changes from the present management regime).

The scope and detail of this Plan will be developed and agreed with Natural England and other key statutory bodies and stakeholders (e.g. Eastern IFCA, CEFAS, Lincolnshire Wildlife Trust). This Plan will include a process for review and appropriate intervention and/or design changes (e.g. refinements to sediment sampling strategies, implementation of alternative and possibly 'softer' design approaches and variations in the standard of protection provided) if required. Triggers or an early warning system will be agreed with Natural England to instigate change if levels are reached that require action. These triggers will be regularly reviewed (and updated if needed) through an iterative approach in response to the analysis of ongoing monitoring and observed changes. The Plan will outline existing available data, ongoing and future monitoring required to understand coastal change, together with monitoring frequency, timescales and responsibility, triggers for change and recommendations. It should be recognised that it will take time to build datasets from new monitoring that enable long-term trends and changes to be identified.

Key components of, and recommendations within this Plan will include (for both/either scenario, as applicable):

- Assessment, review and, if required, surveys to define an <u>accepted (by statutory bodies)</u> <u>baseline</u> against which future impacts can be assessed. This would entail:
 - A review of existing available information such as: shoreline behaviour analysis (CH2M, 2018); Lincshore/LBM annual environmental monitoring data (e.g. Cesar and Peaty (2018); Environment Agency national monitoring programme; Water Framework Directive monitoring data; and existing biological monitoring/surveys undertaken/held by third parties (e.g. Lincolnshire Wildlife Trust, Natural England, Eastern IFCA) – such as breeding bird data from annual monitoring by the wardens at Gibraltar Point, particularly with respect to little tern numbers and productivity.
 - A gap analysis to identify the need for new/adapted <u>environmental surveys or</u> <u>studies/analyses</u> that should be undertaken prior to implementation to provide a complete baseline and build on existing datasets. Examples could include, subject to the initial gap analysis:
 - Improve monitoring frequency and extent (coverage) south of Skegness to Gibraltar spit, to reduce spatial uncertainty through use of LIDAR or detailed survey (e.g. quad bike mounted GPS) rather than just single profile measurements. This would enable volume changes to be properly measured.

- Improve coverage of area below Mean Low Water through use of bathymetric data, profile measurements from jet skis etc.
- Improve understanding of changes in extent and distribution of qualifying habitats through survey of saltmarsh and dune slack topography.
- Improve understanding of changes in sediment composition in the Wash (and associated impacts on qualifying features) by sediment sampling, with consideration of non-invasive techniques.
- Review of any monitoring data available to improve understanding of little terns preferred nesting sites.
- Due to the uncertainty regarding the fate of material within the nearshore zone at the mouth of The Wash, consider the use of more sophisticated monitoring (for example: sediment tracer or sediment fingerprinting studies; bathymetric monitoring of the banks). The results of the monitoring could then be used to feed into the development of sediment transport models.
- A programme of <u>strategic level monitoring and modelling</u> (together with proposed improvements to sediment transport models) to better understand geomorphological changes, sediment dynamics along the coastline, and the continued evolution of the features and associated habitat, including the ness. The improved monitoring would continue to cover the nourishment beaches themselves and dunes, as well as areas to the immediate north and south. Particular focus would be required on the area south of Skegness through to Gibraltar Point, together with furthering our understanding of how the control structures would impact the supply of sediments. The results would help inform future design and management decisions including scheme level HRA(s) and inform the placement of nourishment material and the volumes required to ensure that the beaches are neither over-nourished nor under-nourished.
- A process for the <u>design</u>, <u>modelling and monitoring of any new structures</u> associated with Scenario 2 (if implemented) to consider the impact on longshore and cross-shore sediment transport, interaction with tidal currents, and potential consequences for downdrift areas. This would include an iterative review process to enable changes to design/implementation to be undertaken, should adverse changes (relative to defined trigger levels/parameters) occur.
- Use of the above monitoring, modelling and analysis to inform the <u>assessment of impacts</u> (from either scenario) on key receptors (i.e. designated features/supporting habitat) and identification of any required mitigation actions. This include consideration of:
 - Dune and saltmarsh habitats within the Saltfleetby to Theddlethorpe Dunes and Gibraltar Point SAC, and Gibraltar Point Ramsar site;
 - Grey plover, sanderling, bar-tailed godwit, little tern, dark-bellied brent geese and knot within the Gibraltar Point SPA and Ramsar site;
 - Mudflats and sandflats not covered by seawater, reefs (*Sabellaria spinulosa*) and sandbanks within The Wash and North Norfolk Coast SAC;
 - \circ $\,$ Non-breeding birds within The Wash SPA/Ramsar site;
 - Reefs (*Sabellaria spinulosa*) within the Inner Dowsing, Race Bank and North Ridge SAC.

Any works arising from the Strategy will also be subject to project level EIA including WFD assessment, HRA assent from Natural England to support future marine licences from the MMO, or planning consents from East Lindsey District Council. In addition, any reviews of the Strategy itself will also be subject to strategic-level HRA requiring approval from Natural England. It is acknowledged that implementation of any proposed works arising from the strategy implementation will not be possible without these approvals.

The project level HRA(s) will more precisely describe the potential effects of any works proposed (for Scenario 1 or 2) in the medium and long-term, given our improved knowledge resulting from the monitoring and modelling work undertaken to inform the technical feasibility of options. The HRA will also describe the project level mitigation measures (e.g. appropriate timing of any works to avoid periods of key bird usage in identified locations), when specific details of the location, scale and nature of any upgrading works are known. The scheme level HRA(s) will consider the incombination effects with the Triton Knoll project and The Wash SMP2, plus any additional projects/plans that are relevant at the time of preparation.

References

APEM (2013) Analysis of invertebrate communities and sediment composition of the subtidal sandbanks of The Wash and North Norfolk Coast

Blott S. J. and Pye K. (2004) *Morphological and sedimentological changes on an artificially nourished beach, Lincolnshire*. Journal of Coastal Research 20 (1), Winter 2004. p 214-233.

Cesar CP and Peaty S (2018) Lincshore 2010-2017 Environmental Annual Monitoring Report: 2017. Prepared by the Estuarine & Coastal Monitoring & Assessment Service, Environment Agency.

CH2M (now JACOBS) (2018) Saltfleet to Gibraltar Point Strategy: Shoreline behaviour and response to inform strategy option appraisal. Technical note.

Cook, A.S.C.P., Barimore, C., Holt, C.A., Read, W.J. and Austin, G.E. (2013). *Wetland Bird Survey Alerts 2009/2010: Changes in numbers of wintering waterbirds in the Constituent Countries of the United Kingdom, Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs)*. BTO Research Report 641. BTO, Thetford. <u>http://www.bto.org/volunteer-surveys/webs/publications/webs-annual-report</u>

Emu (2012) Review of relationship between Lincshore Beach Nourishment Scheme and The North Wash Approach. Report for Royal Haskoning, July 2012. pp. 26.

English Nature (2001) *Sabellaria spinulosa* reef in The Wash and North Norfolk cSAC and its approaches. Report Number 544

King C.A.M and May V.J (2003) Volume 28. Coastal geomorphology of Great Britain. Chapter 8: Sand spits and tombolos – GCR site reports. Site: Gibraltar Point (GCR ID 1890) JNCC 1980 – 2007.

Ospar Commission (2013). Background document on Sabellaria spinulosa reefs

Roberts, G., Edwards, N., Neachtain, A., Richardson, H. & Watt, C. (2016). Core reef approach to *Sabellaria spinulosa* reef management in The Wash and North Norfolk Coast SAC and The Wash approaches. *Natural England Research Reports, Number 065* <u>http://publications.naturalengland.org.uk/publication/5970080978960384</u>

General descriptions for Special Areas of Conservation features and Special Protection Area supporting habitats.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/520290/SACfeature-descriptions.pdf

Advice

Environment Agency internal advice and consultation

Natural England advice

Meeting to discuss draft assessment of likely significant effect, 27th November 2017 (notes in Annex 1).

Third party advice

None.

Decision

• Issue the PPP

Name of Environment Agency officer:	Josh Ystenes
Job title:	Senior Environmental Project manager
Date:	31/07/2018

This appropriate assessment has been sent to Natural England for consultation.

Date sent to Natural England:	31/07/2018
Date response received from Natural England:	

Natural England comments:

Natural England advise:

Natural England received the Appropriate Assessment and screening assessment on 31/07/18 following a number of meetings and discussions between EA and NE staff to discuss the progress and content of the HRA. We note that Natural England's comments made at the meeting of 27/11/2017 have been considered in both documents. In addition the subsequent questions raised in our email of 15/08/18 have now been addressed.

We can therefore confirm that Natural England has been fully engaged in the HRA process and we are satisfied that the documents follow appropriate methodology and are in accordance with the Conservation of Habitats and Species Regulations 2017 (the 'Habitats Regulations').

• that the operation can go ahead

Name of Natural England officer:	Roslyn Deeming
Job title:	Lead Adviser
Date:	10/12/18

Final appropriate assessment record

This is a record of the appropriate assessment required by Regulation 61 of the Conservation of Habitats and Species Regulations 2010 (SI No. 2010/490), undertaken by the Environment Agency.

The Stage 1 assessment concluded that the PPP would be likely to have a significant effect on the following site(s):

• See Chapter 2

An appropriate assessment has been undertaken of the implications of the proposal in view of the site's conservation objectives.

The Environment Agency concluded that the PPP would not have an adverse effect on the integrity of the following site(s), either alone or in combination with other plans and projects:

• See Chapter 7

Natural England were consulted on the appropriate assessment and the Environment Agency's conclusions on 31/07/2018 and their representations, to which the Environment Agency has had regard, are highlighted above. The conclusions of this appropriate assessment are in accordance with the advice and recommendations of Natural England.

Name of Environment Agency officer:	Josh Ystenes
Job title:	Senior Environmental Project Manager
Date:	10/12/18

Annex 1 - Record of meeting with Natural England, 27/11/17



Record of Discussion

Meeting Date: 27/11/2017

Project: Saltfleet to Gibraltar Point Strategy Review – DAS Meeting

Location: Kingfisher House, Peterborough, PE2 5ZR

Present

Josh Ystenes	Senior Environmental Project Manager (EA)
Andrew Rouse	Projective Executive (EA)
Sarah Soffe	Environmental Project Manager (EA)
Jeremy Halls	Ecologist (CH2M)
Marcello Cali	Principal Engineer (CH2M)
Andy Millar	Senior Coastal Adviser (Natural England)
Delphine Suty	Responsible Officer (Natural England)
Rachael Oman	Marine Adviser (Natural England)

Record of Discussion and Actions

- 1. Possibility that the use of shingle may have to be subject to public consultation, although it is not expected to be a preferred Strategy option; on this basis, the HRA will continue to evaluate nourishment with sand only.
- 2. Inner Dowsing, Race Bank and North Ridge Offshore SCI is now a designated SAC [JH to amend HR01].
- Good Practice Guidance on Extraction of Aggregates by Dredging recently published by British Marine Aggregates Produces Association and Crown Estate (*NB Consenting for source sites is undertaken by the contractor and does not form part* of the Strategy HRA as locations and quantities will change over time). <u>http://www.bmapa.org/documents/BMAPA_TCE_Good_Practice_Guidance_04_201</u> <u>7.pdf</u>
- 4. Updated version of Shoreline Behaviour Report is being produced by Helen Jay as part of the Strategy SEA.
- 5. Installation of any control structures (Scenario 2 for medium and long term) would likely be trialled on a smaller scale (perhaps three or four structures), and monitored before being adopted along the entire frontage [currently no appropriate models or historic modelling available to assist in predicting what the possible effects might be].
- 6. Need to acknowledge uncertainty of likely effects, timescales over which they may occur, and need for intervention (especially for medium and long term). Deal with this through the adoption of an Action Plan, as per the SMP, to include provision for research, ongoing monitoring and modification of mitigation measures if required.

- 7. NE is commissioning a survey of wader roosts and a review of WeBS count data along the Wash (update of BTO Research Report 578, 2011), including sectors below Gibraltar Point. The outputs won't be available for the Strategy HRA but will be available to inform future reviews / project level assessments.
- 8. Humber Estuary SAC Grey seals are migrating south from Donna Nook which is now nearing capacity. Need to check whether there is any use of functional habitat in Zones A or B by seals, or likelihood of animals moving here in the future. [RO to provide any information that NE has; JH to contact Lincs Wildlife Trust].
- 9. Gibraltar Point Erosion of foredune and saltmarsh habitats associated with the realignment of Greenshank Creek since c.2010 regarded as a natural process and that part of the site (unit 2 foreshore) remains in favourable condition, so no LSE attributable to the current Lincshore campaign or Strategy proposals.
- Gibraltar Point Consideration of establishing full connectivity of the intertidal areas to the freshwater marsh (through to the Golf Club). Modelling currently being undertaken by HR Wallingford.
- 11. Gibraltar Point Recent invertebrate surveys indicate that those found within the saltmarsh areas are generalists, whilst there are some specialists associated with the sea buckthorn dunes. RDB invertebrates are included in the Ramsar designation but no anticipated effects.
- 12. Gibraltar Point conclusions for breeding Little Terns from previous HRA still valid for short-term i.e. no adverse effect.
- 13. Wash and North Norfolk Coast SAC reports and maps showing haul-out sites for Harbour (Common) Seal are available. **[RO to supply].**
- 14. Inner Dowsing, Race bank and North Ridge SAC Sabellaria reefs are widespread and although there are some 'permanent' locations, many are ephemeral and can occur anywhere where conditions are favourable to colonisation. Possible impacts of sinker line have been considered within the Lincshore HRA. Proposed beach control structures would not extend into areas where *Sabellaria* could occur, so any potential impact limited to indirect effects caused by sediment **[RO to supply latest distribution map].**



Saltfleet to Gibraltar Point Strategy (SGPS): Water Framework Directive (WFD) assessment

PREPARED FOR:	Josh Ystenes, Environment Agency
COPY TO:	Angela Scott, Environment Agency
PREPARED BY:	Rebecca Westlake, Helen Jay
DATE:	April 11, 2019
PROJECT NUMBER:	ENVIMAN002226
REVISION NO.:	2.1
CHECKED BY:	Judith Cudden
APPROVED BY:	Marcello Cali

1.0 Purpose and content of this report

This Water Framework Directive (WFD) assessment report has been prepared for the Saltfleet to Gibraltar Point Coastal Flood Risk Management Strategy (SGPS) (referred to as the "strategy") and presents the appraisal of the proposed schemes at a strategic level, in compliance with the Directive requirements. It should be read in conjunction with the SGPS Strategic Environment Assessment (SEA) Environmental Report (ER).

This report sets out the results of the WFD assessment of the proposed strategy; identifying potential effects on water bodies within the strategy area, and providing a statement of compliance with the WFD objectives or identifying the need for an exemption test under Article 4.7.

The content of this report has been prepared in accordance with the requirements of the Directive and is structured in the following sections:

- Section 1 Purpose and content (this section).
- Section 2 Background defines the study area and sets out the context and intention of this WFD assessment.
- Section 3 Assessment methodology outlines the data used and explains the various steps in the WFD appraisal process.
- Section 4 The proposed strategy explains the two principal options/scenarios being considered as part of the strategy proposals.
- Section 5 WFD assessment discusses the appraisal process step by step, including screening, detailed assessment, compliance with WFD objectives and requirement for an exemption test under Article 4.7.
- Section 6 Summary and conclusions provides a summary of key conclusions.

2.0 Background

2.1 The study area

The strategy area, as shown in Figure 1, comprises over 37 km of the Lincolnshire coast between Saltfleet and Gibraltar Point and the low-lying Lincolnshire coastal floodplain extending up to 15 km inland and approximately 5 km offshore. The strategy area is further sub-divided into three zones (A-C) based on the level of historic intervention: Zone A - Northern area: Saltfleet to Theddlethorpe (Meers Bank) (8 km); Zone B - Central area: Mablethorpe (Meers Bank) to Skegness (Lifeboat Avenue) (26 km); and Zone C - Southern area: Skegness (Lifeboat Avenue) to Gibraltar Point (4 km).



Figure 1. The strategy area, which extends from Saltfleet to Gibraltar Point and the three zones (A to C) referred to in the strategy.

The strategy is seeking to identify a sustainable approach to flood risk management along the coast within the strategy area for a 100-year timeframe. Since the early 1990s, tidal flood risk has been managed along the strategy coastline between Mablethorpe and Skegness with an annual programme

of beach nourishment to provide protection to the existing seawalls and banks – the 'Lincshore' scheme; since renamed the Lincolnshire Beach Management (LBM) scheme. This initial strategy, subsequent periodic strategy reviews and annual Lincshore/LBM schemes have required various consents and approvals, through which consideration of the water environment has been made. This includes, most recently, the Environmental Impact Assessment (EIA) prepared in support of the marine licence application for the LBM scheme covering the period 2016 to 2020.

The existing coastal defences and annual beach nourishment scheme in the strategy area reduce flood risk to approximately 22,000 properties¹ (20,000 residential and 1,700 commercial) (based on a flood with a 0.5% chance of occurring in any given year) and approximately 24,500 caravans, as well as key infrastructure, tourism assets, recreational amenities and agricultural land. Without these structures, these assets would regularly be at significant risk from flooding.

2.2 Legislation, policy and guidance

The European Water Framework Directive (WFD)² was passed into UK legislation in 2003 and is currently transposed in England as the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (SI 407/2017). Its aim is to protect and improve the water environment.

The WFD requires that Environmental Objectives (see Table 1) are set for all surface waters and groundwater. Overall status is a composite measure that looks at different quality elements: a water body must be of good or better ecological status, and good (pass) chemical status assessment to be given a good overall status. The WFD specifies the quality elements that are used to assess the ecological, chemical and hydromorphological status of a water body. For each River Basin District (RBD), a River Basin Management Plan (RBMP) outlines the actions required to enable natural water bodies to achieve this.

The WFD recognises that some water bodies, those considered Heavily Modified Water Bodies (HMWB) or Artificial Water Bodies (AWB), may be prevented from reaching good ecological status (GES) by the physical modifications for which they are designated or purpose for which they were constructed (e.g. navigation, flood defence, urbanisation). In these cases, the aim is to achieve good ecological potential (GEP), through implementation of a series of mitigation measures outlined in the applicable RBMP (and in some cases updated since the publication of the RBMP). These measures are to mitigate impacts that have been or are being caused by human activity and to enhance and restore the quality of the existing environment and prevent further deterioration.

There are four key reasons for considering the WFD at a strategic level during the development of a coastal flood risk management strategy:

- 1. To maximise the linkages with the RBMPs and the contribution of flood risk management to delivering their requirements.
- 2. To include and consider alternatives that would not result in significant adverse impacts on the water environment and avoid narrowing down alternatives to a selection that would compromise any Article 4.7 consideration at project level.
- 3. To include, wherever possible, mitigation, opportunities or enhancements that could contribute to the achievement of good status or potential.
- 4. To clarify the reasons for the modification and whether they are of overriding public interest or benefit to the environment, human health, human safety or sustainable development.

 $^{^1}$ Based on 2009 property counts, assuming that subsequent new developments are sufficient in terms of their own flood mitigation provision.

² Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

Table 1. WFD Environmental Objectives

WFD Environmental Objectives (modified from Article 4.1 of the Directive 2000/60/EC- as consolidated in 2014)

(a) For surface waters

Member States shall implement the necessary measures to prevent deterioration of the status of all bodies of surface water.

Member States shall protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (iii) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status by 2015.

Member States shall protect and enhance all artificial and heavily modified bodies of water, with the aim of achieving good ecological potential and good surface water chemical status by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027.

Member States shall implement the necessary measures to progressively reduce pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances.

(b) For groundwater

Member States shall implement the measures necessary to prevent or limit the input of pollutants into groundwater and to prevent the deterioration of the status of all bodies of groundwater.

Member States shall protect, enhance and restore all bodies of groundwater, ensure a balance between abstraction and recharge of groundwater with the aim of achieving good groundwater status by 2015, subject to application of determined extensions

Member States shall implement the measures necessary to reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order progressively to reduce pollution of groundwater.

(c) For protected areas

Member States shall achieve compliance with any standards and objectives at the latest by 2015, unless specified in Community legislation under which the individual protected areas have been established.

3.0 Assessment methodology

The scope of this WFD assessment is to appraise the proposals recommended in the draft Saltfleet to Gibraltar Point strategy to ensure that these are compliant with the objectives of the WFD (i.e. to prevent deterioration and failure to improve) and where possible support WFD mitigation measures to improve the status of a water body. Only strategic changes related to scheme option delivery that are likely to have long term effects at the water body level are considered. Scheme level impacts relating to construction (e.g. pollution incidents) and routine maintenance activities (e.g. minor repairs) will be appraised at the project level when the methods of construction and maintenance are known.

This strategy relates to the physical management of the shoreline and is not anticipated to release any priority substances, priority hazardous substances or other pollutants. Therefore, water body chemical status is scoped out of this assessment. Similarly, chemical elements supporting ecological status (specific pollutants and other substances) are also scoped out of this assessment.

The assessment has therefore focused on (1) identifying possible long term and permanent effects on water bodies which would result in deterioration in status to prevent the improvement of a failing water body and (2) considering potential improvements or mitigation measures to maintain or achieve GES/GEP.

This assessment follows the steps outlined in Table 2), with consideration of the Clearing the Waters for All guidance (Environment Agency 2017). Implementation of the strategy will require further assessment at scheme development stage, therefore this assessment represents a preliminary appraisal involving steps 1 to 3, although commentary is provided on mitigation measures that might be considered at subsequent scheme development stage and whether the strategy proposals are likely to result in any schemes which could require Article 4.7 tests in the future.

Table 2. Eight step process for WFD assessment

Screening and Scoping

Step 1: collate water body baseline data. All surface water bodies within or adjoining the strategy area have been identified, using the Environment Agency's on-line Catchment Data Explorer. Based on expert-judgement, decisions have been made on which water bodies can be scoped out of further appraisal. This is reported in Section 5.

Step 2: collate strategy baseline data. A summary of the proposed strategy is provided in Section 4. Further details on the options appraisal process and the selection of the preferred strategic options for the strategy are provided in the SEA Environmental Report and are not repeated in detail within this report.

Impact assessment

Step 3: preliminary assessment. This assessment is the preliminary WFD assessment for the proposed actions to determine whether any might conflict with the WFD objectives. This is reported in Section 5.

Step 4: design and options appraisal. This assessment identifies where WFD objectives may need to be considered during future implementation of the strategy, including identification of any mitigation measures that might be needed at subsequent scheme development stage.

Step 5: detailed impact assessment. This step relates to the detailed design stage of a scheme, rather than to high level assessment of a strategy, so has not yet been undertaken.

Step 6: Article 4.7 tests. Again, this step relates to the detailed design stage of a scheme; however, this report does identify whether any strategy proposals are likely to result in any schemes which could require such an assessment in the future.

Step 7: reporting. This report summarises this WFD preliminary assessment and will form an appendix to the SEA Environmental Report. Further reporting will be required at subsequent design stages.

Step 8: post-project appraisal work. This relates to the delivery of future schemes following implementation of the strategy.

4.0 The proposed strategy

Development of the strategy was a staged and iterative process and is described in detail in the draft Strategy and SEA Environmental Report.

This assessment considers the potential effects of the proposals recommended in the strategy to sustain the present standard of flood risk management in line with predicted sea level rise in the short (0 to 5 years, nominally up to 2025), medium (6 to 35 years, nominally 2026 to 2055) and long term (36 to 100 years, nominally 2056 to 2120).

Although the proposed strategy sets out a clear direction and proposed change in approach in the medium to long term, there remains inherent uncertainty regarding the type and timing of actions that will be taken to implement the strategy depending on the availability of funding, future climate change and other triggers. To address this, the WFD assessment of the strategy proposals considers two reasonable scenarios in the medium and long term to ensure that both potential solutions are assessed.

The proposals assessed in the short term are to continue the present management approach of annual beach nourishment in Zone B - Central area: Mablethorpe (Meers Bank) to Skegness (Lifeboat Avenue) (see Figure 1). For the medium to long term, the assessment considers two potential approaches (scenarios), principally in Zone B: (1) the retention of an open beach and the continuation of the present regime of annual beach nourishment, sustaining the present standard of protection over time in line with predicted sea level rise; or (2) the introduction of a series of rock structures, principally rock and fishtail groynes, along the coast, with limited supplementary beach nourishment activities. Both scenarios are likely to also require the raising and widening of the landward sea defences in the longer term to provide an effective 'backstop' for the higher and wider beach and prevent the movement of sand landward.

Tables A.1 and A.2 in Annex A provide further details of the proposals in the short, medium and long term which form the basis of this WFD assessment.

5.0 WFD Assessment

5.1 Water body baseline data

5.1.1 Water bodies scoped in

Data has principally been extracted from the Environment Agency's Catchment Data Explorer to identify water bodies present within the strategy area and their ID numbers, designation and classification details. The WFD compliance mapping for groundwater risk and status assessment was also reviewed.

The strategy study area is located within the Anglian River Basin District (RBD) and the relevant water body classifications are reported in the Anglian RBMP (Environment Agency, 2015). Within this RBD, the strategy coastline lies within the wider Anglian TraC (Transitional and Coastal) Management Catchment and more specifically within the Lincolnshire TraC Operational Catchment.

A number of water bodies lie within the strategy area but the appraisal has also considered neighbouring coastal/TraC water bodies, as both sediment transport and hydrodynamics operate outside the geographical boundaries to the strategy, as well as fresh water bodies (i.e. riverine) which adjoin the beach and are linked to the coast by outfalls through the sea walls and other coastal defences. The relevant water bodies are shown on Figure 2.

Table 3 lists the water bodies and explains which have been scoped in or out of the assessment and why.

Water body ID	Name of water body in RBMP	Type and hydro- morphological designation	Scoped in?	Reason (for scoping in/out)			
Coastal/TraC (Transitional and Coastal) water bodies							
GB640402492000	Lincolnshire	Coastal (heavily modified)	Yes	The strategy area lies within this water body. Potential effect on biological invertebrates due to loss of habitat under scheme footprint and physical modification of shoreline as a result of the strategy.			
GB640523160000	Wash Outer	Coastal (not designated artificial or heavily modified)	Yes	This area borders the southern boundary of the strategy area but may be affected by the southward transport of nourishment material. Potential effect on fish, invertebrates and macrophytes, sediment quality and quantity, and sensitive habitats.			

Table 3. River, Transitional, Coastal, Lake and Groundwater Water Bodies considered within this assessment

Water body ID	Name of water body in RBMP	Type and hydro- morphological designation	Scoped in?	Reason (for scoping in/out)
GB640503300000	Norfolk North	Coastal (heavily modified)	No	It is considered unlikely that coarser sediment from littoral drift would reach this water body, which lies c. 4 km from the strategy boundary.
GB530503311300	Wash Inner	Transitional (not designated artificial or heavily modified)	Yes	This area lies 19 km to the south of the strategy area but may be affected by the southward transport of nourishment material. Included because of nature of the shoreline, sediment transport, and to assess impacts as a result of coastal transport of nourishment material. Potential effect on fish, invertebrates and macrophytes, and supporting elements.
GB560503316700	Snettisham lagoon complex	Transitional (not designated artificial or heavily modified)	No	Water body status unlikely to be affected by direct impacts of strategy due to distance (22 km) from strategy area boundary.
Freshwater/Riverine	water bodies		•	
GB105029061680	South Dike and Grayfleet Drain	River (heavily modified)	No	Lies within the northern part of the strategy area and unlikely to be affected by strategy proposals due to southward transport of material.
GB105029061660	Great Eau	River (heavily modified)	No	Lies to the north of zone B within the strategy area and unlikely to be affected by strategy due to southward transport of material.
GB105029061640	Trusthorpe Pump Drain (upper end)	River (artificial)	No	Lies to the north of zone B within the strategy area and unlikely to be affected by strategy due to southward transport of material.
GB105029061760	Trusthorpe Pump Drain (lower end)	River (artificial)	Yes	Assessed because of proximity (i.e. within strategy area) – although impacts may be limited due to lack of connectivity between the river water body (which discharges via a pumped outfall) and coastal water body.
				Potential effect on fish and invertebrates, sediment quality and quantity, and sensitive habitats.
GB105029061650	Woldgrift Drain (lower end)	River (artificial)	Yes	Assessed because of proximity (i.e. within strategy area) and to determine if strategy could reduce the risk of high tide inundation and represent an improvement in status.
				Potential effect on fish, phytobenthos and macrophytes and supporting elements.

Water body ID	Name of water body in RBMP	Type and hydro- morphological designation	Scoped in?	Reason (for scoping in/out)
GB105029061740	Boygrift Drain	River (artificial)	Yes	Assessed because of proximity (i.e. within strategy area) – although impacts may be limited due to lack of connectivity between the river water body (which discharges via a pumped outfall) and coastal water body. Potential effect on invertebrates and
				supporting elements.
GB105029061710	Willoughby High Drain	River (artificial)	Yes	Assessed because of proximity (i.e. within strategy area) – although impacts may be limited due to lack of connectivity between the river water body (which discharges via a pumped outfall) and coastal water body.
				Potential effect on fish, invertebrates, phytobenthos and macrophytes, and supporting elements.
GB105029061700	Ingoldmells Main Drain	River (artificial)	Yes	Assessed because of proximity (i.e. within strategy area) – although impacts may be limited due to lack of connectivity between the river water body (which discharges via a pumped outfall) and coastal water body. Potential effect on invertebrates and supporting elements.
GB105029061730	Anderby Main Drain	River (artificial)	Yes	Assessed because of proximity (i.e. within strategy area) – although impacts may be limited due to lack of connectivity between the river water body (which discharges via a pumped outfall) and coastal water body
				supporting elements.
GB105030056440	Cow Bank Drain	River (artificial)	No	Lies south of the nourishment zone, in zone C within strategy area, but may be affected due to downdrift movement of sediment.
				Potential effect on invertebrates, macrophytes and macrophytes and phytobenthos combined, and supporting elements.
Ground water body	1	1	•	1
GB40501G401600	Steeping Long Eau Little Eau Chalk Unit	Ground water body	Yes	Potential saline intrusion risk due to presence within strategy area Potential effect on salinity and chemical status.

Water body ID	Name of water body in RBMP	Type and hydro- morphological designation	Scoped in?	Reason (for scoping in/out)
Lake water body				
GB30533132	Sea Bank Clay Pits	Lake (artificial)	Yes	Artificial lake in close proximity to shoreline (within strategy area), therefore potential risk of saline intrusion through inundation of sea water during storms. Potential effect on salinity and chemical status.

Approximately 8 km to the north of the strategy area (see Figure 2), to the north of Donna Nook, is the Humber Lower transitional water body (GB530402609201) which is covered by the adjacent Humber RBD River Basin District (rather than Anglian RBD, which covers the strategy area). Although it is possible for sediment to be moved north of Zone B, Saltfleet and the area between Saltfleet and Donna Nook are generally sink areas for sediment and significant volumes of sediment are unlikely to be moved any further north. For this reason, it is not anticipated that there would be an impact on the Humber Lower water body and this water body has been screened out from any further analysis as part of this WFD assessment.

5.1.2 Current status and supporting elements

Table 4 presents the current status of the water bodies scoped into this assessment and identifies key biological quality elements and supporting elements. Those elements shown in bold indicate elements that have been identified by the Environment Agency as preventing water bodies from reaching good status/potential. This information has been taken from the Catchment Data Explorer (accessed April 2018).

Water	Type and	Current	Target	Biological	Physico-chemical	Hydromorpholo	Other supporting	Higher sensitivity	Lower
body ID/	Desig-	Status/	Status/	quality elements	elements (and	gical elements	elements	habitats present	sensitivity
Name	nation	potential	Potential	(and status)	status)	(and status)		(where data available)	habitats
		2016 (Cycle 2)							present (where data available)
GB6404024 92000/ Lincoln- shire	Coastal (heavily modified)	Moderate potential	Good by 2027	Angiosperms Invertebrates Phytoplankton (Moderate)	Dissolved inorganic nitrogen Dissolved oxygen (Moderate)	Not assessed	Mitigation measures assessment: Moderate or less	Chalk reefs Saltmarsh	Cobbles, gravel and shingle Intertidal soft sediment Subtidal soft sediment
GB6405231 60000/ Wash Outer	Coastal	Moderate	Moderate by 2015	Angiosperms Invertebrates Phytoplankton Macroalgae (Moderate)	Dissolved inorganic nitrogen Dissolved oxygen (Moderate)	Morphology (Good)	n/a	Chalk reef Mussel beds including blue and horse mussel Polychaete reef Saltmarsh Subtidal kelp beds	Cobbles, gravel and shingle Intertidal soft sediment Rocky shore Subtidal rocky reef Subtidal soft sediment
GB5305033 11300/ Wash Inner	Coastal	Moderate	Moderate by 2015	Angiosperms Invertebrates Phytoplankton Macroalgae (Good)	Dissolved inorganic nitrogen Dissolved oxygen (Moderate)	Morphology (Good)	n/a	Mussel beds including blue and horse mussel Saltmarsh	Intertidal soft sediment Subtidal soft sediment
GB1050290 61760/ Trusthorpe Pump Drain (lower end)	River (artificial)	Good potential	Good by 2025	Fish Invertebrates (Moderate)	(Not assessed)	Hydrological regime (High)	Mitigation measures assessment: Good	-	-

Water body ID/ Name	Type and Desig- nation	Current Status/ potential 2016 (Cycle 2)	Target Status/ Potential	Biological quality elements (and status)	Physico-chemical elements (and status)	Hydromorpholo gical elements (and status)	Other supporting elements	Higher sensitivity habitats present (where data available)	Lower sensitivity habitats present (where data available)
GB1050290 61650/ Woldgrift Drain (lower end)	River (artificial)	Moderate potential	Moderate by 2015	Invertebrates (Moderate)	Dissolved oxygen Ammonia pH Temperature Phosphate (Bad - phosphate)	Hydrological regime (Good)	Mitigation measures assessment: Moderate or less	-	-
GB1050290 61740/ Boygrift Drain	River (artificial)	Moderate potential	Good by 2027	Invertebrates (High)	Dissolved oxygen Ammonia pH Temperature Phosphate (Good)	Hydrological regime (High)	Mitigation measures assessment: Moderate or less	-	-
GB1050290 61710/ Willoughby High Drain	River (artificial)	Moderate potential	Good by 2027	Fish Invertebrates (Moderate)	Dissolved oxygen Ammonia pH Temperature Phosphate (Good)	Hydrological regime (Supports good)	Mitigation measures assessment: Moderate or less	-	-
GB1050290 61700)/ Ingoldmells Main Drain	River (artificial)	Moderate potential	Good by 2027	Invertebrates (Good)	Dissolved oxygen Ammonia pH Temperature Phosphate (Good)	Hydrological regime (High)	Mitigation measures assessment: Moderate or less	-	-

Water body ID/ Name	Type and Desig- nation	Current Status/ potential 2016 (Cycle 2)	Target Status/ Potential	Biological quality elements (and status)	Physico-chemical elements (and status)	Hydromorpholo gical elements (and status)	Other supporting elements	Higher sensitivity habitats present (where data available)	Lower sensitivity habitats present (where data available)
GB1050290 61730/ Anderby Main Drain	River (artificial)	Moderate potential	Good by 2027	Invertebrates (Good)	Dissolved oxygen Ammonia pH Temperature Phosphate (Moderate)	Hydrological regime (Does not support good)	Mitigation measures assessment: Moderate or less	-	-
GB1050300 56440 Cow Bank Drain	River (artificial)	Moderate	Good by 2027	Invertebrates (Moderate)	Dissolved oxygen Ammonia pH Temperature Phosphate (Moderate)	Hydrological regime (Supports good)	Mitigation measures assessment: Good	-	-
GB40501G 401600/ Steeping Long Eau Little Eau Chalk Unit	Ground water body	Poor	Poor by 2015	Not applicable	Not applicable	Not applicable	Quantitative status element: Good	-	-
GB3053313 2/ Sea Bank Clay Pits	Lake (artificial)	Good potential	Good by 2015	Not assessed	Not assessed	Hydrological regime (High)	Expert judgement: Good Mitigation measures assessment: Good	-	-

5.1.3 Protected areas

The proposed strategy and associated future works need to consider the presence of any protected areas within the immediate vicinity. Table 5 identifies the protected areas covered by the water bodies scoped into this appraisal and defines which have been scoped in for further appraisal.

Directive	Water Body	Protected Area	Scoped in?	Reason for scoping in/out	
Bathing Waters Directive	Lincolnshire TraC	Mablethorpe Town	No	All the bathing waters along the study area are currently classified as "Excellent".	
	Lincolnshire TraC	Moggs Eye		The Strategy would not impact directly on	
	Lincolnshire TraC	Sutton-on-Sea		the frequency or location of discharges which could affect Bathing Waters Any	
	Lincolnshire TraC	Anderby		changes to flood risk management options	
	Lincolnshire TraC	Chapel St Leonards		have the potential to affect coastal processes and the movement/suspension of sediment, which presents potential	
	Lincolnshire TraC	Ingoldmells South		risks to water quality; however, in this	
	Lincolnshire TraC	Skegness		suspended sediment are high. Neither the	
	The Wash TraC	Heacham		strategy proposals nor the post-	
	The Wash TraC	Hunstanton Main Beach		to have a long-term impact on bathing water quality.	
	The Wash TraC	Hunstanton (Old Hunstanton)		Therefore, the Bathing Waters Directive has been scoped out of any further assessment.	
Conservation of	Lincolnshire TraC	Humber Estuary	Yes	There is potential for change in supporting	
Wild Birds Directive	Lincolnshire TraC, The Wash TraC	Gibraltar Point		habitats and breeding grounds along the coastline as a result of any changes from	
	The Wash TraC, Wash Inner	The Wash		the present approach of beach nourishment. Many of these changes are likely to occur outside of the immediate	
	The Wash TraC	North Norfolk Coast		strategy area as a result of wider interactions with The Wash and the open coast offshore.	
Drinking Water Protected Area	Steeping Long Eau Little Eau Chalk Unit	Steeping Long Eau Little Eau Chalk Unit	Yes	The proximity of the water body to the coast means there is a risk of saline intrusion which would affect water quality.	
Habitats and	Lincolnshire TraC	Humber Estuary	Yes	There is potential for habitat change along	
Species Directive	Lincolnshire TraC, The Wash TraC	Saltfleetby- Theddlethorpe Dunes & Gibraltar Point		the coastline as a result of any changes from the present approach of beach nourishment. Many of these changes are likely to occur outside of the immediate	
	Lincolnshire TraC, The	The Wash &		strategy area as a result of wider	
	Wash TraC, Wash Inner	North Norfolk Coast		interactions with The Wash and the open coast offshore.	
	The Wash TraC	North Norfolk Coast			
Nitrates Directive	The Wash TraC, Wash Inner, Anderby Main Drain, Boygrift Drain, Ingoldmells Main Drain, Willoughby High Drain, Woldgrift Drain, Trusthorpe Pump Drain	Various	No	The hinterland within the Strategy area is designated as a surface water Nitrate Vulnerable Zone, i.e. areas of land that drain into a freshwater water body which has, or could have if action is not taken, a nitrate concentration greater than 50 mg/l. Pollution is, however, from rural	

Directive	Water Body	Protected Area	Scoped in?	Reason for scoping in/out
	(lower end), Cow Bank Drain, Steeping Long Eau Little Eau Chalk Unit, Sea Bank Clay Pits			areas and unlikely to be affected by the strategy
Shellfish Water Directive	The Wash TraC The Wash TraC, Wash Inner The Wash TraC, Wash Inner	North East Wash South East Wash West Wash	Yes	Changes in coastal processes, as a result of management activities, can cause sedimentation, which has the potential to reduce the water quality for shellfisheries.
Urban Waste Water Treatment Directive	The Wash TraC Wash Inner	River Witham Cut Off and Relief Channel	No	The general objective of the Urban Waste Water Treatment Directive (UWWTD) is to protect the environment from the adverse effects of urban waste water discharges and water discharges from certain industrial sectors. The Strategy is unlikely to affect this.

5.1.4 Mitigation measures

Table 6 sets out the mitigation measures in place for the appraised water bodies as set out in the Anglian RBMP. These are the suite of measures that the Environment Agency has judged are required to meet WFD ecological potential objectives. Heavily modified water bodies are classified in terms of ecological potential and not status.

It should be noted that as the Wash Inner and Wash Outer coastal and the Steeping Long Eau Little Eau Chalk Unit water bodies are not designated as Artificial or Heavily Modified, these do not have mitigation measures, and are not considered in Table 6.

The assessment of ecological potential focuses predominantly on the presence/absence of water body wide mitigation measures.

Consideration has been given as to whether the proposed strategy options could potentially compromise or render proposed mitigation measures ineffective, whether they are already in place or not. An appraisal has also been undertaken to assess whether implementation of the strategy options could deliver mitigation measures that may help the water bodies meet good status / potential. These will require further consideration at subsequent scheme design stage.

Table 6. Mitigation measures that have been defined for water bodies covered in this appraisal

Waterbody ID/	Mitigation Measures (MMs)		Status	Potential for	Can MMs be		
name				strategy options	incorporated		
				to prevent	in strategy		
				MMs?	options?		
GB640402492000/	Habitat creation	48. Indirect mitigation	Not In Place		Y		
Lincolnshire	Operations and maintenance	21. Avoid the need to dredge	Not In Place	Y	Y		
	Operations and maintenance	22. Dredging disposal strategy	Not In Place		Y		
	Operations and maintenance	23. Reduce impact of dredging	Not In Place	Y	Y		
	Operations and maintenance	24. Reduce sediment resuspension	Not In Place	Y	Y		
	Operations and maintenance	25. Re-time dredging or disposal	Not In Place		Y		
	Operations and maintenance	26. Sediment management	Not In Place		Y		

[*Those mitigation measures 'in place' are highlighted in green; and those 'not in place' are highlighted in orange]

Waterbody ID/ name	Mitigation Measures (MMs)		Status	Potential for strategy options to prevent MMs?	Can MMs be incorporated in strategy options?
	Operations and maintenance	27. Dredge disposal site selection	Not In Place		Y
	Operations and maintenance	28. Manage disturbance	Not In Place		Y
	Operations and maintenance	37. Retain habitats	Not In Place	Y	Y
	Structural modification	16. Fish passes	Not In Place		
	Structural modification	19. Enhance ecology	Not In Place		Y
	Structural modification	20. Changes to locks, etc.	Not In Place		
	Working with physical form and function	13. Realign flood defence	Not In Place		
	Working with physical form and function	2. Remove obsolete structure	Not In Place		
	Working with physical form and function	4. Remove or soften hard bank	Not In Place		
	Working with physical form and function	5. Preserve or restore habitats	Not In Place	Y	Y
	Working with physical form	6. In-channel morph	Not In Place		
	Working with physical form and function	7. Bank rehabilitation	Not In Place		
GB105029061760/	Operations and maintenance	33. Selective vegetation	In Place		
Trusthorpe Pump	On a wation of and maximter and	control	In Diaco		
Drain (lower end)	Operations and maintenance	34. Vegetation control			
	Operations and maintenance	timing	In Place		
	Operations and maintenance	39. Maintenance – minimise habitat impact	In Place		
	Operations and maintenance	41. Water level management	In Place		
	Structural modification	19. Enhance ecology	In Place		Y
	Working with physical form and function	5. Preserve or restore habitats	In Place		
	Working with physical form and function	6. In-channel morph diversity	In Place		
GB105029061750/ Woldgrift Drain	Operations and maintenance	33. Selective vegetation control	Not In Place		
	Operations and maintenance	34. Vegetation control	Not In Place		
	Operations and maintenance	35. Vegetation control timing	Not In Place		
	Operations and maintenance	37. Retain habitats	Not In Place		
	Operations and maintenance	39. Maintenance – minimise habitat impact	Not In Place		Y
	Operations and maintenance	40. Maintenance – prevent sediment transfer	Not In Place		Y
	Structural modification	16. Fish passes	Not In Place		Y
	Structural modification	18. Reduce fish entrainment	Not In Place		Y
	Structural modification	19. Enhance ecology	Not In Place		Y
	Working with physical form and function	11. Set-back embankments	Not In Place		
	Working with physical form and function	12. Floodplain connectivity	Not In Place		
	Working with physical form and function	4. Remove or soften hard bank	Not In Place		
	Working with physical form and function	5. Preserve or restore habitats	Not In Place		
	Working with physical form and function	6. In-channel morph diversity	Not In Place		

Waterbody ID/	Mitigation Measures (MMs)		Status	Potential for	Can MMs be
name				to prevent MMs?	in strategy options?
GB105029061720/ Boygrift Drain	Operations and maintenance	33. Selective vegetation control	Not In Place		
	Operations and maintenance	34. Vegetation control	Not In Place		
	Operations and maintenance	35. Vegetation control timing	Not In Place		
	Operations and maintenance	37. Retain habitats	Not In Place		
	Operations and maintenance	39. Maintenance – minimise habitat impact	Not In Place		Y
	Operations and maintenance	40. Maintenance – prevent sediment transfer	Not In Place		Y
	Structural modification	18. Reduce fish entrainment	Not In Place		Y
	Structural modification	19. Enhance ecology	Not In Place		Y
	Working with physical form and function	5. Preserve or restore habitats	Not In Place		
	Working with physical form and function	6. In-channel morph diversity	Not In Place		
GB105029061710/ Willoughby High	Operations and maintenance	33. Selective vegetation control	Not In Place		
Drain	Operations and maintenance	34. Vegetation control	Not In Place		
	Operations and maintenance	35. Vegetation control timing	Not In Place		
	Operations and maintenance	37. Retain habitats	Not In Place		
	Operations and maintenance	39. Maintenance – minimise habitat impact	Not In Place		Y
	Operations and maintenance	40. Maintenance – prevent sediment transfer	Not In Place		Y
	Structural modification	16. Fish passes	Not In Place		Y
	Structural modification	18. Reduce fish entrainment	Not In Place		Y
	Structural modification	19. Enhance ecology	Not In Place		
	Working with physical form and function	11. Set-back embankments	Not In Place		
	Working with physical form and function	12. Floodplain connectivity	Not In Place		
	Working with physical form and function	4. Remove or soften hard bank	Not In Place		
	Working with physical form and function	5. Preserve or restore habitats	Not In Place		
	Working with physical form and function	6. In-channel morph diversity	Not In Place		
GB105029061700/ Ingoldmells Main	Operations and maintenance	33. Selective vegetation control	Not In Place		
Drain	Operations and maintenance	34. Vegetation control	Not In Place		
	Operations and maintenance	35. Vegetation control timing	Not In Place		
	Operations and maintenance	37. Retain habitats	Not In Place		
	Operations and maintenance	39. Maintenance – minimise habitat impact	Not In Place		Y
	Operations and maintenance	40. Maintenance – prevent sediment transfer	Not In Place		Y
	Structural modification	18. Reduce fish entrainment	Not In Place		Y
	Structural modification	19. Enhance ecology	Not In Place		Y
	Working with physical form and function	5. Preserve or restore habitats	Not In Place		
	Working with physical form and function	6. In-channel morph diversity	Not In Place		

Waterbody ID/ name	Mitigation Measures (MMs)		Status	Potential for strategy options to prevent MMs?	Can MMs be incorporated in strategy options?
GB105029061730/ Anderby Main Drain	Operations and maintenance	33. Selective vegetation control	Not In Place		
	Operations and maintenance	34. Vegetation control	Not In Place		
	Operations and maintenance	35. Vegetation control timing	Not In Place		
	Operations and maintenance	37. Retain habitats	Not In Place		
	Operations and maintenance	39. Maintenance – minimise habitat impact	Not In Place		Y
	Operations and maintenance	40. Maintenance – prevent sediment transfer	Not In Place		Y
	Structural modification	18. Reduce fish entrainment	Not In Place		Y
	Structural modification	19. Enhance ecology	Not In Place		Y
	Working with physical form and function	5. Preserve or restore habitats	Not In Place		
	Working with physical form and function	6. In-channel morph diversity	Not In Place		
GB105030056440/ Cow Bank Drain	Operations and maintenance	33. Selective vegetation control	In Place		
	Operations and maintenance	34. Vegetation control	In Place		
	Operations and maintenance	35. Vegetation control timing	In Place		
	Operations and maintenance	36. Invasive species techniques	In Place		
	Operations and maintenance	39. Maintenance – minimise habitat impact	In Place		
	Operations and maintenance	41. Water level management	In Place		Y
	Structural modification	19. Enhance ecology	In Place		
	Working with physical form and function	6. In-channel morph diversity	In Place		

5.2 WFD appraisal

Tables 7 and 8 consider the proposed strategy options in respect to the objectives of the WFD for the scoped-in water bodies.

The focus of this appraisal is to demonstrate:

- The proposed strategy will not result in a deterioration of current surface water or groundwater ecological status or potential (WFD objective 1 WFD1).
- The proposed strategy will not cause failure to meet the surface water GES/GEP by the target timeframe (WFD objective 2 WFD2).
- The proposed strategy will not permanently prevent or compromise the relevant environmental objectives being met in other water bodies (WFD objective 3 WFD3).

As part of appraising the above, the appraisal has considered whether the strategy will negatively impact the delivery of any of the mitigation measures or whether the strategy can include improvement or mitigation measures required to meet good ecological status / potential for those water bodies that are not currently at good status / potential.

Additional mitigation actions have been identified where appropriate.

Table 9 discusses the potential impacts of the strategy proposals on Protected Areas.

Table 7. WFD assessment of strategy proposals: Short term (0 to 5 years)

SHORT TERM (0 to 5 years)							
Open beach with annual beach nourishment							
Water body ID/ Name	Assessment of proposals against WFD objectives	Target WFD status/ potential	Expected contribution to WFD status/potential	WFD1	WFD2	WFD3	Proposed scheme actions
GB640402492000/ Lincolnshire	The strategy will involve introduction of sediment, with associated changes in shoreline erosion/accretion patterns, due to increased volumes of sediment available for transport. Through providing a wider beach the strategy will continue to reduce the risk of erosion and flooding and help prevent the loss of beach habitat that would otherwise occur. Unlikely to affect migration of aquatic organisms. There is potential for an increase in turbidity and suspended sediment concentrations due to the outwashing of fines from the recharge material, although impacts on light and water quality along the coastal frontage and within the coastal waters are however unlikely to be permanent following recharge campaigns. There could however be a wider impact on phytoplankton growth, macrophytes and invertebrates and other aquatic flora as sediment is moved offshore and alongshore, however turbidity concentrations are already high under normal conditions. The scheme will take account of monitoring data to inform volumes and timing of nourishment required in line with mitigation measures related to sediment management and dredging activities.	Good by 2027	No change in potential	Y	Y	Y	Continue measures to reduce release of fines during recharge (scheme level) Continue to use monitoring data to inform nourishment needs
GB640523160000/ Wash Outer	There is potential that the movement of nourishment material southwards could have a wider scale impact on nearshore banks and channel within the Wash, which in turn could affect the flow of water in these areas, but natural influx of sediment is much larger than the potential input of suspended sediments that could be released from the nourishment works. No change in water quality in terms of chemical composition is anticipated.	Moderate by 2015	No change in status	Y	Y	Y	Continue measures to reduce release of fines during recharge (scheme level)

	Subtidal habitats and features within the areas covered by this water body have the potential to continue to be directly and/or indirectly affected by the beach nourishment activities.						
GB530503311300/ Wash Inner	As for the Wash Outer, there is potential that the movement of nourishment material southwards could have a wider scale impact on nearshore banks and channel within the Wash. This in turn could affect the flow of water in these areas, but natural influx of sediment is much larger than the potential input of suspended sediments that could be released from the nourishment works. No change in water quality in terms of chemical composition is anticipated.	Moderate by 2015	No change in potential	Y	Y	Y	Continue measures to reduce release of fines during recharge (scheme level)
	Intertidal and subtidal habitats and features within the areas covered by this water body have the potential to continue to be directly and/or indirectly affected by the beach nourishment activities.						
GB105029061760/ Trusthorpe Pump Drain (lower end)	The water body lies inland of the coastal frontage and the key impacts will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events. There is a potential risk that the Trusthorpe drainage outfall (which links this waterbody to the sea) could become occasionally blocked by sediment. Defined Mitigation Measures are associated with in-channel form, ecology and vegetation control, which will require further consideration at scheme level and are	Good by 2025	No change in potential	Y	Y	Y	Measures to prevent sediment blockage at the outfall as necessary.
GB105029061650/ Woldgrift Drain (lower end)	therefore outside the scope of the Strategy. The water body lies inland of the coastal frontage and the key impacts will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events. There is a potential risk that the Woldgrift drainage outfalls (which links this waterbody to the sea) could become occasionally blocked by sediment.	Moderate by 2015	No change in potential	Y	Y	Y	Measures to prevent sediment blockage at the outfall as necessary.
	There may be an opportunity to undertake modifications to the outfall structure as part of any scheme implementation, to address recommended Mitigation Measures to incorporate measures for fish passage and reduce fish entrainment. Similarly, other defined Mitigation Measures are associated with in-channel form, ecology vegetation						

	control and floodplain connectivity, which will require further consideration at						
	scheme level and are therefore outside the scope of the Strategy.						
GB105029061740/	The water body lies inland of the coastal frontage and the key impacts will be the	Good by	No change in	Y	Y	Y	Measures to prevent
Boygrift Drain	continued reduction of flood and erosion risk and, associated with this, the continued	2027	potential				sediment blockage at
GB105029061700/	protection from saline inundation during high water events. There is a potential risk						the outfall as
Ingoldmells Main Drain	that the drainage outfalls (which links these waterbodies to the sea) could become occasionally blocked by sediment.						necessary.
GB105029061730/ Anderby Main Drain	There may be an opportunity to undertake modifications to the outfall structure as						
GB105029061710/	to reduce fish entrainment Similarly, other defined Mitigation Measures are						
Willoughby High Drain	associated with in-channel form, ecology and vegetation control (and floodplain						
	connectivity for the Willoughby High Drain), which will require further consideration						
	at scheme level and are therefore outside the scope of the Strategy.						
GB105030056440/	The water body lies inland of the coastal frontage and to the south of the nourishment	Good by	No change in	Y	Y	Y	None required
Cow Bank Drain	zone. Due to longshore transport of sediment the key impacts will be the continued	2027	potential				
	reduction of flood and erosion risk and, associated with this, the continued protection						
	from saline inundation during high water events. At detailed scheme design, there						
	may be an opportunity to consider managing inland water level.						
GB40501G401600/	Key impact will be the continued reduction of flood and erosion risk and, associated	Poor by	No change in	Y	Y	Y	None required
Steeping Long Eau	with this, the continued protection from saline inundation during high water events.	2015	status				
Little Eau Chalk Unit	Chemical saline Intrusion is currently defined as good and is anticipated to remain so.						
	Other elements of the water body are unlikely to be affected by the strategy.						
GB30533132/ Sea Bank	These lakes are situated inland of the coastal frontage. Key impacts will be the	Good by	No change in	Y	Y	Y	None required
Clay Pits	continued reduction of flood and erosion risk and, associated with this, the continued	2015	potential				
	protection from saline inundation during high water events. No Mitigation Measures						
	have been defined for this water body.						
				1	1	1	

Table 8. WFD assessment of strategy proposals: Medium term (6 to 35 years) and long term (36 to 100 years)

MEDIUM TERM (6 to 35 years) to LONG TERM (36 to 100 years)							
Scenario 1: Open beach with annual beach nourishment and additional works in the long term							
Water body ID/ Name	Assessment of proposals against WFD objectives	Target WFD status/ potential	Expected contribution to WFD status/potential	WFD1	WFD2	WFD3	Proposed scheme actions
GB640402492000/ Lincolnshire	This will be a continuation of the short-term management and therefore impacts will be as described for the short term. Beach nourishment will help to reduce the risk of erosion and flooding and help prevent the loss of beach habitat that would otherwise occur as a result of sea level rise. However, there will remain a continued risk of offshore losses of beach sediment during storm conditions. Unlikely to affect migration of aquatic organisms and whilst there is a risk that fines could be released with a potential for an increase in turbidity and suspended sediment concentrations and a wider impact on phytoplankton growth, macrophytes and invertebrates and other aquatic flora turbidity concentrations are already high under normal conditions. The scheme will take account of monitoring data to inform volumes and timing of nourishment required in line with mitigation measures related to sediment management and dredging activities.	Good by 2027	No change in potential	Y	Y	Y	Continue measures to reduce release of fines during recharge (scheme level) Continue to use monitoring data to inform nourishment needs
GB640523160000/ Wash Outer	This will be a continuation of the short-term management and therefore impacts will be as described for the short term. There is potential for the movement of nourishment material southwards therefore intertidal and subtidal habitats and features within the areas covered by this water body have the potential to continue to be directly and/or indirectly affected by the beach nourishment activities.	Moderate by 2015	No change in status	Y	Y	Y	Continue measures to reduce release of fines during recharge (scheme level)
GB530503311300/ Wash Inner	As for the Wash Outer, this will be a continuation of the short-term management and therefore impacts will be as described for the short term. There is potential that the movement of nourishment material southwards could have a wider scale impact on nearshore banks and channel within the Wash, which in turn could affect the flow of water in these areas, but natural influx of sediment is much larger than the potential	Moderate by 2015	No change in potential	Y	Y	Y	Continue measures to reduce release of fines during recharge (scheme level)
	input of suspended sediments that could be released from the nourishment works. No change in water quality in terms of chemical composition is anticipated.						
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GB105029061760/ Trusthorpe Pump Drain (lower end)	This will be a continuation of the short-term management and therefore impacts will be as described for the short term. The water body lies inland of the strategy area and the key impacts will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events. There is a potential risk that the Trusthorpe drainage outfall (which links this waterbody to the sea) could become occasionally blocked by sediment.	Good by 2025	No change in potential	Y	Y	Y	Measures to prevent sediment blockage at the outfall as necessary.
GB105029061650/ Woldgrift Drain (lower end)	This will be a continuation of the short-term management and therefore impacts will be as described for the short term. The water body lies inland of the strategy area and the key impacts will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events. There is a potential risk that the Woldgrift drainage outfall (which links this waterbody to the sea) could become occasionally blocked by sediment.	Moderate by 2015	No change in potential	Y	Y	Y	Measures to prevent sediment blockage at the outfall as necessary.
GB105029061740/ Boygrift Drain GB105029061710/ Willoughby High Drain GB105029061700/ Ingoldmells Main Drain GB105029061730/ Anderby Main Drain	This will be a continuation of the short-term management and therefore impacts will be as described for the short term. The water body lies inland of the strategy area and the key impacts will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events. There is a potential risk that these drainage outfalls (which link these waterbodies to the sea) could become occasionally blocked by sediment.	Good by 2027	No change in potential	Y	Y	Y	Measures to prevent sediment blockage at the outfall as necessary.
GB40501G401600/ Steeping Long Eau Little Eau Chalk Unit	This will be a continuation of the short-term management and therefore impacts will be as described for the short term. Key impacts will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events. Chemical saline Intrusion is currently defined as good and is anticipated to remain so. Other elements of the water body are unlikely to be affected by the strategy.	Poor by 2015	No change in status	Y	Y	Y	None required

GB30533132/ Sea Bank	This will be a continuation of the short-term management and therefore impacts will	Good by	No change in	Y	Y	Y	None required
Clay Pits	be as described for the short term. These lakes are situated inland of the scheme. Key	2015	potential				
	impacts will be the continued reduction of flood and erosion risk and, associated with						
	this, the continued protection from saline inundation during high water events.						
Scenario 2: Introduce	e structures along the coast and additional works in the long term				1	1	
Water body ID/ Name	Assessment of proposals against WFD objectives	Target	Expected	WFD1	WDF2	WFD3	Proposed scheme
		WFD	contribution to				actions
		status	WFD status				
GB640402492000/	As for scenario 1, there will be a reduced risk of erosion and flooding and the strategy	Good by	No change in	Y	Y	Y	Continue measures
Lincolnshire	will help prevent the loss of beach habitat that would otherwise occur as a result of	2027	potential				to reduce release of
	sea level rise.						fines during
	There will be a direct impact in terms of babitat loss due to the presence/footprint of						recharge (scheme
	new large structures, but this may be offset by the greater retention of heach volumes						level).
	over a longer period, compared to the open beach scenario. There is also an						Continue to use
	opportunity for new rock structures to be designed to provide new babitat for						monitoring data to
	colonication by macrophytos, maring invertebrates and other aquatic flora						inform nourishmont
	coolisation by macrophytes, marine invertebrates and other aquatic nora.						noodc
	The construction of structures will affect currents and therefore sediment transport,						neeus.
	with sediment being held within smaller 'sediment cells'. This change in zones of						As part of scheme
	accretion and erosion may impact sensitive intertidal and subtidal habitats,						design, determine
	particularly downdrift of structures. There is also the potential for localised scour						changes to currents
	around structures. Impacts will depend upon the scheme design.						and sediment
	Neither the recharge nor the structures are likely to affect migration of aquatic						transport to ensure
	organisms and whilst there is a risk that fines could be released with a potential for an						downdrift beaches
	increase in turbidity and suspended sediment concentrations and a wider impact on						do not become
	nhytonlankton growth macronhytes and invertebrates and other aquatic flora						depleted of
	turbidity concentrations are already high under normal conditions						sediment.
	The scheme will take account of monitoring data to inform volumes and timing of						
	nourishment required in line with mitigation measures related to sediment						
	management and dredging activities. The structures should reduce the nourishment						

	required, reducing maintenance activities in line with recommended mitigation measures.						
GB640523160000/ Wash Outer	As for scenario 1, beach recharge will introduce more sediment into the system. The key difference in scenario 2 is that subsequent longshore drift of this sediment will be reduced through introduction of structures. Intertidal and subtidal habitats and features within the areas covered by this water body will therefore continue to be directly and/or indirectly affected by the beach nourishment activities, but to a lesser extent. The degree to which sediment transport will be reduced will depend upon the scheme design.	Moderate by 2015	No change in status	Y	Y	Y	
GB530503311300/ Wash Inner	As for the Wash Outer, there is still potential that the movement of recharge material southwards could have a wider scale impact on nearshore banks and channel within the Wash, which in turn could affect the flow of water in these areas, but volumes involved will be reduced compared to scenario 1. No change in water quality in terms of chemical composition is anticipated.	Moderate by 2015	No change in potential	Y	Y	Y	Continue measures to reduce release of fines during recharge (scheme level). As part of scheme design, determine changes to currents and sediment transport to assess impact on downdrift areas.
GB105029061760/ Trusthorpe Pump Drain (lower end)	As for scenario 1, the key impacts will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events. There is a potential risk that the Trusthorpe drainage outfall could become occasionally blocked by sediment, but the rock armour control structures should reduce this through managing the movement of sediment, and consideration at scheme stage could be to build the structures at the outfall location.	Good by 2025	No change in potential	Y	Y	Y	Consider incorporating outfall into scheme design.

GB105029061650/ Woldgrift Drain (lower end)	As for scenario 1, the key impacts will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events. There is a potential risk that the Woldgrift drainage outfall could become occasionally blocked by sediment, but the rock armour control structures should reduce this through managing the movement of sediment, and consideration at scheme stage could be to build the control structures at the outfall location.	Moderate by 2015	No change in potential	Y	Y	Y	Consider incorporating outfall into scheme design.
GB105029061740/ Boygrift Drain GB105029061710/ Willoughby High Drain GB105029061700/ Ingoldmells Main Drain GB105029061730/ Anderby Main Drain	As for scenario 1, the key impacts will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events. There is a potential risk that the drainage outfalls could become occasionally blocked by sediment, but the rock armour control structures should reduce this through managing the movement of sediment, and consideration at scheme stage could be to build the control structures at the outfall locations.	Good by 2027	No change in potential	Y	Y	Y	Consider incorporating outfall into scheme design.
GB105030056440 Cow Bank Drain	Impacts are likely to be the same as for scenario 1; the key impact will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events.	Good by 2027	No change in potential	Y	Y	Y	None required
GB40501G401600/ Steeping Long Eau Little Eau Chalk Unit	Impacts are likely to be the same as for scenario 1; the key impact will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events. No difference in impacts is anticipated from scenario 1. Chemical Saline Intrusion is currently defined as good and is anticipated to remain so. Other elements of the water body are unlikely to be affected by the strategy.	Poor by 2015	No change in status	Y	Y	Y	None required
GB30533132/ Sea Bank Clay Pits	Impacts are likely to be the same as for scenario 1; key impacts will be the continued reduction of flood and erosion risk and, associated with this, the continued protection from saline inundation during high water events.	Good by 2015	No change in potential	Y	Y	Y	None required

Table 9. WFD assessment of strategy proposals on Protected Areas

Directive	Relevant water bodies	SHORT TERM (0 to 5 years)	MEDIUM TERM (6 to 35 years years)	Mitigation Actions	
		Open beach with annual beach nourishment	Scenario 1: Open beach with annual beach nourishment and additional works in the long term	Scenario 2: Introduce structures along the coast and additional works in the long term	
Conservation of Wild Birds Directive	Lincolnshire The Wash Wash Inner	Intertidal and subtidal habitats and features, both locally and downdrift, have the potential to continue to be directly and/or indirectly affected by the beach nourishment activities in the short term. However, the HRA concluded that the short term Strategy proposals will not adversely affect any Special Protection Areas. A more detailed description of potential impacts is provided in the SEA ER and the Habitats Regulations Assessment (HRA).	As assessed for the short term, there is potential for intertidal and subtidal habitats and features, both locally and downdrift, to continue to be directly and/or indirectly affected by the beach nourishment activities in the medium to long term. However, the HRA concluded that with the implementation of appropriate mitigation and monitoring, the medium term Strategy proposals will not adversely affect any Special Protection Areas. A more detailed description of potential impacts is provided in the SEA ER and HRA.	There is potential for indirect effects on sites downdrift of new structures. However, the HRA concluded that with the implementation of appropriate mitigation and monitoring, the long-term term Strategy proposals will not adversely affect any Special Protection Areas. A more detailed description of potential impacts is provided in the SEA ER and HRA.	Mitigation and monitoring will be required to identify at an early stage (and avoid if necessary) adverse effects on the integrity of one or more of the European sites attributable to the strategy. The monitoring is described more fully in the Stage 2 HRA (Appropriate Assessment) but will comprise the production of a Strategic Monitoring and Mitigation Action Plan, to include strategic level monitoring, new surveys, continued annual monitoring (e.g. breeding bird data, beach profiles etc) and scheme level HRAs. The monitoring programme will be agreed with Natural England, and will include review and appropriate intervention/design changes (e.g. refinements to sediment sampling strategies) if required when agreed trigger levels are reached/early warning system and/or alternative mechanisms for sediment release (in conjunction with SMP mitigation measures).

Directive	Relevant water bodies	SHORT TERM (0 to 5 years)	MEDIUM TERM (6 to 35 years years)	Mitigation Actions	
		Open beach with annual beach nourishment	Scenario 1: Open beach with annual beach nourishment and additional works in the long term	Scenario 2: Introduce structures along the coast and additional works in the long term	
Drinking Water Protected Area	Steeping Long Eau Little Eau Chalk Unit	The aim of the proposed strategy is to continue to reduce the risk of flooding and erosion to the hinterland, where the Steeping Long Eau Little Eau Chalk Unit sits. There will be an associated reduced risk of saline intrusion, which would otherwise detrimentally affect water quality.	This is a continuation of the short term, so effects will remain the same. There will be an associated reduced risk of saline intrusion, which would otherwise detrimentally affect water quality.	As assessed for the short term, and scenario 1, the aim is to continue to reduce the risk of flooding and erosion to the hinterland. The introduction of structures is unlikely to have any additional impact.	None necessary
Habitats and Species Directive	Lincolnshire The Wash Wash Inner	Intertidal and subtidal habitats and features, both locally and downdrift, have the potential to continue to be directly and/or indirectly affected by the beach nourishment activities in the short term. However, the HRA concluded that the short term Strategy proposals will not adversely affect any Special Areas of Conservation. A more detailed description of potential impacts is provided in the SEA ER and the HRA.	As for the short term, there is potential for intertidal and subtidal habitats and features, both locally and downdrift, to continue to be directly and/or indirectly affected by the beach nourishment activities in the medium to long term. However, the HRA concluded that with the implementation of appropriate mitigation and monitoring, the medium term Strategy proposals will not adversely affect any Special Areas of Conservation.	As for the short term, there is potential for intertidal and subtidal habitats and features, both locally and downdrift, to continue to be directly and/or indirectly affected by the beach nourishment activities in the medium to long term. There is also potential for indirect effects on sites downdrift of new structures. However, the HRA concluded that with the implementation of appropriate mitigation and monitoring, the long-term term Strategy proposals will not adversely affect any Special Areas of Conservation.	Mitigation and monitoring will be required to identify at an early stage (and avoid if necessary) adverse effects on the integrity of one or more of the European sites attributable to the strategy. The monitoring is described more fully in the Stage 2 HRA (Appropriate Assessment) but will comprise the production of a Strategic Monitoring and Mitigation Action Plan, to include strategic level monitoring, new surveys, continued annual monitoring (e.g. beach profiles etc) and scheme level HRAs. The monitoring programme will be agreed with Natural England, and will include review and appropriate intervention/design changes (e.g. refinements to sediment sampling

Directive	Relevant water bodies	SHORT TERM (0 to 5 years)	MEDIUM TERM (6 to 35 years) to LONG TERM (36 to 100 years)		Mitigation Actions
		Open beach with annual beach nourishment	Scenario 1: Open beach with annual beach nourishment and additional works in the long term	Scenario 2: Introduce structures along the coast and additional works in the long term	
			A more detailed description of potential impacts is provided in the SEA ER and HRA.	The footprint of new structures will result in local loss of habitat but there is also opportunity for new rock structures to be designed to provide new habitat for colonisation by marine invertebrates. A more detailed description of potential impacts is provided in the SEA ER and HRA.	strategies) if required when agreed trigger levels are reached/early warning system and/or alternative mechanisms for sediment release (in conjunction with SMP mitigation measures).
Shellfish Water Directive	The Wash Wash Inner	A more detail description of potential impacts is provided in the SEA ER. There is potential for indirect effects on fisheries and shellfisheries along the coastal frontage and downdrift into The Wash as a consequence of the continuation of the present annual beach nourishment regime.	A more detailed description of potential impacts is provided in the SEA ER. There is potential for indirect effects on fisheries and shellfisheries along the coastal frontage and downdrift into The Wash as a consequence of the continuation of the present annual beach nourishment regime in the medium to long term.	A more detailed description of potential impacts is provided in the SEA ER. The installation of new structures, together with supplementary beach nourishment, has potential for indirect effects on fisheries and shellfisheries along the coastal frontage and downdrift into The Wash in the medium to long term.	Mitigation may be required in order to avoid adverse effects. Continued monitoring of fish yields at the commercial fisheries within nearshore waters (e.g. brown shrimp fishery in The Wash), status of commercial fisheries and monitoring of water quality will be necessary to inform what interventions are necessary.

6.0 Summary and Conclusions

The preferred options/strategy proposals for the Saltfleet to Gibraltar Point Coastal Flood Risk Management Strategy for the short (0 to 5 years), medium (6 to 35 years) and long term (36 to 100 years) have been assessed in relation to the objectives of the WFD. This appraisal has focused on changes that are likely to have long term effects at the water body level. As such, construction activities have not been considered, despite the possibility of short term temporary effects on biological quality elements directly and via changes in physico-chemical conditions, nor local effects that are not significant at water body level. These will be assessed for WFD at the scheme level.

The WFD assessment presented in Section 5 has shown that both strategy option scenarios for the medium and long term for Zone B will satisfy the relevant criteria for compliance with the WFD, but there are opportunities to explore options to improve/implement Mitigation Measures, such as fish passes, reducing fish entrainment within the river water bodies, and sediment management for the coastal water bodies; therefore a scheme level WFD assessment is recommended.

At this stage, the proposed strategy can be said to satisfy the following objectives, at the water body level:

- WFD 1: The proposed works will not result in a deterioration of current surface water ecological status or potential.
- WFD 2: The proposed works will not cause failure to meet surface water GES /GEP by the target timeframe.
- WFD 3: The proposed works will not permanently prevent or compromise the relevant environmental objectives being met in other water bodies.

The **short term (0 to 5 years) strategy option** of maintaining an open beach represents a continuation of current management practice.

The aim is to continue to reduce flood and erosion risk and therefore the strategy also minimises the risk of saline intrusion to inland water bodies. Other impacts on river water bodies are limited because the rivers discharge to the coast through outfalls and flap gates and would continue to do so under the proposed strategy. Although there is limited scope under the strategy to address the majority of mitigation measures identified for the river water bodies, modification to the drainage outfall structures will be considered as part of the scheme design including opportunities to reduce fish entrainment and incorporating measures for fish passage, where possible; this could lead to an improvement in water body status.

There will be a continued impact on coastal water bodies, both direct and indirect, due to the redistribution of nourishment sediments offshore and southwards, with potential effects on intertidal and subtidal habitats within the Lincolnshire and Wash (Outer and Inner) water bodies.

Two scenarios have been presented for the medium (6 to 35 years) and long term (36 to 100 years):

- Scenario 1: Open beach with annual beach nourishment and additional works in the long term
- Scenario 2: Introduce structures along the coast and additional works in the long term

Both scenarios aim to continue to reduce flood and erosion risk, therefore impacts on hinterland water bodies (river, lake and groundwater) are similar to the short term: saline intrusion will be minimised with no deterioration in water body status likely. Under both scenarios there is potential for sediment to block outfalls and management of this will be required. There is scope for incorporating the outfalls within the structures as part of implementing scenario 2, which could address this issue and minimise maintenance requirements.

As beach nourishment will be undertaken under both scenarios, there will remain an impact on coastal water bodies, both direct and indirect, due to the redistribution of nourishment sediments offshore and southwards, with potential effects on intertidal and subtidal habitats within the Lincolnshire and

Wash (Outer and Inner) water bodies. The installation of structures will reduce the movement of sediment and will therefore have a different (possibly reduced) impact on downdrift habitats; this will need to be informed by scheme design, and environmental monitoring.

Whilst the construction of structures will have a negative impact on shoreline habitats and benthic invertebrates due to their physical footprint, there is potential for the structures to act like a reef and attract colonisation of macroalgaes and invertebrates within the gaps between the rock, with potential for habitat gain and possible improvement in water body status (Lincolnshire water body). During the detailed design of schemes to deliver the strategy, consideration should be given to opportunities for habitat improvement and the creation of niche habitats (e.g. new habitats on new structures) for aquatic species.

In conclusion, all options put forward as part of the strategy are not predicted to cause deterioration in water body status or prevent the water body from meeting its objectives and therefore **an assessment against the conditions listed in Article 4.7 is not required** at this strategy level.

7.0 References

Environment Agency Catchment Explorer database. Available online http://environment.data.gov.uk/catchment-planning/WaterBody/GB105029061700. Accessed November 2017.

Environment Agency (2016) Anglian river basin district: River basin management plan. Updated: December 2015.

Environment Agency (2010) Operational Instruction 488_10: Assessing new modifications for compliance with WFD: detailed supplementary guidance.

Environment Agency (2009) Assessing SMP against the Requirements of the WFD – Guidance and background information.

Annex A: Strategy proposals - assessment assumptions

Table A.1. Proposed strategic approaches – assessment assumptions

 Open beach: Sustain – annual nourishment (with present management) increasing volumes to maintain same standard of protection 						
Description	Continuation of the current coastal defence strategy of proactive annual beach nourishment.					
Approach	The wide, sloping beach will protect the existing seawalls, reducing wave overtopping and possible breaching of the defences in conditions up to the design storm event. Beach nourishment will also protect the underlying clay layer from long-term erosion. Design beach profiles vary slightly along the coast in accordance with seawall parameters. A planned nourishment regime will contribute towards knowledge retention and dedicated teams. Keeping pace with climate change would require moderate increases to beach levels in the medium term. Climate change and sea level rise will eventually require higher and wider beaches and hence higher walls in the long term (+50 years).					
Location	Applicable to 'hotspot' areas in the short term, to all areas within Zone B in the medium					
assumptions	term, and all Zones A, B and C in the long term (see Figure 1). (Trigger levels will need to be					
	set to determine when and where action will be required).					
End-product assumptions	Wide open beaches allowing material to move in response to coastal processes (wave and tides). Seawall damage kept to a minimum if beaches are maintained in a healthy state and adapted to climate change.					
2. Introduce s	structures. Sustain – beach with rock armour structures maintaining same standard of protection					
Description	This option would comprise the adoption of rock armour control structures (rock groynes or fishtail structures or a combination of both). Fishtails could extend 300 m from the seawall line and could be up to 200 m wide at the seaward end and groynes could be 150 to 200 m long. Structure footprints would be quite extensive for the fishtails (between 10,000 and 12,000 m ²) due to the sloping bathymetry at the shore [potentially down to -4 mODN (4m below Ordnance Datum Newlyn) at 300 m] calling for a large pyramid shape to foundation level. Groyne structures would have 1,200 to 2,000m ² footprints. Based on current assumptions on size and spacings, as a function of total beach area, a combination of fishtail and groyne structures would cover 4% to 6% of the intertidal area.					
Approach	This option would have the same technical merits of beach nourishment as nourishment would form part of the initial construction and as required, the ongoing beach management. Fishtail structures could be spaced to suit coastal features (subject to coastal modelling) to provide minimum beach (design) width halfway between the fishtail structures. Beaches would therefore change from being linear (generally following the coastline) to crescent bays holding more sand (or other nourished material) within the bays. Critical beach widths will be at the centre of the bays. These areas may be subject to remedial works until some equilibrium in plan beach shape is reached. Keeping pace with climate change would require moderate increases to beach levels in the medium term. Climate change and sea level rise will eventually require higher and wider beaches and hence higher walls in the long term (+50 years), although wave diffraction and the breaking action of structures will reduce wave energy reaching the shoreline compared to an open beach.					
Location	Applicable to 'hotspot' areas in the short term, to all areas within Zone B in the medium					
assumptions	term, and all Zones A, B and C in the long term. (Trigger levels will need to be set to determine when and where action will be required).					
End product	Rock armour structures augmented with beaches, initially built up through nourishment, until					
assumptions	sufficient sediments are present to provide the minimum design profile. Sediments should be					
	trapped within the bays with minimal transfer along the coast due to tidal currents being					
	Turther seaward compared to at present. Unshore / offshore sediment transfer could still					
	Occur between the beach control structures.					
	to depletion of downdrift beaches. Option will require transitional arrangements for topping up affected areas allowing the coastline to function in a state of dynamic equilibrium.					

Table A.2. Strategy proposals for the short, medium and long term – assessment assumptions

Short term (0 - 5 years) or practically	Maintain open beach Sustain – annual nourishment (with present management) increasing volumes to maintain same standard of protection. All works within Zone B between Mablethorpe and						
until 2025	Ingoldmells. With climate change sea level rise (UKCPO term, assume that the current design beac nourishment design sand crest level will re tolerance. Nourishment volumes will increa	ngoldmells. Vith climate change sea level rise (UKCP09) prediction of 0.1 m sea level rise in the short erm, assume that the current design beach profile is valid throughout the period. The nourishment design sand crest level will remain at 4.50 mAOD (Newlyn) + 0.3 m height olerance. Nourishment volumes will increase only if erosion of the beaches increases but					
	overall volumes will be adapted within tole	erances	(i.e. most beach design crest widths have a				
	5 m tolerance). Note that climate change	predictio	ons will evolve through time. The current				
	estimate is considered to be robust for stro	itegic pl	irposes. Future strategy revisions and				
	business cases will adopt the latest guidan	ce on ci	imate change.				
(6 - 35 years)	Continue to maintain open beach	UK	Depending on actual trigger points being				
or practically	Sustain – annual nourishment (with		activated (e.g. significant sand erosion at hotspots, seawall toe exposures within 1				
2026 to 2055	present management) increasing		year). Introduce structures at most				
	volumes to maintain same standard of		erosion affected locations or plan trials for				
	protection. All works within Zone B		groups of structures at agreed locations.				
	between Mablethorpe and Ingoldmells.		Ultimate goal is to complete structure				
	However, some periodic nourishments		installations over a period of 10 to 15				
	may be required between ingoldmells		years.				
	Also sand recycling may be required to		Sustain – beach with rock armour				
	the north of Mablethorpe as was		structure combinations maintaining				
	carried out in January 2014 (although		same standard of protection. All works				
	still within Zone B).		within Zone B between Mablethorpe and				
	Moderate increases to beach levels		Skegness. Also, sand recycling may be				
	required to accommodate 0.35 m		required to the north of Mablethorpe as				
	estimated sea level rise. The		was carried out in January 2014				
	nourishment design sand crest level may		(although still within Zone B).				
	thus end up at 4.80 mAOD + 0.3 m		Beach nourisnment will still be required to				
	crest width currently proposed) Actual		structure placements. Ongoing				
	nourishment volumes continuously		requirements will involve beach				
	monitored against predictions.		nourishments every 5 to 10 years.				
	Subsequent nourishments adapted to		Moderate increases to beach levels				
	target most vulnerable areas.		required to accommodate 0.35 m				
			estimated sea level rise. The nourishment				
			design sand crest level may thus end up at				
			4.80 mAOD + 0.3 m height tolerance.				
			Actual nourishment volumes continuously				
			monitored against predictions.				
			target most vulnerable areas				
Long term (35	SCENARIO 1	OR	SCENARIO 2				
- 100 years)	Continue to maintain open beach	-	Continuing structure maintenance and				
or			maintain beach profiles				
practically	Sustain – annual nourishment (with						
2056 to 2120	present management) increasing		Sustain - operation/maintenance phase.				
	volumes to maintain same standard of		Structures – ongoing maintenance of				
	Protection. All works initially within		structures. As beach levels are raised, so				
	Lone b between wabiethorpe and		but this will be effective in 50+ years				
	nourishments may be required		time. All works initially within Zone R				
	between Ingoldmells and Skegness if		between Mablethorpe and Skegness.				

deemed necessary. Also periodic sand recycling may be required to the north of Mablethorpe as was carried out in January 2014 (this may encroach into Zone A). Nourishments may also be required in the northern part of Zone C although this will require further assessments at the time (environmental baselines may have

changed by then). Climate change and sea level rise will eventually require higher and wider beaches to accommodate up to 1.1 m estimated sea level rise and hence higher walls in the long term (+50 years). The nourishment design sand crest level may thus end up at between 5.0 and 5.50 mAOD + 0.3 m height tolerance.

Beach nourishment – ongoing requirements will involve nourishment every 5 to 10 years. All works initially within Zone B between Mablethorpe and Skegness. Also, periodic sand recycling may be required to the north of Mablethorpe as was carried out in January 2014 (this may encroach into Zone A). Nourishments may also be required in the northern part of Zone C although this will require further assessments at the time (environmental baselines may have changed by then). Climate change and sea level rise will eventually require higher and wider beaches to accommodate up to 1.1 m estimated sea level rise and hence higher walls in the long term (+50 years), albeit on a reduced basis compared to the open beach option. The nourishment design sand crest level may thus end up at between 5.0 and 5.50 mAOD + 0.3 m height tolerance.

Appendix C: Options appraisal and criteria

The development of the strategy was a staged and iterative process. From the starting point of the relevant SMP policies (refer to Table 2.1 in the Environmental Report), a summary of high level concepts (management approaches) was developed, as shown in Table C.1.

Policy	Approach	Description	Consequence	Taken forward to Options long list (see Table 7.1 in the ER) (Y/N)
No Active Intervention	Do Nothing	Not SMP policy	Will not hold the line - loss of assets/environment damage - Do nothing damages base case.	Yes - Option 1
(Reactive)	Do minimum	Patch and repair of seawall structures and sand recycling as and when required.	Flooding risk will increase with climate change sea level rise (Eventual loss of beach – assume 10% AEP).	Yes - Option 2.1
	Maintain	Patch and repair of seawall structures and beach nourishment as and when required.	Flooding risk will increase with climate change sea level rise.	Yes - Option 2.2
	Sustain	Patch and repair of seawall structures and increasing beach nourishment as and when required.	Flooding risk keeps pace with climate change sea level rise.	Yes - Option 2.3
	Improve	Patch and repair of seawall structures, with increasing and further nourishment as and when required.	Reduce flood risk from existing including for climate change sea level rise.	No - not applicable to do minimum and previous economics does not support further blanket increase in SoP*
(Proactive)	Do minimum	Planned patch and repair of seawall structures and sand recycling.	Flooding risk will increase with climate change sea level rise (Eventual loss of beach).	No - approach is more applicable to reactive do minimum (Option 2.1)
	Maintain	Planned patch and repair of seawall structures and beach nourishment.	Flooding risk will increase with climate change sea level rise.	Yes - Options 3.1 & 3.3
		Planned patch and repair of seawall structures, plus control structures and reduced nourishment.	Long term reduction in nourishment compared to nourishment only.	Yes - Options 3.8, 3.9 & 3.16
		Planned patch and repair on seawall structures but no nourishment.	No nourishment - loss of amenity.	Yes - Options 4.1 & 4.4
	Sustain	Planned patch and repair of seawall structures and increasing beach nourishment.	Flooding risk keeps pace with climate change sea level rise.	Yes - Options 3.2, 3.4, 3.5, 3.6 & 3.7
		Planned patch and repair of seawall structures, plus control structures and reduced nourishment.	Front end expenditure loading but long term reduction in nourishment	Yes - Options 3.10, 3.11, 3.12, 3.13, 3.14 & 3.15

Table C.1: Summary of the	e long list of options to	aken from the SMP approaches.
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Policy	Approach	Description	Consequence	Taken forward to Options long list
				(see Table 7.1 in the ER) (Y/N)
			allowing for SLR compared to	
			nourishment only.	
		Planned patch and repair of seawall	No nourishment - loss of amenity.	Yes - Options 4.2 & 4.3
		structures but no nourishment.		·
	Improve	Planned patch and repair of seawall	Reduce flood risk from existing	No - economics does not support
		structure, plus increasing and further	including for climate change sea level	further blanket increase in SoP*
		nourishment.	rise.	
		Planned patch and repair seawall	Long term reduction in nourishment	No - economics does not support
		structures, plus control structures and	allowing for increased sea level rise,	further blanket increase in SoP*
		reduced nourishment.	compared to nourishment only.	
		Planned patch and repair of seawall	No nourishment - loss of amenity.	No - economics does not support
		structures, but no nourishment.		further blanket increase in SoP*
Hold the Line +	Do minimum /	Various approaches (as listed above)	Approach leads to multiple standards	Yes - Option 5.1
segregate	Maintain /	for each segment of coast, e.g. rock	of risk along frontage.	·
(compartmentalise)	Sustain	headlands and wider beaches.	0 0	
Hold the Line +	Maintain /	Various approaches (as listed above)	Approach leads to multiple standards	Yes - Options 5.2 & 5.3
managed	Sustain	for each segment of coast, plus some	of risk along frontage and allows for	
realignment(s)		limited areas of managed realignment.	managed realignment(s) in zones at	
• • • •			trigger points - long term planning	
			required.	
Hold the Line +	Sustain /	Various approaches / development	Compromises the future - long term	No – not supported by Grant in Aid.
advancements	Improve	needed to create advancement.	planning required – requires	
			additional contributions.	

* Note: The improve approach was revisited as a sensitivity test on the leading option(s). Commentary may also refer to 'additionality' offering an opportunity to improve, but this is beyond GiA requirements.

From the initial approaches, a list of 27 potential options were identified (see Table C.2), which were subject to consultation with key stakeholders and multi-criteria technical appraisals that considered the costs and benefits of these options using a suite of environmental, economic and social factors (Table C.2). The applied weightings used for the appraisal process are set out below. Table C.3 provides details of the high level appraisal undertaken of the long list of options.

٠	Damages avoided	- 40%
•	Environment	- 20%

- Social-economic 20% 40% combined
- Costs 20%

Biodiversity, flora and fauna	Does option maintain, and where possible, enhance flora and fauna?
Water and hydromorphology	Does option maintain, and where possible improve, the quality of water resources as defined by the WFD?
Material sustainability	Does option require ever greater reliance on availability of materials?
Landscape and visual amenity	Does option maintain and enhance the quality and character of the landscape?
Climate	Does option adapt to future climate changes?
Geology, geomorphology and coastal processes	Does option protect geological diversity and work with (rather than against) natural coastal processes?
Historic environment	Does option conserve, and where possible enhance, the historic environment, heritage assets and their settings?
Business development	Does option minimise risk to economic activities and facilitate the creation of economic opportunities?
Transport	Does option maintain current levels of people movement and access?
Land use	Does option support varied land uses along the coastline?
Population and health	Does option manage risk to the health of people and vulnerability of local communities?
Recreation and tourism	Does option avoid damage to, and enhance where possible, recreation and tourism?
Stress	Does option provide a sense of security in terms of flood risk?
Emergency services	Does option allow for sufficient time for emergency response?

 Table C.2. Summary of the high level appraisal selection criteria and scoring prompts

Table C.3: Long list of options considered and their environmental consequences.

	Option	Status/reasons for rejection
1	Do nothing - base case	This option involves ceasing of all activities, resulting in erosion of the beaches, exposure and erosion of the underlying clay layer (within 2 to 5 years) and failure of the sea defences (estimated within 25 years). This option is not considered as a viable coastal defence option across all zones due to the unacceptable risk of tidal
		flooding to residential/commercial properties, static caravans and land, which would provide a very low sense of security. However, this option provides the baseline against which the economic and environmental benefits of implementing a coastal defence strategy can be assessed.
	Торіс	Environmental consequences
	Biodiversity, flora and fauna	 Results in saline flooding of large area inland over time with catastrophic impacts on freshwater and terrestrial habitats and species in the hinterland. Potential opportunities for formation of new intertidal and coastal habitat over time as coastline realigns. Loss/erosion of beach over time with likely changes in subtidal habitats (Sabellaria potentially present), physical processes and sediment transport up and downdrift (from present day). Uncertain impacts on designated habitats and species and fisheries updrift and, more likely, downdrift – these may be positive or negative e.g. potential reduction/change in supply of material to Gibraltar Point, reduction in potential movement of sand into The Wash, etc. No requirement for a supply of dredged sand from offshore sandbanks – avoiding impacts on the benthic, subtidal and marine communities in these locations, however overall it is considered the worst performing ontigen under this criterion.
	Material sustainability	Option does not require ever greater reliance on availability of materials.
	Water and hydromorphology	 Erosion/loss of beach and uncontrolled failure/loss of defences, with eventual transition to more 'naturally' functioning coastline – potential benefits to heavily modified (HM) Lincolnshire coastal water body with reduction/removal of hydromorphological pressure. Saline flooding of hinterland could impact on the groundwater body (i.e. via saline intrusion) and the artificial/HM river water bodies that drain the area at risk (i.e. impeded drainage). Overall though it is still considered to have the potential to be the best performing options under this criterion.
	Landscape and visual amenity	 Do nothing implies complete loss of present landscape and amenity value. Opportunity for the restoration of a new coastal landscape could not be managed.
	Climate	 Option will not require any action and therefore, there is no opportunity to proactively plan a response to adapt to future climate change.
	Geology, geomorphology and coastal processes	 Erosion/loss of beach and uncontrolled failure/loss of defences, with rollback of shoreline and eventual transition to more 'naturally' functioning coastline. Potential uncertain changes to predominant southerly sediment transport as nourishment operations cease. Erosion of the beach would potentially expose the designated geological features (e.g. RIGS); whilst saline flooding of large area inland over time would increase flood risk to geological features within the hinterland. Score reflects the benefits of the potential restoration of more 'natural' coastal processes, but does not represent potential adverse impacts on geological features.
	Historic environment	 Results in saline flooding of large area inland over time with adverse impacts to varying degrees (depending on frequency and depth of flooding and sensitivity of individual features) on all features of archaeological and heritage value (whether designated or undesignated) and the wider historic environment/seaside heritage

		along the frontage or within the hinterland – either by direct damage or changes to setting. Erosion of the
		beach would expose the clay exposures (currently covered by the beach) known to be of paleo-environmental
	Business development	Do nothing would stop any development
	Transport	 Do nothing considered the lowest score for this criterion as links (roads) along the coast would cease and
	'	links from inland (road and rail) would stop where inundation determines 'end of the road/line'.
	Land use	 Do nothing would impact on the economy (agriculture, tourism and services) in the near future and therefore is the worst performing option.
	Population and health	Do nothing implies not managing the risk to the health of people and local communities.
	Recreation and tourism	 Do nothing implies a change from present recreation and tourism, which may lead to dereliction before potentially turning to a new type of recreation.
	Stress	 Do nothing gives a very low sense of security and will eventually lead to increase in population stress (score 0).
	Emergency services	 Do nothing gives a very low sense of security and will eventually lead to minimal response time for emergency services (assign lowest score 0).
	Option	Status/reasons for rejection
2	DO MINIMUM OPTIONS	· · ·
2.1	Do minimum – doing the	This scenario involves repair of the sea backstop structures as and when required to maintain their present condition.
	minimum works necessary to	Sand recycling would extend wall resilience at erosion hotspots but beach levels would continually erode over time,
	maintain the defence line	decreasing the standard of protection (SoP) of the defence and increasing the risk of failure due to overtopping. To
		than on a sustained planned proactive approach.
		This option was rejected due to a drop in standard of protection in the medium and long-term with wave impacts and overtopping progressively increasing. This option would provide a low sense of security.
	Торіс	Environmental consequences
	Biodiversity, flora and fauna	 Doing minimum to 'patch and repair' will continue to reduce flood risk in short to medium term with resulting benefits to freshwater and terrestrial habitats and species in the hinterland from reduced flood risk. In long term, eventual loss of fronting beach will result in increasing flood risk to freshwater and terrestrial habitats and species in the hinterland with associated adverse impacts.
		 Any beach erosion will be addressed in a responsive way by recycling existing sand with potential impacts if undertaken in sensitive areas (e.g. SSSI, SAC, SPA etc) to the north or south of the study area. Eventual loss of beach in long term with likely changes in subtidal habitats (<i>Sabellaria</i> potentially present),
		physical processes and sediment transport up and downdrift (from present day).
		 Uncertain impacts on designated habitats and species and fisheries up- and, more likely, downdrift – these may be positive or negative e.g. potential reduction/change in supply of material to Gibraltar Point, reduction in potential movement of sand into The Wash etc.
		 No requirement for a supply of dredged sand from offshore sandbanks – avoiding impacts on the benthic, subtidal and marine communities in these locations.
	Water and hydromorphology	 Maintaining existing defence structures, albeit with standards deteriorating over time, will maintain existing hydromorphological pressure on the HM coastal water body.

	 Cessation of or reducing beach nourishment activities (from present management) would remove/reduce this existing hydromorphological pressure; but pressure would remain from the continued presence of the existing sea defences. In the long term, saline flooding of hinterland could impact on the groundwater body (i.e. saline intrusion) and impacts on artificial/HM river water bodies that drain the area at risk.
Material sustainability	 Option does not require ever greater reliance on availability of sand as no new material will be obtained and used to nourish beaches and any erosion will be addressed in a responsive way by recycling existing sand. However, patch and repair works to sea defences following an event will use increasing amounts of concrete materials over time as the need increases.
Landscape and visual amenity	 Doing minimum 'patch and repair' will allow deterioration of the frontage (at varying degrees) over time and associated adverse changes to landscape character and visual amenity; with further reductions with increased flood risk. Improvement on score from Do Nothing as this process would occur more gradually and could be managed.
Climate	 Option will require minimal actions and therefore, there is no opportunity to proactively plan the response to adapt to future climate change. Option scores slightly better than the Do Nothing option.
Geology, geomorphology and coastal processes	 Eventual loss of beach over time with potential changes in coastal morphology and potentially a more 'naturally' functioning coastline, but still significantly limited by the continued presence of the landward defences. Potential uncertain changes to southerly sediment transport as present nourishment operations cease. In long term, the eventual loss of fronting beach will result in saline flooding of large area inland and increase flood risk to geological features within the hinterland and exposure of the designated geological features along the shoreline.
Historic environment	 Doing minimum 'patch and repair' will continue to reduce flood risk in short to medium term with resulting benefits to archaeological and heritage features (whether designated or undesignated) along the coast and in the hinterland from reduced flood risk. In long term, the eventual loss of fronting beach will result in a reduction in standard of protection, increasing risk to features in the hinterland and changing the seaside character and associated heritage – either by direct damage or changes to setting – and exposing the clay outcrops known to be of paleo-environmental importance.
Business development	• Any do minimum option would not give much confidence and development potential will be minimal, score 20.
Transport	 Any do minimum option would keep transport links going for up to 30-40 years, but not much investment for the future, score 40.
Land use	• Do minimum would eventually impact on the economy (agriculture, tourism and services), especially along the coastal strip, in the near to mid future and therefore is scored 50.
Population and health	 Do minimum, maintain and sustain options will score increasingly higher with sustain scoring the highest (100) for this criterion. Thus, assess maintain as 80 and do minimum as 50. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring avoidance by population (score 70 for this sustain option). Similarly, different beach material grading may impact on population and health (score 80).
Recreation and tourism	 Do minimum, maintain and sustain options will score highly for enhancing recreation and tourism, but only if option provides the amenity potential such as a beach or local attraction. Score 80, 90 and 100 respectively. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring loss of recreation and tourism (score 70 for this sustain option). Similarly, different beach

		material grading may impact on recreation and tourism (score 90 and 80 for sustain and maintain respectively).
	Stress	Do minimum gives the perception of not proactively providing flood defence standard, therefore scores 50.
	Emergency services	Do minimum gives the perception of not proactively providing flood defence standard, therefore scores 50.
	Option	Status/reasons for rejection
2.2	Maintain - doing the minimum works necessary to maintain the defence line, excluding climate change	This option entails the continuation of the current coastal defence strategy of proactive annual beach nourishment. Working with nature in front of the seawall will provide an effective form of soft coastal defence, efficiently absorbing the energy of approaching waves. This option was rejected due to a drop in standard of protection and because the impacts of waves and overtopping
		would progressively increase.
2.3	Sustain - doing the minimum works necessary to maintain the defence line, including for climate change	This scenario involves repair of the sea backstop structures as and when required to maintain their present condition. Sand recycling would extend wall resilience at erosion hotspots but beach levels would continually erode over time, decreasing the standard of protection (SoP) of the defence and increasing the risk of failure due to overtopping. To sustain SoP the option would include beach nourishment (topping up) as and when required, on a reactive basis, rather than on a sustained planned proactive approach.
		overtopping would progressively increase. This option also requires ever increasing sourcing requirements, especially in the long-term.
	Торіс	Environmental consequences
	Biodiversity, flora and fauna	 Continued reduction in flood risk to freshwater and terrestrial habitats and species within the hinterland – with risk increasing over time as beach levels decline between reactive nourishment operations. Additional increase in risk for maintain option as beach levels would not be nourished to a level that will keep pace with increasing sea level rise. Uncertain impacts on designated habitats and species and fisheries up- and most likely, downdrift due to
		continued reactive beach nourishment operations, albeit at a reduced volume and frequency to present, in particular for the maintain option – this may be positive or negative.
		 Options will generally maintain existing beach and landward dune habitats and associated biodiversity. Continued, but reduced, need to dredge sand from offshore sandbanks – with impacts on the benthic, subtidal and marine communities in these locations – with greater volumes required for the sustain option.
	Water and hydromorphology	 As Option 2.1 Maintaining existing defence structures, albeit with standards deteriorating over time, will maintain existing hydromorphological pressure on the HM coastal water body. Cessation of or reducing beach nourishment activities (from present management) would remove/reduce this existing hydromorphological pressure; but pressure would remain from the continued presence of the existing sea defences. In the long term, saline flooding of hinterland could impact on the groundwater body (i.e. saline intrusion) and impacts on artificial/HM river water bodies that drain the area at rick.
	Material sustainability	 Option does not require ever greater reliance on availability of sand as no new material will be obtained and used to nourish beaches and any erosion will be addressed in a responsive way by recycling existing sand. However, patch and repair works to sea defences following an event will use increasing amounts of concrete materials over time as the need increases.

Landscape and visual amenity	As Option 2.1
	 Doing minimum 'patch and repair' will allow deterioration of the frontage (at varying degrees) over time and associated adverse changes to landscape character and visual amenity; with further reductions with increased flood risk. Improvement on score from Do Nothing as this process would occur more gradually and could be managed.
Climate	Options will only provide an opportunity to reactively respond to future events and limited opportunity to plan a robust adaptation strategy to account for future predicted climate change. In addition, the maintain option will not provide a standard of protection that keeps pace with sea level rise and predicted changes and scores lower.
Geology, geomorphology and	As Option 2.1
coastal processes	• Eventual loss of beach over time with potential changes in coastal morphology and potentially a more 'naturally' functioning coastline, but still significantly limited by the continued presence of the landward defences. Potential uncertain changes to southerly sediment transport as present nourishment operations cease.
	 In long term, the eventual loss of fronting beach will result in saline flooding of large area inland and increase flood risk to geological features within the hinterland and exposure of the designated geological features along the shoreline.
Historic environment	 Continued reduction in flood risk to features of archaeological and heritage value (whether designated or undesignated) and the wider historic environment/seaside heritage along the frontage and within the hinterland. No changes from present for sustain options, but a gradual increase in risk for maintain options over time with associated lower score.
	 Continued protection of clay exposures known to be of paleo-environmental importance on the beach, although risk may increase between beach nourishment operations. Sustain antion accrea 00, with a radiused score for the maintain antion.
Business development	 Sustain option scores 50, with a reduced score for the maintain option. The maintain option would give some confidence, perhaps for 50 years, but that would cap development, suggest scores 50 to 60.
	 Any sustain options would give highest confidence in the range do minimum, maintain, sustain, but the highest score (100) goes to seeing long term structures being put in place. Other sustain options would score 90 except changing frequency will reduce confidence.
Transport	The maintain options would keep transport links going for longer, but not much investment for the future, scores 60 to 80.
	 Any sustain options would give highest confidence in the range do minimum, maintain, sustain, allowing for investment into improving transport links. Suggest scores of 80 to 100 for all sustain options. Targeting certain areas may attract improvements to transport links including better connectivity along the coast.
Land use	All maintain options are considered beneficial for land use and score 80.
	 Sustain options would be considered the most beneficial, especially if little impact on the economy (agriculture, tourism and services). Score 100 except for sustain options with a beach, see 1.9.5.
Population and health	 Do minimum, maintain and sustain options will score increasingly higher with sustain scoring the highest (100) for this criterion. Thus, assess maintain as 80 and do minimum as 50. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring avoidance by population (score 70 for this sustain option). Similarly, different beach material grading may impact on population and health (score 80).

	Recreation and tourism	 Do minimum, maintain and sustain options will score highly for enhancing recreation and tourism, but only if option provides the amenity potential such as a beach or local attraction. Score 80, 90 and 100 respectively. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring loss of recreation and tourism (score 70 for this sustain option). Similarly, different beach material grading may impact on recreation and tourism (score 90 and 80 for sustain and maintain respectively).
	Stress	 HTL options will score high for sense of security with the highest scores for sustain and improve options. Lesser scores for maintain options and for less frequent works.
	Emergency services	 HTL options will score high sense of security and emergency response with the highest scores for sustain and improve options. Lesser scores for maintain options and less frequent works.
	Option	Status/reasons for rejection
3	BEACH WITHOUT CONTROL S	STRUCTURES
3.1	Maintain - Beach without control structures with present re-nourishment quantities, maintaining same standard of	This option involves continuing the existing strategy of annual beach nourishment to maintain the existing standard of protection. This option was rejected due to a medium and long term drop in standard of protection.
	protection	
3.2	Sustain - Beach without control structures maintaining same standard of protection.	This option entails the continuation of the current coastal defence strategy of proactive annual beach nourishment. Working with nature in front of the seawall will provide an effective form of soft coastal defence, efficiently absorbing the energy of approaching waves.
		This option was Identified as the preferred option on technical, economic and environmental criteria in short term and a potential scenario in medium to long term. This was one of the options most favoured by stakeholders and the public.
3.3	Maintain - Beach without control structures changing nourishment frequency to every 2 or 3 years.	This option would have the same technical merits of annual beach nourishment, providing an effective form of soft coastal defence and efficiently absorbing the energy of approaching waves, but would allow beaches to erode further before being replenished.
	,,	This option was rejected due to the unacceptable risk of a lower standard of protection in intermediate years in an open beach approach and long term drop in standard of protection.
3.4	Sustain - Beach without control structures changing nourishment frequency to every 2 or 3 years.	This option would have the same technical merits of annual beach nourishment, providing an effective form of soft coastal defence and efficiently absorbing the energy of approaching waves, but would allow beaches to erode further before being replenished.
		This option was rejected due to the unacceptable risk of a lower standard of protection in intermediate years in an open beach approach.
3.5	Sustain - Beach without control structures change nourishment frequency to more than 5 years (e.g. sand engine).	This option would have the same technical merits of annual beach nourishment, providing an effective form of soft coastal defence and efficiently absorbing the energy of approaching waves, but would allow beaches to erode significantly before being replenished.
		This option was rejected due to the unacceptable risk of a lower standard of protection in intermediate years in an open beach approach.

Торіс	Environmental consequences
Biodiversity, flora and fauna	 Continued reduction in flood risk to freshwater and terrestrial habitats and species within the hinterland – with risk increasing over time for the maintain options. Uncertain impacts on designated habitats and species and fisheries up- and more likely, downdrift due to continued proactive beach nourishment operations – may be positive or negative relative to present conditions. Greater volumes of material likely to be required for the sustain options and potentially those requiring annual rather than less frequent nourishment, resulting in the continuation of present conditions and potentially an increase in annual losses from the beach and associated sediment movement. Significant uncertainty relating to the potential movement/impacts of the large volume of material required to be deposited to reduce the frequency to more than five years, Options will generally maintain existing beach and landward dune habitats and associated biodiversity. Continued need for a regular supply of dredged sand from offshore sandbanks – with impacts on the benthic, subtidal and marine communities in these locations. Required volumes of sand required likely to vary between options depending on the standard of protection required (i.e. maintain/sustain, the frequency of nourishment and annual losses from the beach (that can be addressed more flexibly under the annual nourishment regime).
Water and hydromorphology	 Continued hydromorphological pressures from presence of existing coastal defence structures (i.e. shoreline reinforcement) and ongoing beach nourishment activities. No changes to status/potential of discharging artificial/HM river water bodies or underlying groundwater body in the hinterland.
Material sustainability	 Sustain and maintain nourishment options will generally score 0 and 20 respectively. There will be a continued annual reliance on obtaining dredged sand from offshore locations to continue a planned programme of annual or periodic (2/3 or >5 years) beach nourishment to maintain beach levels and existing standard of protection. Increasing quantities of sand required over time (i.e. >10 years) for each planned nourishment operation for the sustain option to keep pace with sea level rise and proactively sustain the existing standard of protection. Continued availability of required volumes of sand is uncertain in the medium to long term with increasing demands over time. Additional ongoing materials demand for proactive works to maintain sea defences for all options.
Landscape and visual amenity	 Options 3.1-3.4: Would retain the existing landscape character of a shoreline with a sandy beach and open views along the coast and seaward – score 100. Slightly reduced score (90) for not keeping up with climate change for the maintain options. Reduction in score (-10) for options with nourishment every 2-3 years as beaches will deplete further in intermediate years. Similar score for option 3.8 (80). Option 3.5: Relatively unknown what the physical response would be as a result of these options. May be beneficial in terms of landscape and visual amenity in some locations but detrimental in others, i.e. depends very much on where the new features are introduced and how the coastal processes respond – score 50.
Climate	 Options will provide an opportunity to proactively plan the response to adapt to future climate change through the programme of planned beach nourishment operations (whether with sand or an alternative material). Options with annual nourishment to build beach levels to the required standard, with sand or an alternative material, or with the flexibility to vary levels between locations along the frontage (i.e. Option 3.8) provide the flexibility to adapt responses to local conditions and changes over time and score highest; although the maintain option will not provide a standard of protection that keeps pace with sea level rise and predicted changes and scores relatively lower. Options with a reduced frequency of nourishment material do not offer this flexibility and also score lower.

Geology, geomorphology and coastal processes	 Continued beach nourishment on a proactive basis to maintain/sustain the present standard of protection will generally continue the present day conditions. Maintain/sustain options will vary the degree of nourishment required. Potential implications for sediment transport and coastal processes relative to present conditions. Continued reduction in flood risk to geological features at risk within the hinterland and protection of those currently buried under the beach – risk varies between maintain/sustain options and where the frequency of nourishment is varied or different standards are applied, the level of protection may deteriorate over time in the period between proactive nourishment operations. The use of alternative beach material is not considered likely to affect this.
Historic environment	 Continued reduction in flood risk to features of archaeological and heritage value (whether designated or undesignated) and the wider historic environment/seaside heritage along the frontage and within the hinterland. No changes from present for sustain options, but a gradual increase in risk for maintain options over time.
	 Continued protection of clay exposures known to be of paleo-environmental importance for all options, although this is less certain with reduced frequency of nourishment resulting in a slight reduction in scores. No significant differences between beach material used in terms of protection of these features, although a slight reduction in score representing the potential impact on the traditional tourist resort character with any change from a sandy beach.
	 Sustain beach nourishment option scores 100, with a reduced score for the maintain options and variations reflecting the alternative nourishment frequency and materials.
Business development	 The maintain option would give some confidence, perhaps for 50 years, but that would cap development, suggest scores 50 to 60. Any sustain options would give highest confidence in the range do minimum, maintain, sustain, but the highest score (100) goes to seeing long term structures being put in place. Other sustain options would score 90 except changing frequency will reduce confidence.
Transport	 The maintain options would keep transport links going for longer, but not much investment for the future, scores 60 to 80. Any sustain options would give highest confidence in the range do minimum, maintain, sustain, allowing for investment into improving transport links. Suggest scores of 80 to 100 for all sustain options. Targeting certain areas may attract improvements to transport links including better connectivity along the coast.
Land use	 All maintain options are considered beneficial for land use and score 80. Sustain options would be considered the most beneficial, especially if little impact on the economy (agriculture, tourism and services). Score 100 except for sustain options with a beach, see 1.9.5.
Population and health	 Do minimum, maintain and sustain options will score increasingly higher with sustain scoring the highest (100) for this criterion. Thus, the assessment scores maintain as 80 and do minimum as 50. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring avoidance by population (score 70 for this sustain option). Similarly, different beach material grading may impact on population and health (score 80).
Recreation and tourism	 Do minimum, maintain and sustain options will score highly for enhancing recreation and tourism, but only if option provides the amenity potential such as a beach or local attraction. Score 80, 90 and 100 respectively. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring loss of recreation and tourism (score 70 for this sustain option). Similarly, different beach material grading may impact on recreation and tourism (score 90 and 80 for sustain and maintain respectively).

	Stress	 HTL options will score high for sense of security with the highest scores for sustain and improve options. Lesser scores for maintain options and for less frequent works.
	Emergency services	HTL options will score high sense of security and emergency response with the highest scores for sustain and improve options. Lesser scores for maintain options and less frequent works.
	Option	Status/reasons for rejection
3.6	Maintain - Beach without control structures with different beach material grading.	This option would have the same technical merits of annual beach nourishment, providing an effective form of soft coastal defence and efficiently absorbing the energy of approaching waves, but would introduce different beach material properties (such as coarser sand or shingle) to the foreshore. This option was rejected due to distance to source of material and unpopularity of material with stakeholders and the public (mixing of booch material will inquitably load to concerns over booch attractiveness to tourism), and the long
		term drop in standard of protection.
3.7	Sustain - Beach without control structures with different beach material grading.	This option would have the same technical merits of annual beach nourishment, providing an effective form of soft coastal defence and efficiently absorbing the energy of approaching waves, but would introduce different beach material properties (such as coarser sand or shingle) to the foreshore. This option was rejected due to distance to source of material and unpopularity of material with stakeholders and the
		public (mixing of beach material will inevitably lead to concerns over beach attractiveness to tourism).
	Торіс	Environmental consequences
	Biodiversity, flora and fauna	 Continued reduction in flood risk to freshwater and terrestrial habitats and species within the hinterland – with risk increasing over time for the maintain option. Uncertain impacts on designated habitats and species and fisheries up- and, more likely, downdrift due to beach nourishment operations with a different form of material – may be positive or negative (e.g. reduction in present likely movement of some sand downdrift). Options will generally maintain existing beach and landward dune habitats and associated biodiversity. However, the ecology of the beach itself and the inter/subtidal area will be altered from present conditions with the use of an alternative material. Impacts of sourcing alternative beach materials are currently unknown. No requirement for a continuous supply of dredged sand from offshore sandbanks – avoiding impacts on the benthic, subtidal and marine communities in these locations.
	Water and hydromorphology	 As Options 3.1-3.5 Continued hydromorphological pressures from presence of existing coastal defence structures (i.e. shoreline reinforcement) and ongoing beach nourishment activities. No changes to status/potential of discharging artificial/HM river water bodies or underlying groundwater body in the hinterland.
	Material sustainability	 Initial significant requirement to source new beach materials to provide an alternative fronting beach – potential types of materials and sources not yet known – and ongoing management to maintain existing standard of protection. However, alternative materials may provide a more stable fronting beach with reduced natural losses and associated reduced requirement for replenishment. Increasing quantities of beach materials required over time (i.e. >10 years) for the sustain option to keep pace with sea level rise and proactively sustain the existing standard of protection. Therefore, scores are higher than the sustain and maintain options for beach nourishment with sand (i.e. 20 and 40 respectively). Additional ongoing materials demand for proactive works to maintain sea defences.

Landscape and visual amenity	 Relatively unknown what the physical response would be as a result of these options. May be beneficial in terms of landscape and visual amenity in some locations but detrimental in others, i.e. depends very much on where the new features are introduced and how the coastal processes respond – score 50.
Climate	 As Options 3.1-3.5 Options will provide an opportunity to proactively plan the response to adapt to future climate change through the programme of planned beach nourishment operations (whether with sand or an alternative material). Options with annual nourishment to build beach levels to the required standard, with sand or an alternative material, or with the flexibility to vary levels between locations along the frontage (i.e. Option 3.8) provide the flexibility to adapt responses to local conditions and changes over time and score highest; although the maintain option will not provide a standard of protection that keeps pace with sea level rise and predicted changes and scores relatively lower. Options with a reduced frequency of nourishment material do not offer this flexibility and also score lower.
Geology, geomorphology and coastal processes	 As Options 3.1-3.5 Continued beach nourishment on a proactive basis to maintain/sustain the present standard of protection will generally continue the present day conditions. Maintain/sustain options will vary the degree of nourishment required. Potential implications for sediment transport and coastal processes relative to present conditions. Continued reduction in flood risk to geological features at risk within the hinterland and protection of those currently buried under the beach – risk varies between maintain/sustain options and where the frequency of nourishment is varied or different standards are applied. The level of protection may deteriorate over time in the period between proactive nourishment operations. The use of alternative beach material is not considered likely to affect this.
Historic environment	 As Options 3.1-3.5 Continued reduction in flood risk to features of archaeological and heritage value (whether designated or undesignated) and the wider historic environment/seaside heritage along the frontage and within the hinterland. No changes from present for sustain options, but a gradual increase in risk for maintain options over time. Continued protection of clay exposures known to be of paleo-environmental importance for all options, although this is less certain with reduced frequency of nourishment resulting in a slight reduction in scores. No significant differences between beach material used in terms of protection of these features, although a slight reduction in score representing the potential impact on the traditional tourist resort character with any change from a sandy beach. Sustain beach nourishment option scores 100, with a reduced score for the maintain options and variations reflecting the alternative nourishment frequency and materials.
Business development	 As Options 3.1-3.5 The maintain option would give some confidence, perhaps for 50 years, but that would cap development, suggest scores 50 to 60. Any sustain options would give highest confidence in the range do minimum, maintain, sustain, but the highest score (100) goes to seeing long term structures being put in place. Other sustain options would score 90 except changing frequency will reduce confidence.
Transport	As Options 3.1-3.5 • The maintain options would keep transport links going for longer, but not much investment for the future, scores 60 to 80.

		Any sustain options would give highest confidence in the range do minimum, maintain, sustain, allowing for
		investment into improving transport links. Suggest scores of 80 to 100 for all sustain options. Largeting certain areas may attract improvements to transport links including better connectivity along the coast
	Land use	As Options 3.1-3.5
		All maintain options are considered beneficial for land use and score 80.
		 Sustain options would be considered the most beneficial, especially if little impact on the economy
		(agriculture, tourism and services). Score 100 except for sustain options with a beach, see 1.9.5.
	Population and health	As Options 3.1-3.5
		 Do minimum, maintain and sustain options will score increasingly higher with sustain scoring the highest (100) for this criterion. Thus, assess maintain as 80 and do minimum as 50. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring avoidance by population (score 70 for this sustain option). Similarly, different beach material grading may impact on population and health (score 80).
	Recreation and tourism	As Options 3.1-3.5
		 Do minimum, maintain and sustain options will score highly for enhancing recreation and tourism, but only if option provides the amenity potential such as a beach or local attraction. Score 80, 90 and 100 respectively. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring loss of recreation and tourism (score 70 for this sustain option). Similarly different beach material grading may impact on recreation and tourism (score 90 and 80 for sustain and maintain respectively).
	Stress	As Options 3.1-3.5
		 HTL options will score high for sense of security with the highest scores for sustain and improve options. Lesser scores for maintain options and for less frequent works.
	Emergency services	As Options 3.1-3.5
		 HTL options will score high sense of security and emergency response with the highest scores for sustain and improve options. Lesser scores for maintain options and less frequent works.
	Option	Status/reasons for rejection
3.8	Maintain - Beach without control structures with different standards of protection in different areas.	This option would have the same merits of annual beach nourishment, providing an effective form of soft coastal defence and efficiently absorbing the energy of approaching waves, but would introduce beach material at different areas.
	Tonio	I his option was rejected as it was not favoured by stakeholders.
	Riediversity flora and fauna	Environmental consequences
	Diouversity, nora and fauna	 Continued reduction in flood risk to freshwater and terrestrial habitats and species within the hinterland – with risk increasing over time in locations where a reduced standard of protection is implemented and associated potential adverse impacts.
		 Uncertain impacts on designated habitats and species and fisheries up- and, more likely, downdrift due to continuing beach nourishment operations, albeit at a reduced volume from present management – this may be positive or negative.
		 Option will maintain existing beach and landward dune habitats and associated biodiversity in key sensitive locations except where standards of protection are reduced. Potential opportunities to align any reduction in standards of protection with initiatives to create habitats more tolerant of occasional flooding.

	 Continued need to regularly dredge sand from offshore sandbanks – with impacts on the subtidal and marine communities in these locations – although potentially at a reduced volume to present management.
Water and hydromorphology	As Options 3.1-3.7 • Continued hydromorphological pressures from presence of existing coastal defence structures (i.e. shoreline
	reinforcement) and ongoing beach nourishment activities.
	 No changes to status/potential of discharging artificial/HM river water bodies or underlying groundwater body in the hinterland.
Material sustainability	 Continued reliance on obtaining dredged sand from offshore locations to continue a planned programme of beach nourishment in key locations to maintain beach levels and existing standard of protection. However, this more flexible approach would reduce the overall materials demand for dredged sand in other locations where the standard of protection is reduced. Therefore, score is higher than other beach nourishment options at 40.
Landagana and visual amonity	Additional ongoing materials demand for proactive works to maintain sea defences.
	 Would retain the existing landscape character of a shoreline with a sandy beach and open views along the coast and seaward – score 100. Slightly reduced score (90) for not keeping up with climate change for the maintain options. Reduction in score (-10) for options with nourishment every 2-3 years as beaches will deplete further in intermediate years. Similar score for option 3.8 (80).
Climate	As Options 3.1-3.7
Coology geometrical and	 Options will provide an opportunity to proactively plan the response to adapt to future climate change through the programme of planned beach nourishment operations (whether with sand or an alternative material). Options with annual nourishment to build beach levels to the required standard, with sand or an alternative material, or with the flexibility to vary levels between locations along the frontage (i.e. Option 3.8) provide the flexibility to adapt responses to local conditions and changes over time and score highest; although the maintain option will not provide a standard of protection that keeps pace with sea level rise and predicted changes and scores relatively lower. Options with a reduced frequency of nourishment material do not offer this flexibility and also score lower.
coastal processes	 As options 3.1-3.7 Continued beach nourishment on a proactive basis to maintain/sustain the present standard of protection will generally continue the present day conditions. Maintain/sustain options will vary the degree of nourishment required. Potential implications for sediment transport and coastal processes relative to present conditions. Continued reduction in flood risk to geological features at risk within the hinterland and protection of those currently buried under the beach – risk varies between maintain/sustain options and where the frequency of nourishment is varied or different standards are applied. The level of protection may deteriorate over time in the period between proactive nourishment operations. The use of alternative beach material is not considered likely to affect this.
Historic environment	 Continued reduction in flood risk to features of archaeological and heritage value (whether designated or undesignated) and the wider historic environment/seaside heritage along the frontage and within the hinterland. Gradual increase in risk for maintain option over time and in locations where the standard of protection will be deliberately reduced, although features at risk can be identified and appropriate actions identified to avoid/mitigate adverse impacts. Continued protection of clay exposures known to be of paleo-environmental importance, although risk may increase over time.
Business development	As Options 3.1-3.7

		The maintain option would give some confidence, perhaps for 50 years, but that would cap development,
		 Any sustain options would give highest confidence in the range do minimum, maintain, sustain, but the highest score (100) goes to seeing long term structures being put in place. Other sustain options would score 90
	Transport	As Options 3 1 3 7
	Transport	 The maintain options would keep transport links going for longer, but not much investment for the future, scores 60 to 80. Any sustain options would give highest confidence in the range do minimum, maintain, sustain, allowing for improvement links for the future of 20 to 400 for all excitors and the second secon
		investment into improving transport links. Suggest scores of 80 to 100 for all sustain options. Fargeting certain areas may attract improvements to transport links including better connectivity along the coast
	l and use	As Options 3.1-3.7
		All maintain options are considered beneficial for land use and score 80.
		 Sustain options would be considered the most beneficial, especially if little impact on the economy
		(agriculture, tourism and services). Score 100 except for sustain options with a beach, see 1.9.5.
	Population and health	As Options 3.1-3.7
		 Do minimum, maintain and sustain options will score increasingly higher with sustain scoring the highest (100) for this criterion. Thus, assess maintain as 80 and do minimum as 50. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring avoidance by population (score 70 for this sustain option). Similarly, different beach material grading may impact on population and health (score 80).
	Recreation and tourism	As Options 3.1-3.7
		 Do minimum, maintain and sustain options will score highly for enhancing recreation and tourism, but only if option provides the amenity potential such as a beach or local attraction. Score 80, 90 and 100 respectively. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring loss of recreation and tourism (score 70 for this sustain option). Similarly, different beach material grading may impact on recreation and tourism (score 90 and 80 for sustain and maintain respectively).
	Stress	As Options 3.1-3.7
		 HTL options will score high for sense of security with the highest scores for sustain and improve options. Lesser scores for maintain options and for less frequent works.
	Emergency services	 As the whole area is currently one flood cell, emergency response times may be compromised due to possibility of outflanking.
	Option	Status/reasons for rejection
	BEACH WITH CONTROL STRU	ICTURES
3.9	Maintain - Beach with detached offshore rock armour control structures with some	The works would involve a new offshore rock structure with the potential for adaptation (raising) to counter climate change sea level rise to maintain the same standard of flood protection.
	areas maintaining same standard of protection.	This option was rejected due to the long term drop in standard of protection and that this option was not favoured by stakeholders and the public.

3.10	Sustain - Beach with large rock armour fishtail breakwater control structures maintaining same standard of protection.	The large fishtail structures, finished with 10 to 15 tonne armour units, could extend 300m from the seawall line and could be up to 200m wide at the seaward end. Initially the top of the structures could be set at circa +5.0 mODN with the potential for adaptation (raising) to counter climate change sea level rise.
		This option was edged out of the top six at detailed assessment. However, in some locations fishtail breakwaters could be used in combination with grovne structures in the medium to long term.
3.11	Sustain - Beach with rock armour groynes structures maintaining same standard of protection.	The medium to large groyne structures, finished with 10 to 15 tonne armour units (initially 3 rocks placed on 4 arrangement), could extend up to 200m from the seawall line and could be up to 10m wide at the seaward end. Initially the top of the structures could be set at circa +5.0 mODN (at the seawall end) following the beach slope to toe out at the mean low water springs (MLWS) level. Groynes will have the potential for adaptation (raising) to counter climate change sea level rise with the placement of another row of rocks.
		This option was identified as a <u>potential scenario</u> in some locations and also in combination with other structures in the <u>medium to long term</u> . This was one of the options most favoured by stakeholders and the public.
3.12	Sustain - Beach with timber groynes structures maintaining same standard of protection.	The small to medium groyne structures, finished in timber, could extend up to 150m from the seawall line. Initially the top of the structures could be set at circa +5.0 mODN (at the seawall end) following the beach slope to toe out well above mean low water springs (MLWS) level. Groynes would not need to have the potential for adaptation (raising) to counter climate change sea level rise as their design life would end before long term climate change requirements would kick in. However, this being the case the groynes would need whole scale replacement and adaptation say every 20 to 25 years.
		<u>This option was rejected</u> due to the failure of this type of structure in the past (timber groynes were present on this shoreline prior to the current strategy and these groynes became dilapidated and were not replaced due to the general loss of beach material in front of the seawall), and the structural issue with the scale of the beach height retention required to sustain the standard of protection.
3.13	Sustain - Beach with rock armour structure combinations maintaining same standard of protection.	This option could comprise adoption of large fishtail structures in combination with intermediate medium sized groynes, both finished with 10 to 15 tonne armour units. Fishtails could extend 300m from the seawall line and could be up to 200m wide at the seaward end and groynes could be 150 to 200m long. Initially the top of the structures could be set at circa +5.0 mODN with the potential for adaptation (raising) to counter climate change sea level rise.
		This option was identified as a <u>potential scenario in the medium to long term</u> and is one of the options most favoured by stakeholders and the public.
3.14	Sustain - Beach with rock armour structures allowing for change in nourishment volume.	Similar to Options 3.10, 3.11 and 3.13 but instead of a blanket standard of protection throughout, certain areas will be well defended to a high standard and other areas will be allowed to have a lower beach buffer through more targeted initial nourishment followed by selective nourishment volume targeting in future years. Option has the potential to reduce volumes of material required whilst accepting that areas not immediately prone to risk to properties and life will have a lower standard of protection.
2.45	Sustain Baseh with rest	This option was rejected as it was not favoured by stakeholders and the public.
3.15	armour structures allowing for change in nourishment frequency.	well defended to a high standard and other areas will be allowed to have a lower beach buffer through more targeted initial nourishment followed by selective nourishment frequency targeting in future years. Option has the potential to reduce volumes of material required whilst accepting that areas not immediately prone to risk to properties and life will have a lower standard of protection.

		This action was rejected as it was not fever and by statished are and the public
3.16	Maintain - Beach with rock armour structures allowing for nourishment volumes / frequencies giving lower (or higher if sustain & improve) SoP.	Inis option was rejected as it was not ravoured by stakeholders and the public. Similar to Options 3.10, 3.11 and 3.13 but instead of a blanket standard of protection throughout, certain areas will be well defended to a high standard and other areas will be allowed to have a lower beach buffer through more targeted initial nourishment followed by selective nourishment volumes. Option has the potential to lower or higher volumes of material required. This option was rejected due to the long-term drop in standard of protection.
	Topic	Environmental consequences
	Biodiversity, flora and fauna	 Continued reduction in flood risk to freshwater and terrestrial habitats and species within the hinterland. No changes from present for sustain options, but a gradual increase in risk for maintain options over time. Presence of new significant subtidal structures result in loss of/damage to subtidal habitat under footprint of submerged structures and impacts on benthic, epibenthic fauna (due to disturbance, changes in water quality). Uncertain impacts on designated habitats and species and fisheries up- and, more likely, downdrift due to changes in sediment transport/coastal processes due to the presence of the structures altering sediment movement, reducing potential losses relative to present conditions – may be positive or negative. There will be differences between options depending on their orientation, form and structure and the associated frequency and volumes of beach nourishment required, although there will be impacts on beach habitats due to presence of new structures will maintain existing beach and landward dune habitats and associated biodiversity. Continued need to dredge sand from offshore sandbanks, but at a reduced frequency and volume to present management – continued with impacts on the benthic, subtidal and marine communities in these locations.
	Water and hydromorphology	 Opportunity to design new structures to increase biodiversity potential. Increased hydromorphological pressure from presence of existing and new coastal defence structures (i.e. shoreline reinforcement) and ongoing beach nourishment activities. No changes to status/potential of discharging artificial/HM river water bodies or underlying groundwater body in the hinterland.
	Material sustainability	 Ongoing materials demand for proactive works to maintain sea defences. Initial significant requirement to source construction materials (rock, timber) to build new defence structures – potential types of materials and sources not yet known – and ongoing management to maintain existing standard of protection. However, these options would reduce the overall volume of beach nourishment material required to maintain the existing standard of protection or sustain in line with sea level rise. Therefore, maintain and sustain options score 50 and 30 respectively; an increase in score of 30 compared to the beach nourishment options. The exception to this is timber groynes, which would not work and would require significant additional nourishment material, therefore, scoring 10.
	Landscape and visual amenity	 Options 3.8-3.11 and 3.13-3.16: Introduction of large rock structures will invariably affect the landscape and visual amenity, changing the existing character of the coastline and views from the beach/frontage. Offshore breakwaters would be a particularly large intrusion, especially at low tide. Slightly less intrusive, but still very visually prominent, would be fishtail groynes (especially the larger 'segment the coast' type, although there would be fewer of these) and straight groynes. The degree of change would depend on whether beaches are

	 maintained – scores 10 to 40. Similar scores for options 3.13 to 3.16 except considered slightly better if structures targeted for less visited areas – scores 20 to 50. Option 3.12: Timber groynes are less intrusive than rock structures and were present along this shoreline in the past (some still remain at Skegness) and so would score relatively higher. However, their performance may not be as effective as rock and therefore the existing sandy nature and character of the beaches may not be maintained – score 50.
Climate	 Options will provide an opportunity to proactively plan the response to adapt to future climate change through the programme of planned construction of new structures and associated (reduced level) of beach nourishment. Structures will be designed to provide the required standard of protection (whether to maintain or sustain the standard of protection). This will be determined at the outset of the strategy implementation in anticipation of the predicted changes in sea level; whether for a maintain or sustain option, and will be limited in their future adaptability without significant changes in design or additional investment. Onshore rock groynes offer the best opportunity to be redesigned and score best in this context. Option 3.16 also provides some additional flexibility and scores better.
Geology, geomorphology and coastal processes	 Introduction of new structures will change the local shoreline processes and sediment movement – depending on the type, size, position (i.e. cross or along shore; on the beach/nearshore or offshore) and location of structures; and associated beach nourishment. These could have potential wider implications for sediment transport and coastal processes relative to present conditions. Potential damage to geological features along the shoreline from the construction of new structures. Continued reduction in flood risk to geological features at risk within the hinterland and protection of those currently buried under the beach (where not affected by structures) – risk varies between maintain/sustain options and where the frequency of nourishment is varied or different standards are applied.
Historic environment	 Continued reduction in flood risk to features of archaeological and heritage value (whether designated or undesignated) and the wider historic environment/seaside heritage along the frontage and within the hinterland. No changes from present for sustain options, but a gradual increase in risk for maintain options over time. Presence of new significant subtidal structures result in loss of/damage to clay exposures/any unknown areas of archaeological interest under footprint of new beach and submerged structures; with greater impacts (and lower scores) for options that have the largest physical footprint or potentially alter the seaside heritage and character of the frontage.
Business development	 The maintain options would give some confidence, perhaps for 50 years, but that would cap development, suggest scores 50 to 60. Any sustain options would give highest confidence in the range do minimum, maintain, sustain, but the highest score (100) goes to seeing long term structures being put in place. Other sustain options would score 90 except changing frequency will reduce confidence. Option 3.16: Targeting certain areas may attract more confidence in this maintain option.
Transport	 The maintain options would keep transport links going for longer, but not much investment for the future, scores 60 to 80. Any sustain options would give highest confidence in the range do minimum, maintain, sustain, allowing for investment into improving transport links. Suggest scores of 80 to 100 for all sustain options. Targeting certain areas may attract improvements to transport links including better connectivity along the coast.
Land use	All maintain options are considered beneficial for land use and score 80.

		Sustain options would be considered the most beneficial, especially if little impact on the economy
		(agriculture, tourism and services). Score 100 except for sustain options with a beach, see 1.9.5.
	Population and health	 Do minimum, maintain and sustain options will score increasingly higher with sustain scoring the highest (100) for this criterion. Thus, assess maintain as 80 and do minimum as 50. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring avoidance by population (score 70 for this sustain option). Similarly, different beach material grading may impact on population and health (score 80).
	Recreation and tourism	 Maintain and sustain options with structures will score slightly less than open beach options due to there being a physical barrier. Score 80 and 90 respectively.
	Stress	HTL options will score high for sense of security with the highest scores for sustain and improve options. Lesser scores for maintain options and for less frequent works.
		 Option 3.15: Perception is that if sand is not placed every year, there is less commitment to flood defence. Option 3.16: As the whole area is currently one flood cell, stress levels will be higher due to possibility of outflanking.
	Emergency services	 Option 3.9: As the whole area is currently one flood cell, emergency response times may be compromised due to possibility of outflanking.
		HTL options will score high sense of security and emergency response with the highest scores for sustain and improve options. Lesser scores for maintain options and less frequent works, except that structures could
	A <i>i</i> :	compromise emergency service access routes on the seaward side.
	Option	Status/reasons for rejection
4	SEAWALLS, NO BEACH	
4.1	Maintain – maintaining and repairing seawalls only	Works involve maintaining and repairing seawalls only to maintain standard of protection.
		This option was rejected due to the long term drop in standard of protection and change in amenity.
4.2	Sustain – raising seawalls only	Works involve raising seawalls to sustain standard of protection in response to climate change
		This option was rejected due to the change in amenity and costs and also due to the fact that this option is not favoured by stakeholders.
4.3	Sustain - widening seawalls	Works involve widening seawalls to sustain standard of protection in response to climate change
	only	This option was rejected due to the change in amenity and costs and also due to the fact that this option is not favoured by stakeholders.
4.4	Sustain, maintain or do minimum, repair, raise or widen seawalls with no beach	Works involve modifications to seawalls, as required to maintain or sustain standard of protection with different works to the seawalls in different locations.
	nourishment.	This option was rejected due to the change in amenity and costs and also due to the fact that this option is not favoured by stakeholders.
	Торіс	Environmental consequences
	Biodiversity, flora and fauna	 Continued reduction in flood risk to freshwater and terrestrial habitats and species within the hinterland with positive impacts. No changes from present for sustain options, but a gradual increase in risk for maintain/do minimum options over time with associated adverse impacts.
		 Loss/erosion of beach over time with likely changes in subtidal habitats (Sabellaria potentially present), physical processes and sediment transport up and downdrift (from present day).

	 Direct impacts on beach/coastal habitats due to presence of larger structures.
	 Uncertain impacts on designated habitats and species and fisheries up- and, more likely, downdrift – these may be positive or negative relative to present management e.g. potential reduction/change in supply of
	material to Gibraltar Point, reduction in potential movement of sand into The Wash, etc.
	No requirement for any dredged sand from offshore sandbanks – avoiding impacts on the benthic, subtidal
	and marine communities in these locations.
Water and hydromorphology	Maintaining or expanding existing defence structures, even with standards deteriorating over time, will maintain and increases existing budgemeents begins and the LIM secretary water body
	maintain and increase existing hydromorphological pressure on the HM coastal water body.
	 Cessation of beach nourishment activities would remove this element of the existing hydromorphological pressure; but additional pressure from the continued presence and reinforcement of the existing sea
	gelences.
	 No changes to status/potential of discharging artificial/HM river water bodies or underlying groundwater body in the binterland, except a startic linear age in risk in languation for activity anti-
	in the ninteriand, except potential increase in risk in long term for maintain option.
	Overall it is considered to have the potential to be the worst performing options under this criterion.
Material sustainability	 Initial significant requirement to source construction materials to increase defence structures – potential types of materials and sources not yet known – and ongoing management to maintain existing standard of protection. The volumes required will depend on the design, extent and form of these raised or widened
	defences.
	 No new material will be obtained and used to nourish beaches; therefore, no dependence on annual beach nourishment.
	Therefore, sustain and maintain options will score 50 and 70 respectively.
Landscape and visual amenity	 Options with seawall repairs and improvements (i.e. raising or widening) without beach nourishment would be very detrimental to the landscape (especially the seascape) and visual amenity would be severely affected (especially by higher walls) – hence low scores 10 to 20.
Climate	 Options will provide an opportunity to proactively plan the response to adapt to future climate change through the programme of planned maintenance of existing and construction of new structures.
	 Structures will be designed to provide the required standard of protection (whether to maintain or sustain the standard of protection). This will be determined at the outset of the strategy implementation in anticipation of
	the predicted changes in sea level; whether for a maintain or sustain option, and will be limited in their future adaptability without significant changes in design or additional investment.
Geology, geomorphology and coastal processes	 Loss of fronting beach over time with potential changes in coastal morphology with functioning of the coastline significantly limited by the presence of the expanded existing landward defence structures. Potential implications for sediment transport and coastal processes relative to present conditions.
	• Erosion of the beach would expose the designated geological features (e.g. RIGS) and potential damage to
	geological features on the beach from the construction of new structures. Continued positive reduction in flood
	risk to geological features at risk within the hinterland. Considered to be the worst performing option for this criteria, hence score 0.
Historic environment	 Option 4.1: Doing minimum 'patch and repair' will continue to reduce flood risk in short to medium term with resulting benefits to archaeological and heritage features (whether designated or undesignated) and the wider historic environment/seaside heritage along the coast and in the hinterland from reduced flood risk. In long term, the eventual loss of fronting beach will result in a reduction in standard of protection, increasing risk to features in the hinterland – either by direct damage or changes to setting – and exposing the clay exposures here to be applied environment of the patch.

	Business development Transport Land use Population and health	 Continued reduction in flood risk to features of archaeological and heritage value (whether designated or undesignated) and the wider historic environment/seaside heritage along the frontage and within the hinterland. No changes from present for sustain options, but a gradual increase in risk for maintain options over time. In long term, the eventual loss of fronting beach will expose the clay exposures known to be of paleo-environmental importance. Presence of new significantly increased structures result in damage to/changes to setting of any archaeological/heritage features in the vicinity of new structures. Seawall only options may give confidence to the security of the sea defence, but would inhibit the business potential of the beach. Therefore, development would score poorly as opposed to keeping the beach. Score range 30 to 60 for maintain and sustain respectively. Option 4.1: Maintaining and repairing the seawall only may lead to more damage to coastal links, score 40. Seawall only options may consider benefits of including new coastal links built into the structure. Although need for additional links may be questioned if business potential falls. Therefore score range of 70 for the sustain options. Option 4.1: All maintain options are considered beneficial for land use and score 80. Sustain options which would end up with loss of beach would impact on the tourism economy and therefore land along the coastal strip may become derelict, score 80. Do minimum, maintain and sustain options will score increasingly higher with sustain scoring the highest (100) for this criterion. Thus, assess maintain as 80 and do minimum as 50. Exception is the sand engine option
	-	which may present safety (health) issues due to potential quick-sand presence requiring avoidance by population (score 70 for this sustain option). Similarly, different beach material grading may impact on population and health (score 80).
	Recreation and tourism	 Options with no beach will score lower for recreation and tourism (30), except for the widening option which could provide a wider open space (score 60).
	Stress	 HTL options will score high for sense of security with the highest scores for sustain and improve options. Lesser scores for maintain options and for less frequent works.
	Emergency services	 Solid seawalls would be good for emergency service access in general but the ultimate condition of having little or no beach in front of the seawall could strongly compromise emergency service access routes on the seaward side.
	Option	Status/reasons for rejection
5	COMPARTMENTALISATION	
5.1	Sustain - Various approaches, e.g. rock headlands and wider beaches	Similar to option 3.10, but with even larger structures, possibly stretching up to 1 km offshore. Structures may end up having a variety of uses and must be considered in combination with other intermediate control structures but primarily the approach is to isolate sections of coastline into distinct areas. This option was rejected due to the overall low score in the detailed assessment, resulting from initially high material (rock) needs and expenditure in short-term, and changes to geomorphology, sediment balance and landscape.
5.2	Sustain - Hardpoints plus single realignment and beaches in some locations	Similar option 5.1, but with the added feature of a single (relatively large, circa 5km long) long term realignment opportunity.

	This option was rejected due to the overall low score in the detailed assessment, resulting from changes to landscape and sediment balance, and impacts on undeveloped land (including potential archaeological remains). Additionally,
	this option could not be practicably implemented in the short-term.
5.3 Sustain - Hardpoints plus multiple realignment and beaches in some locations.	Similar option 5.1, but with the added feature of a smaller (circa 1-2km long) multiple long term realignment opportunities.
	This option was rejected due to the overall low score in the detailed assessment, resulting from changes to landscape and sediment balance, and impacts on undeveloped land (including potential archaeological remains). Additionally, this option could not be practicably implemented in the short-term.
Topic	Environmental consequences
Biodiversity, flora and fauna	 Option 5.1: Continued reduction in flood risk to freshwater and terrestrial habitats and species within the hinterland with positive impacts. Presence of new structures result in loss of/damage to subtidal habitat under footprint of submerged structures and impacts on benthic, epibenthic fauna (due to disturbance, changes in water quality) and beach habitats. Larger but fewer structures will be required, relative to the other control structure options. Uncertain impacts on designated habitats and species and fisheries up- and, more likely, downdrift due to changes in sediment transport/coastal processes as a result of the presence of the rock headlands altering sediment movement, reducing potential losses relative to present conditions – may be positive or negative. This will depend on their orientation, form and structure and the associated frequency and volumes of beach nourishment required. Presence of new structures will maintain existing beach and landward dune habitats and potentially provide
	 Reduction in need to continuously dredge sand from offshore sandbanks to nourish beaches, limited to an initial nourishment activity – reducing impacts on the subtidal and marine communities in these locations. Opportunity to design new structures to increase biodiversity potential.
	 Continued reduction in flood risk to freshwater and terrestrial habitats and species within the hinterland – with the flexibility to consider realignment and alternative, more diverse, habitat creation as appropriate. Presence of new structures result in loss of/damage to subtidal habitat under footprint of submerged structures and impacts on benthic, epibenthic fauna (due to disturbance, changes in water quality) and beach habitats. Uncertain impacts on designated habitats and species and fisheries up- and, more likely, downdrift due to changes in sediment transport/coastal processes as a result of the presence of the rock structures altering sediment movement, reducing potential losses relative to present conditions – may be positive or negative. This will depend on their orientation, form and structure and the associated frequency and volumes of beach nourishment required. Presence of new structures will maintain existing beach and landward dune habitats and associated biodiversity – with the flexibility to consider realignment and alternative, more diverse, habitat creation as appropriate. Reduction in need to continuously dredge sand from offshore sandbanks to nourish beaches, limited to an initial nourishment activity – reducing impacts on the subtidal and marine communities in these locations. Opportunity to design new structures and realignment areas to increase biodiversity potential. Considered to have the potential to be the best performing options under this criterion.
Water and hydromorphology	 Increased hydromorphological pressure from presence of new (and existing) coastal defence structures (i.e. shoreline reinforcement). Potential opportunities to create sections of more 'naturally' functioning coastline within any realignment areas. No changes to status/potential of discharging artificial/HM river water bodies or underlying groundwater body
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Material sustainability	 in the hinterland. Option 5.1: Initial significant requirement to source construction materials to build new defence/headland structures – potential types of materials and sources not yet known – and ongoing management to maintain/sustain existing standard of protection. Potential requirement for additional materials to initially "feed" beaches between structures where needed or engineer new realignments. This may be required on an ongoing basis. Assumed that score is similar to Option 3.9 (offshore structures). Options 5.2-5.3: Initial significant requirement to source construction materials to build new structures – potential types of materials and sources not yet known – and ongoing management to maintain/sustain existing standard of protection. Potential requirement for additional materials to initially "feed" beaches between structures where needed or engineer new realignments. However, following the initial "feed", there will be no requirement to source and place new beach material as the individual cells are designed to become self-sustaining.
Landscape and visual amenity	 Option 5.1: Relatively unknown what response will be to compartmentalisation. May be beneficial in landscape and amenity respects in some areas but detrimental in others, i.e. depends very much on where the new features are introduced and how the coastal processes respond – score 50. Options 5.2-5.3: Similar to compartmentalisation but now including for realignment(s). May be beneficial in landscape and amenity respects in some areas but detrimental in others, i.e. depends very much on where the new features are introduced and how the coastal processes respond – score 50.
Climate	 Options will provide an opportunity to proactively plan the response to adapt to future climate change through the programme of planned construction of new structures, associated (reduced level) of initial beach nourishment and partial realignments. Compartmentalisation approach potentially provide increased flexibility to adapt responses to local conditions and changes over time. Structures will be designed to provide the required standard of protection (whether to maintain or sustain the standard of protection). This will be determined at the outset of the strategy implementation in anticipation of the predicted changes in sea level and will be limited in their future adaptability without significant changes in design or additional investment. Options score 70 given uncertainty regarding proposed approach.
Geology, geomorphology and coastal processes	 Introduction of new structures will change the local shoreline processes and sediment movement – depending on the type, size, position (i.e. cross or along shore; on the beach/nearshore or offshore) and location of structures; and associated initial beach nourishment. Potential wider implications for sediment transport and coastal processes of compartmentalising the coast relative to present conditions. Potential damage to geological features on the beach from the construction of new structures; but continued reduction in flood risk to geological features at risk within the hinterland, where appropriate, and protection of those currently buried under the beach (where not affected by structures or realignments) – risk varies where different standards would be applied.
Historic environment	Continued reduction in flood risk to features of archaeological and heritage value (whether designated or undesignated) and the wider historic environment/seaside heritage along the frontage and within the

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	 hinterland within the compartments/potential realignment areas. No changes from present for sustain options and no differences between options. Presence of new significant subtidal structures result in loss of/damage to clay exposures/any areas of archaeological interest under footprint of any new structures.
Business development	 High potential for development surrounding new headlands but existing developments may suffer. Consider range of scores 80 to 60 depending on outline considerations of holding the line or allowing for 1 or more realignments.
Transport	 Option 5.1: Any sustain options would give highest confidence in the range do minimum, maintain, sustain, allowing for investment into improving transport links. Suggest scores of 80 to 100 for all sustain options. Targeting certain areas may attract improvements to transport links including better connectivity along the coast. Options 5.2-5.3: Any outline considerations of allowing for 1 or more realignments will affect existing transport links, but careful planning could incorporate new links along retired defence lines. Therefore score should reflect potential, 90.
Land use	 Option 5.1: Sustain options would be considered the most beneficial, especially if little impact on the economy (agriculture, tourism and services). Score 100 except for sustain options with a beach, see 1.9.5. Options 5.2-5.3: Sustain options with single or multiple realignments would lose some land currently given over to agriculture, tourism and services. Suggest scores of 80 and 70 respectively.
Population and health	 Do minimum, maintain and sustain options will score increasingly higher with sustain scoring the highest (100) for this criterion. Thus, assess maintain as 80 and do minimum as 50. Exception is the sand engine option which may present safety (health) issues due to potential quick-sand presence requiring avoidance by population (score 70 for this sustain option). Similarly, different beach material grading may impact on population and health (score 80).
Recreation and tourism	Segregation and realignment options may provide alternative amenities and may therefore also score high (100).
Stress	 Option 5.1: HTL options will score high for sense of security with the highest scores for sustain and improve options. Lesser scores for maintain options and for less frequent works. Options 5.2-5.3: Changing the line will increase stress for some most affected but conversely may not increase stress for others. Hence score 50.
Emergency services	 Option 5.1: HTL options will score high sense of security and emergency response with the highest scores for sustain and improve options. Lesser scores for maintain options and less frequent works. Options 5.2-5.3: Changing the line should be planned with adequate provision for emergency access and therefore scores high.

All 27 options in Table C.3 were scored on a relative basis between 0 (worst performing) and 100 (best performing) based on whether their performance was closest to the best or worst performing option for each criterion. Where scores play an important role in the status of the option, the score has been incorporated in Table C.3 above. The scores for all criteria were added and the criteria weighted (as indicated previously) to reduce the long list to a short list of 13 best-performing ranked options (plus the do-nothing base case).

This short list of 14 options (see Table C.4) was then subject to further detailed analysis using the following weighted criteria: (a) SEA objectives and assessment criteria in Table 4.2 of the Environmental Report (40%); (b) technical and social criteria (40%); and (c) other (more global) criteria (20%). The results of the analysis were presented in evaluation matrix templates. In order to critically assess the options, and in the essence of

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project specific detailed modelling, a range of assumptions were made. Term durations were selected and proposed with reference to the SMP Epochs as follows:

- Short term SMP Epoch: Present (from 2006) to 2025 (propose SGPS to 2025)
- Medium term SMP Epoch: 2025 to 2055 (propose SGPS 2026 2055)
- Long term SMP Epoch: 2055 to 2105 (propose SGPS 2056 to 2120)

Table C.4: Options short-listed following high level appraisal

No	Options
1	1 - Do nothing (Base case)
2	2.3 - Sustain - Doing the minimum works necessary to maintain the defence line including for climate change.
3	3.2 - Sustain - Annual nourishment (WPM) increasing volumes to maintain same standard of protection.
4	3.4 - Sustain - Nourishment every 2 to 3 years increasing volumes to maintain same standard of protection.
5	3.7 - Sustain - Beach without control structures with different beach material grading.
6	3.10 - Sustain - Beach with large rock armour fishtail breakwater control structures maintaining same standard of protection.
7	3.11 - Sustain - Beach with rock armour groynes structures maintaining same standard of protection.
8	3.12 - Sustain - Beach with timber groynes structures maintaining same standard of protection.
9	3.13 - Sustain - Beach with rock armour structure combinations maintaining same standard of protection.
10	3.14 - Sustain - Beach with rock armour structures at lower or higher standards of protection by changing nourishment volumes.
11	3.15 - Sustain - Beach with rock armour structures at lower or higher standards of protection by changing nourishment frequency.
12	5.1 - Sustain - Segment the coast with rock headlands and wider beaches.
13	5.2 - Sustain - Hardpoints plus single realignment + beaches in some locations.
14	5.3 - Sustain - Hardpoints plus multiple realignment + beaches in some locations.

Options were scored in terms of whether they fully, partially or did/did not meet these criteria (from a range of +2 to -2). All options were assessed against a baseline of present day conditions, accounting (as far as possible) for changes over time in the future. The environmental evaluation matrix (see Tables C.6 and C.7) was combined with the scores from the other assessments (see Table C.5 for criteria used) and the weighting applied, to identify the highest ranking options in terms of best meeting the various criteria. The six best ranked options were then subject to further consultation to identify the preferred strategy.

Table C.5. Technical and economic criteria used for the detailed appraisal.

Technical and Economic Criteria	Assessment Objective	No	Assessment Criteria
		1	Allow long-term natural adaptation to rising sea levels?
10. Work with rather than	Refer to coastal processes	2	Avoid adverse effects on sediment balance of neighbouring sites?
against coastal processes?	report	3	Is it a valid option in light of the local coastal process issues?
		4	High or low sensitivity to external change? (-2, -1, 0, 1, 2)
		5	Defence can be feasibly constructed?
		6	Defence can be feasibly maintained?
11. Technically feasible?	Construction, maintenance and practicality	7	Is option practicable in short-term timeframe (to 2025)
		8	Is option practicable in medium-term timeframe (2026 - 2055)
		9	Is option practicable in long-term timeframe (2056 - 2120)
	Economic (PV) expenditure	10	Relative expenditure profile, i.e. overall discounted cost estimates are used for economic case over the duration of the assessment? Ranked: Very High, High, Medium, Low, Very Low (-2, -1, 0, 1, 2)
	Financial (cash) expenditure profile	11	Short-term (to 2025) relative expenditure profile, i.e. from being a front heavy option cost with lower costs in the future as opposed to being a regular annual cost? Ranked: Very High, High, Medium, Low, Very Low (-2, - 1, 0, 1, 2)
12. Economically and financially feasible?		12	Medium-term (2026 - 2055) Relative expenditure profile, i.e. from being a front heavy option cost with lower costs in the future as opposed to being a regular annual cost? Ranked: Very High, High, Medium, Low, Very Low (-2, -1, 0, 1, 2)
		13	Long-term (2056 - 2120) Relative expenditure profile, i.e. from being a front heavy option cost with lower costs in the future as opposed to being a regular annual cost? Ranked: Very High, High, Medium, Low, Very Low (-2, - 1, 0, 1, 2)
	Does not require excessive capital or maintenance costs disproportionate to the risk?	14	Relative cost of option? Ranked: Very High, High, Medium, Low, Very Low (-2, -1, 0, 1, 2)

Table C.6: Option assessment matrix score summary: Environmental Criteria 1 to 24

No	Assessment Criteria	1	2.3	3.2	3.4	3.7	3.10	3.11	3.12	3.13	3.14	3.15	5.1	5.2	5.3
1	Do the proposals change the number of residential properties at risk from flooding from the present day?	-2	2	2	2	2	2	2	2	2	2	2	2	1	1
2	Do the proposals seek to manage future risks to properties through an adaptive approach?	-2	1	1	1	2	2	2	1	2	2	2	2	2	2
3	Do the proposals change social vulnerability and deprivation in affected areas from the present day?	-2	1	2	2	2	2	2	1	2	2	2	2	2	2
4	Do the proposals affect the viability of local communities?	-2	1	2	2	2	2	2	1	2	2	2	2	2	2
5	Do the proposals help to maintain or improve amenity beaches and associated facilities, compared to the present day?	-2	1	2	2	1	1	1	1	1	1	1	1	1	1
6	Do the proposals maintain or improve visitor attractions from the present day?	-2	1	2	2	1	1	1	1	1	1	1	1	2	2
7	Do the proposals maintain, or improve, existing access and recreational provisions/facilities along the coast, compared to the present day?	-2	1	2	2	2	1	1	1	1	1	1	1	2	2
8	Do the proposals contribute to future regeneration of the tourism industry or improve formal or informal recreational facilities/opportunities?	-2	0	1	1	1	1	1	0	1	1	1	1	1	1
9	Do the proposals change the level of risk to areas of significant employment or economic activity?	-2	1	2	2	2	2	2	2	2	2	2	2	2	2
10	Could the proposals generate future employment/development opportunities?	-2	ο	1	1	1	1	1	0	1	1	1	1	1	1
11	Are there conflicts between the proposals and ongoing/planned development?	-2	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Do the proposals affect commercial fishing/shellfisheries activity (e.g. by affecting important fisheries, restricting access to fishing grounds or presenting risks to water quality) in The Wash and offshore waters?	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
13	Could the proposals conflict with or change the risk of flooding to key transport routes (roads) from the present day?	-2	1	2	2	2	2	2	2	2	2	2	2	1	1
14	Could the proposals conflict with or will it change the risk of flooding to critical services/infrastructure from the present day?	-2	1	2	2	2	2	2	2	2	2	2	2	1	1
15	Do the proposals require the use of significant volumes of finite materials? Are these readily available?	0	-1	-2	-2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
16	Do the proposals require the sourcing of and regular input of finite materials over the lifetime of the strategy?	0	-2	-2	-2	-1	-1	-1	-2	-1	-1	-1	-1	о	ο
17	Are there any constraints on the availability of materials required?	0	-2	-2	-2	-1	-1	-1	-2	-1	-1	-1	-1	0	0
18	Do the proposals allow flexibility for the sourcing of alternatives?	0	-2	-2	-2	1	-1	-1	-2	-1	-1	-1	-1	-1	-1
19	Do the proposals affect conservation/condition status of international or national nature conservation sites (SPA, SAC, Ramsar sites, MCZ, SSSI, NNR), or support achievement of conservation objectives, compared to the present day?	-1	-1	-1	-1	0	0	0	0	0	0	0	0	0	0
20	Do the proposals affect the condition of local nature conservation sites (LNR, LWS, SNCI) compared to the present day?	-2	2	2	1	1	1	1	1	1	1	1	1	1	1
21	Could the proposals damage or result in loss of Habitats of Principal Importance present within the strategy area?	-2	1	1	1	1	1	0	1	1	1	1	0	1	1
22	Could the proposals affect Species of Principal Importance or known species of conservation concern, known to be present along the coastal frontage or in the coastal waters within the strategy area?	-2	0	0	0	-1	-1	0	-1	-1	-1	-1	0	1	1
23	Could the proposals affect fish/shellfish or their spawning/nursery grounds within the strategy area?	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0
24	Are there any opportunities for habitat restoration or creation?	0	0	0	0	0	1	1	0	1	1	1	1	2	2

Table C.7: Option assessment matrix score summary: Environmental Criteria 25 to 45

				100110			-				-				
25	Do the proposals affect geological interests of nationally (SSSI) or locally (LGS, RIGSs) designated earth heritage sites, compared to the present day?	-2	1	2	2	2	1	1	1	1	1	1	1	0	0
26	Do the proposals work with natural geomorphological processes, including sediment movement, and enable natural evolution of the coastline?	1	-1	-1	-1	-1	-2	-2	-1	-2	-2	-2	-2	-1	-1
27	Do the proposals change the risk of flooding to known and potentially contaminated land and licensed/historic landfills, compared to the present day?	-2	2	2	2	2	2	2	2	2	2	2	2	2	2
28	Will the proposals change risk of tidal flooding to the existing agricultural land, compared to the present day, affecting its quality and versatility?	-2	2	2	2	2	2	2	2	2	2	2	2	1	1
29	Do the proposals impact on other key land uses?	-2	2	2	2	2	2	2	2	2	2	2	2	1	1
30	Will the proposals help or conflict with meeting WFD objectives for good ecological status/potential for water bodies (coastal, river and groundwater) within the strategy area?	-1	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
31	Will the proposals affect or contribute to the delivery of morphological mitigation measures for water bodies (coastal, transitional, river and groundwater) within the strategy area?	0	0	0	0	0	0	0	0	0	0	0	0	1	1
32	Will the proposals affect WFD protected areas, e.g. Bathing Water Directive, for water bodies within the strategy area?	-1	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Will the proposals contribute to climate change?	0	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-1	-1
34	How vulnerable are the proposals to climate change?	-2	1	-1	-1	1	2	2	-1	2	2	2	2	2	2
35	Can the proposals adapt to future climate changes?	-2	1	1	1	1	1	1	1	1	1	1	2	2	2
36	Will the proposals change the risk of flooding to nationally designated heritage assets (Scheduled Monuments, Registered Park and Gardens, Protected Wreck sites, listed buildings) and locally designated heritage assets (listed buildings, Conservation Areas) within the strategy area; or directly affect their physical structure/condition or setting?	-2	2	2	2	2	2	2	2	2	2	2	2	1	1
37	Will the proposals change the risk of flooding to or affect the current condition of locally listed heritage assets and their setting within the strategy area?	-2	2	2	2	1	1	1	1	1	1	1	2	1	1
38	Will the proposals affect known undesignated archaeological and paleo- environmental features along the coastal frontage within the strategy area?	-2	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1
39	Will the proposals encroach on undeveloped land, which may harbour archaeological remains?	0	0	0	0	0	-1	-1	0	-1	-1	-1	-1	-2	-2
40	Are the proposals sympathetic to the local character of the historic environment?	-2	0	1	1	0	-1	-1	0	-1	-1	-1	-1	-1	-1
41	Is there any potential for loss of access to heritage resources?	-2	0	0	0	0	-1	-1	0	-1	-1	-1	-1	-1	-1
42	Could the proposals include/promote opportunities for heritage-led regeneration or heritage-based tourism?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	Will the proposals lead to the introduction of features which are unsympathetic to the present character of the landscape and cause deterioration?	-2	1	2	2	1	-2	-2	-1	-2	-2	-2	-2	-2	-2
44	Will the proposals improve the value of the existing landscape (i.e. the aesthetic satisfaction derived from a landscape type), compared to the present day?	-2	-1	0	0	-1	-2	-2	-1	-2	-2	-2	-1	-1	-1
45	Will the proposals result in an adverse change to sea views along the coastal frontage where these significantly contribute to the value and quality of the coastal landscape?	-2	-1	0	0	-1	-2	-2	-1	-2	-2	-2	-1	-1	-1

APPENDIX D: Strategy proposals – key assumptions for the SEA

Table D.1: Details	of strategy proposal	assumptions in the short	, medium and long term
	······································		,

Short	Maintain open beach					
term	Sustain – annual nourishment (with present management) increasing volumes to maintain					
(0 - 5	same standard of protection. All works within Zone B erosion hotspots ¹ (refer to Figure 2.3)					
vears)	between Mablethorpe and Ingoldmells.					
or ,	1 5					
practically	With climate change sea level rise (I	IKCP	(9) prediction of 0.1 m sea level rise in the short			
until 2025	term assume that the current design	beac	h profile is valid throughout the period This design			
	profile was developed during the 200	10/10	appraisal/approval to achieve a 1 in 200 standard of			
	protection (0.5% risk) and has perfor	med v	well since 2010. The nourishment design sand crest			
	level will remain at 4 50 mAOD (New	lineu v dvp) +	0.3 m height tolerance. Nourishment volumes will			
	increase only if creation of the beach	iyii) +	reason but overall volumes will be adopted within			
	toloronooo (i.o. moot booob dooign of		idthe north of Chonel Doint have a 5 m tolerance)			
	Note that dimete change predictions		iuliis north of Chaper Point nave a 5 m tolerance).			
	Note that climate change predictions	wiii e	volve through time. The current estimate is			
	considered to be robust for strategic	purpo	ses. Future strategy revisions and business cases			
	will adopt the latest guidance on clim	ate ch	nange.			
Medium	Scenario 1	OR	Scenario 2			
term	Continue to maintain open		Introduce control structures			
(6 - 35	beach		Depending on actual trigger points being activated			
years)	Sustain – annual nourishment (with		(e.g. significant sand erosion at hotspots, seawall			
or	present management) increasing		toe exposures within 1 year) introduce structures			
practically	volumes to maintain same		at most erosion affected locations or plan trials for			
2026 to	standard of protection. All works		groups of structures at agreed locations. The			
2055	within Zone B between		ultimate goal is to complete structure installations			
	Mablethorpe and Ingoldmells.		over a period of 10 to 15 years.			
	However, some periodic		Sustain – beach with rock armour structure			
	nourishments may be required		combinations maintaining same standard of			
	between Ingoldmells and Skegness		protection. All works within Zone B between			
	if deemed necessary. Also, sand		Mablethorpe and Skegness. Sand recycling may			
	recycling may be required to the		also be required to the north of Mablethorpe as			
	north of Mablethorpe as was		was carried out in January 2014 (although still			
	carried out in January 2014		within Zone B)			
	(although still within Zone B)					
			Reach nourishment will still be required to stabilise			
	Moderate increases to heach levels		beach levels following initial structure placements			
	required to accommodate 0.35 m		Oppoing requirements will involve beach			
	estimated sea level rise. The		nourishments every 5 to 10 years			
	pourishment design send crest		nounsiments every 5 to 10 years.			
	lovel may thus and up at 4 90		Madarata increases to beach levels required to			
	m = 0 $m = 0$ $m =$		Moderale increases to beach revers required to			
	mAOD + 0.5m height tolerance (no		The neurishment design conderect level may thus			
	change in beach crest width		The nourishment design sand crest level may thus			
	currentiy proposed). Actual		end up at 4.80 mAOD + 0.3 m neight tolerance.			
	nourishment volumes continuously		Actual nourishment volumes continuously			
	monitored against predictions.		monitored against predictions. Subsequent			
	Subsequent nourishments adapted		nourishments adapted to target most vulnerable			
	to target most vulnerable areas.		areas. With the structures providing some			
			segregation of the frontages, crest levels can be			
			adapted to suit the prevailing sea defence profile			
			dimensions, i.e. the beach crest level increases			
			may be less on better protected frontages.			

¹ Six key erosion 'hotspot' locations within Zone B: Mablethorpe, Trusthorpe & Sutton on Sea; Boygrift; Huttoft & Moggs Eye; Wolla Bank & Chapel Six Marshes; Trunchlane; and Ingoldmells.

Long	Continue to maintain open	OR	Continuing structure maintenance and
term	beach	0	maintain beach profiles
(35 - 100	Sustain – annual nourishment (with		Sustain - operation/maintenance phase
vears)	present management) increasing		Structures – ongoing maintenance of structures
or	volumes to maintain same		As beach levels are raised, so too will the crest
practically	standard of protection All works		height of the beach control structures, but this will
2056 to	initially within Zone B between		be effective in 50+ years time and only at the
2120	Mablethorpe and Ingoldmells		landward end of the control structures where
2120	However some regular		beach levels will be raised. All works initially within
	nourishments may be required		Zone B between Mablethorpe and Skegness
	between Ingoldmells and Skegness		Beach nourishment – ongoing requirements will
	if deemed necessary Also		involve nourishment every 5 to 10 years. All works
	periodic sand recycling may be		initially within Zone B between Mablethorpe and
	required to the north of		Skegness, Also, periodic sand recycling may be
	Mablethorpe as was carried out in		required to the north of Mablethorpe as was
	January 2014 (This may encroach		carried out in January 2014 (This may encroach
	into Zone A). Nourishments may		into Zone A). Nourishments may also be required
	also be required in the northern		in the northern part of Zone C although this will
	part of Zone C although this will		require further assessments at the time
	require further assessments at the		(environmental baselines may have changed by
	time (environmental baselines may		then).
	have changed by then).		,
	3,,,,		Climate change and sea level rise will eventually
	Climate change and sea level rise		require higher and wider beaches to accommodate
	will eventually require higher and		up to 1.1 m estimated sea level rise and hence
	wider beaches to accommodate up		higher sand backstop walls in the long term (+50
	to 1.1 m estimated sea level rise		vears), albeit on a reduced basis compared to the
	and hence higher sand backstop		open beach option. The nourishment design sand
	walls in the long term (+50 years).		crest level may thus end up at between 5.0 and
	The nourishment design sand crest		5.50 mAOD + 0.3 m height tolerance.
	level may thus end up at between		
	5.0 and 5.50 mAOD + 0.3m height		
	tolerance.		

Table D.2: Initial design assumptions for the two principal scenarios included within the strategic approach – used as the basis for this assessment

Scenario	1: Open beach: Sustain – annual nourishment (with present management) increasing volues to maintain same standard of protection	2: Introduce structures: Sustain – beach with rock armour structure combinations maintaining same standard of protection
Description	Continuation of the current coastal defence strategy of proactive annual beach nourishment. Working with nature in front of the seawall will provide an effective form of soft coastal defence, efficiently absorbing the energy of approaching waves. Long term sustainability may be impacted by increases in nourishment requirements. Material source may be	This option could comprise adoption of large fishtail structures in combination with intermediate medium sized groynes, both finished with 10 to 15 tonne armour units. Fishtails could extend 300 m from the seawall line and could be up to 200 m wide at the seaward; groynes could be 150 to 200 m long. Initially the top of the structures could be set at circa +5.0 mAOD with the potential for adaptation (raising) to counter climate change sea level rise.

Scenario	1: Open beach: Sustain – annual nourishment (with present management) increasing volues to maintain same standard of protection	2: Introduce structures: Sustain – beach with rock armour structure combinations maintaining same standard of protection
	further away implying longer transit times for dredgers and higher carbon footprint.	Structure footprints would be quite extensive for the fishtails (between 10,000 and 12,000 m^2) due to the sloping bathymetry at the shore (potentially down to -4 mAOD {4m below Ordnance Datum} at 300 m) calling for a large pyramid shape to foundation level. Groyne structures would have 1,200 to 2,000 m^2 footprints. Based on current assumptions on size and spacings, as a function of total beach area, the combination of fishtail and groyne structures would cover 4% to 6% of the intertidal area.
		It is envisaged that rock material would be imported from Norway, which is a relatively straightforward route across the North Sea. Each fishtail groyne could comprise up to 45,000 m ³ (100,000 tonnes) of rock and each groyne could comprise 3,000 to 4,000 m ³ (7,000 to 10,000 tonnes) of rock.
Approach	The wide, sloping beach will protect the existing seawalls, reducing wave overtopping and possible breaching of the defences in conditions up to the design storm event. Beach nourishment will also protect the underlying clay layer from long-term erosion. Design beach profiles will vary slightly along the coast in accordance with seawall parameters. A planned nourishment regime will contribute towards knowledge retention and dedicated teams. Keeping pace with climate change would require moderate increases to beach levels in the medium term. Climate change and sea level rise will eventually require higher and wider beaches and hence higher walls in the long term (+50 years).	This option would have the same technical merits of beach nourishment as nourishment would form part of the initial construction. The large fishtail structures could be spaced to suit coastal features but would generally be spaced between 900 and 1,500 m apart (subject to coastal modelling) to provide large crescent bays augmented by the rock groynes. These would stabilise to a minimum beach (design) width halfway between the fishtail structures. Beaches would therefore change from being linear (generally following the coastline) to crescent bays holding more sand (or other nourished material) within the large bays. Critical beach widths will be at the centre of the bays. These areas may be subject to remedial works until some equilibrium in plan beach shape is reached. Keeping pace with climate change would require moderate increases to beach levels in the medium term. Climate change and sea level rise will eventually require higher and wider beaches and hence higher walls in the long term (+50 years), although wave diffraction and the breaking action of structures will reduce wave energy reaching the shoreline compared to an open beach.

Scenario	1: Open beach: Sustain – annual nourishment (with present management) increasing volues to maintain same standard of protection	2: Introduce structures: Sustain – beach with rock armour structure combinations maintaining same standard of protection
Location assumptions	Applicable to 'hotspot' areas in the short term, to all areas within Zone B in the medium term, and all Zones A, B and C in the long term.	Applicable to 'hotspot' areas in the short term, to all areas within Zone B in the medium term, and all Zones A, B and C in the long term.
	(Trigger levels will need to be set to determine when and where action will be required).	(Trigger levels will need to be set to determine when and where action will be required).
End product assumptions	Wide open beaches allowing material to move in response to coastal processes (wave and tides). Seawall damage kept to a minimum as long as beaches are maintained in a healthy state and adapted to climate change.	Large rock armour structures with crescent shaped beaches interspersed with medium sized rock groynes. Beaches would initially be built up through nourishment until sufficient sediments are present to provide the minimum design profile (at the centre). Sediments should be trapped within the bays with minimal transfer along the coast due to tidal currents being further seaward compared to at present. Onshore / offshore sediment transfer could still occur at mid crescent. Potentially in the short to medium term longshore drift will be significantly reduced, leading to depletion of downdrift beaches.
		Option will require transitional arrangements for topping up affected areas until the coast returns to some form of equilibrium.

APPENDIX E: Detailed Baseline Description

Note: taken directly from the SGPS Scoping Consultation Document (Environment Agency, 2016). Any relevant updates are included within the Environmental Report.

E.1. Population and local economy

Population and health

Lincolnshire has an estimated population of 713,653 (2011 Census); a 10.4% increase since 2001, which exceeds the rate at both regional and national levels. The largest increase in the population was in the 60 – 64 age group with decreases in the younger age groups (i.e. under 14 years) (Lincolnshire Research Observatory (LRO) 2011). Pressure on the existing environment is therefore considerable and care is required to ensure that new development and infrastructure required as a result of an increasing population does not exacerbate the existing flood risk within the study area.

The tidal floodplain of the study area contains approximately 22,000 properties¹ (20,000 residential and 1,700 commercial) at risk, based on a flood with a 0.5% chance of occurring in any year (i.e. a 1 in 200 risk), and in addition, approximately 24,500 caravans (ELDC, 2016). As sea levels rise in the future, flood risk to properties and the growing population within the floodplain is likely to increase.

In terms of the 2010 Index of Multiple Deprivation², Lincolnshire is ranked 95th out of 149 local authorities in England, where the 1st is the most deprived. Within the strategy area, there are localised areas of social deprivation with a high dependency on benefits, particularly along the coast (ELDC, 2016). In particular, Mablethorpe and Skegness contain concentrated areas of deprivation of regional significance, and these areas have been identified for regeneration to address high levels of deprivation and seasonal unemployment. This observation is supported by the later data presented in the 'Indices of Deprivation 2015' produced by the Lincolnshire Research Observatory.

Tourism and Recreation

The beach and natural landscape of the seafront along the coastline between Saltfleet and Gibraltar Point is popular with visitors. Key tourist resorts along the frontage, which are seasonal in nature, are:

- Mablethorpe: a major tourist resort including the Haven Holiday centre, Trusville Holiday centre to the north and south of Mablethorpe consisting of holiday chalets (see Plate A.1) and static caravans with access to the beach and bathing waters. An amusement park is located along the Central Promenade.
- Trusthorpe: developed predominantly around Seacroft Holiday Estate and Greenfield Caravan Park.
- Sutton-on-Sea: developed as a retirement centre providing a quieter holiday environment with bathing waters. Beach chalets line the seawall backed by the Sutton Pleasure Garden.
- Sandilands: small linear village along the A52. The predominant feature is the golf course situated immediately to the rear of the coastal defences.

¹ Based on 2009 property counts, assuming that subsequent new developments are sufficient in terms of their own flood mitigation provision.

² The 2010 Index of Multiple Deprivation is a statistically generated output that that can be used to identify small geographical areas that are deprived. The measure combines information from a range of datasets including income, employment, health deprivation and disability, education, skills and training, barriers to housing and services, and crime and living environment. It is through the results of this study that many areas across England are identified as a priority for funding to improve the quality of life of their various populations.

- Chapel St Leonards: popular retirement settlement and tourist resort catering for holidays of a quieter nature than Skegness. This resort hosts an amenity beach with a tourist train (Plate A.2), and bathing waters.
- Ingoldmells: a busy holiday centre including Fantasy Island and numerous holiday parks consisting of static caravans. Sea Lane fulfils the role of a promenade because coastal conditions and the presence of the coastal defences at this location make it difficult to have seafront facilities (ELDC 1999). There is an amenity beach and bathing waters at Ingoldmells South.
- Skegness: traditional seaside resort with the northern end of the seafront commercialised with a funfair (Plate A.3) and pier while the southern end, south of the clock tower, comprises formal gardens with a lakeside walk, marine lake, boating lake (Plate A.4), paddling pool and crazy golf course.

Seaside tourism is an industry of considerable economic value to the local community. As it is based primarily on the beaches, family entertainment and coastal scenery, tourism is predominantly seasonal (i.e. May to September) with the peak in August. Mablethorpe and Skegness are the most popular tourist destinations; with these resorts generating £400m per year from tourism in the coastal zone (Lincolnshire County Council, 2015). However, the beach and the sand dunes at these locations would erode in the absence of coastal management works (i.e. sea defences and beach nourishment) with an associated reduction in amenity value.

Informal recreational pursuits in the study area include bird watching along the natural coast and at the numerous wildlife reserves, sand yachting, angling, golfing, picnicking, motor-cycling, informal games, walking and cycling. There is an informal promenade cycleway along parts of the coastal frontage (e.g. Mablethorpe to Sutton-on-Sea).

There are three Blue Flag beaches in the study area; Central Beach in Skegness, Central Beach in Sutton-on-Sea and Central Beach in Mablethorpe. Under the EC Bathing Waters Directive, in 2016, the seven beaches within the study area were classified as meeting the higher standard of water quality annual compliance (i.e. of excellent quality)³. These beaches are regularly monitored by the Environment Agency.



³ Source: http://environment.data.gov.uk/bwg/explorer/index.html#



Local economy

The local economy is sustained primarily by tourism, but agriculture, fisheries and service industries also contribute to the Lincolnshire economy. Our partners ELDC and LCC have confirmed that a strategy should be implemented that supports and where possible, contributes to economic regeneration, and attracts more visitors and businesses to the area. However, the continuing need to encourage inward investment to ensure economic viability and the needs of the coastal population, needs to be balanced with the potential threat to property and life from coastal flooding (ELDC, 2016).

Shellfish (notably cockles, mussels and shrimps) provide an economically important local industry of commercial value to the district's fishermen, particularly in The Wash, to the south of the strategy area. Approximately 21 fishing boats from Boston and 31 vessels from King's Lynn harvest brown shrimp, mussels and cockles throughout The Wash, which is characterised by its shallow waters, intertidal areas and sand banks (CEFAS 2007; Eastern IFCA, 2013). These shellfisheries, which are subject to strict management by licensing, closure of shellfish beds and landing quotas, are particularly sensitive to changes in water quality and changes in patterns of sedimentation. Sprat are also trawled in The Wash and herring is taken in drift nets in April and May.

There is however, a lack of suitable harbours along the coast to Gibraltar Point, which means that the local vessels are all small beach-launched boats. Efforts are mainly directed at demersal species such as cod and rays using long-lines, gill and trammel nets, with some potting for crabs and lobsters in the summer months. Between Huttoft and Gibraltar Point, there are approximately six Grimsby vessels, which use shrimp beam trawls, and longlines and fixed nets to catch cod, with bycatches of whiting, dogfish, pollock and ling. Visiting otter trawlers and beam trawlers, fish within a few miles of the coast during the spring sole fishing season. There is one 10m stern trawler at Gibraltar Point, two <10m vessels based at Skegness (one using longlines/pots, and the other trawling shrimps) and one <10m vessel based at Chapel Point, fishing part time using pots, nets and longlines (CEFAS 2007; Eastern IFCA, 2013).

Bait diggers also operate in the intertidal zones within the strategy area, and most boats set pots for brown crabs from spring onwards (there is a brown crab fishery on the Race Bank, Dudgeon Shoal, and Triton Knoll offshore of the strategy area).

E.2. Material assets

There are no motorways in the strategy area and there are no rail connections to the rest of the country. The local infrastructure is therefore dependent on coastal access roads and A-roads comprising the A1031 and A111 in the north of the strategy area, the A52, which broadly runs parallel to the coast between Mablethorpe and Boston, and the inland A158 Skegness Road.

There are numerous existing and proposed wind farms (see Plate A.5) located in the North Sea off the Lincolnshire coast including Lynn, Inner Dowsing, Humber Gateway, Centrica Lincs Offshore, Westermost Rough, Race Bank, Triton Knoll and Docking Bank, with associated cable landings and connections that could be affected by changes in flood risk management.

Key infrastructure along the coast frontage includes:

- Theddlethorpe Gas Terminal a large gas terminal on Mablethorpe Road at Theddlethorpe St Helen close to Mablethorpe.
- The Lynn wind farm and the Inner Dowsing (108MW) wind farm power transmission cables make landfall at Skegness where an onshore 33 to 132kV substation and associated switchgear are located.
- Future wind farm cable landings are proposed for the Triton Knoll (1200MW) and Hornsea (1800MW) wind farms. The proposed landfall site for the Triton Knoll windfarm is to the north of Anderby Creek; whilst the Hornsea land fall site for the Hornsea wind farm is to the north of the strategy area boundary at Horseshoe Point.
- Currently the subject of a planning application is the "Viking Link" from Lincolnshire to Revsing in Denmark. This cable link would enable import and export of power with mainland Europe. The proposed landing point on the Lincolnshire coast is at Sandilands golf course.



The Mablethorpe Royal National Lifeboat Institute (RNLI) has an access off the Central Promenade onto the main beach at Mablethorpe, which is used by the inshore rescue boat throughout the year, particularly in the summer season; there is also a Lifeboat Station at Skegness. The strategy needs to consider access for these emergency services.

E.3. Biodiversity, flora and fauna

Internationally important nature conservation sites

The ecological importance of the strategy area is reflected in a variety of international, national and local environmental designations, shown on Figure 3.1 in the SCD. Internationally designated sites within the strategy area are located to the north of Mablethorpe, to the south of Skegness and immediately offshore and comprise:

- <u>Saltfleetby-Theddlethorpe Dunes and Gibraltar Point Special Area of Conservation (SAC)</u> (Plates A.7 and A.8) – dune system.
- <u>Gibraltar Point Special Protection Area (SPA) and Ramsar site</u> (see Plates A.9 and A.10) comprises dune and saltmarsh habitats that support internationally important populations of regularly occurring Annex 1 species (e.g. little terns), populations of other regularly occurring migratory birds and wetland invertebrates.



- <u>The Wash SPA and Ramsar site</u> estuarine mudflats, sandbanks and saltmarsh, that support internationally important bird populations including regularly occurring Annex 1 bird species, migratory birds and an internationally important assemblage of waterfowl of over 19 species. The Ramsar site is also designated for its inter-relationship between various components forming the basis for high estuary productivity.
- <u>The Wash and North Norfolk Coast SAC</u> this site has been designated for its coastal, intertidal and subtidal habitats, common seal and otter.
- <u>Inner Dowsing, Race Bank and North Ridge SAC</u> this site comprises sandbanks, which are slightly covered by seawater all the time and reefs with Sabellaria spinulosa agglomerations.
- <u>Possible Greater Wash SPA</u> this site is currently under consideration as a new marine SPA; and its landward extent extends to approximately 1.5m above mean high water within the strategy area. It is designated for its internationally important populations of breeding terns and non-breeding seabirds.
- In addition, the <u>Humber estuary</u> (designated as a SPA, SAC and Ramsar site) is located to the north of the strategy area and is designated for its complex of intertidal, coastal and subtidal habitats; internationally important populations of breeding, passage and wintering birds and an assemblage of waterbirds; and significant populations of lampreys, Natterjack toads and grey seals.

Natural England has confirmed through informal correspondence in 2013 that a Habitat Regulations Assessment (HRA) of the strategy is likely to be required under the Conservation of Habitats and Species Regulations 2010, as amended, if approaches resulting from the strategy change 'natural' processes and potentially affect Gibraltar Point and The Wash.

Nationally important nature conservation sites

There are also numerous nationally designated conservation sites throughout the strategy area and the SSSIs described below (excluding Sea Bank Clay Pits SSSI) underpin the European designations set out above. These comprise:

- <u>Saltfleetby-Theddlethorpe Dunes Site of Special Scientific Interest (SSSI) and National</u> <u>Nature Reserve (NNR)</u>: dune complex recognised for its saltmarsh, foreshore and embryonic dunes on the seaward side and more stable dunes/marsh on landward side. Contains flats, dunes, salt/freshwater marshes supporting outstanding assemblages of vascular plants, invertebrates, breeding birds and Natterjack toad. This is also identified as an important site for research into the processes of coastal development.
- <u>Gibraltar Point SSSI and NNR</u>: sand dunes, coastal habitats and fauna, notably invertebrates and passage/breeding birds. Important site for coastal geomorphology.
- <u>The Wash SSSI and NNR</u>: Intertidal mudflats/saltmarshes supporting wintering waders and wildfowl, botanical interests, bird breeding and breeding common seals. Open deep water, permanent shallow water, mudflats and saltmarsh, representing one of Britain's most important winter feeding areas for waders and wildfowl.
- <u>Sea Bank Clay Pits SSSI</u>: former clay workings situated landward of the coast supporting uncommon aquatic plant communities, extensive reedbeds and marginal wetland. Important for birds.
- In addition, the strategy area includes part of a 175.5km² recommended Marine Conservation Zone (MCZ) at Lincs Belt (i.e. the offshore area from Saltfleet to south of Sutton-on-Sea). This was considered for potential designation based on its subtidal habitats of conservation importance, but was not included within the final list of recommended sites.

Saltfleet to Gibraltar Point Strategy

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 - Located a minimum of 10km to the north of the strategy area, the <u>Holderness MCZ</u> was formally designated in January 2016 under the Marine and Coastal Access Act 2009 for its habitats of conservation importance, including intertidal mixed sediments, subtidal coarse sediment, subtidal sand, subtidal chalk, peat and clay exposures and Ross worm (*Sabellaria spinulosa*) reefs.

Locally important nature conservation sites

There are also locally designated sites in the Strategy area including 11 Local Wildlife Sites (LWS) and two Sites of Importance for Nature Conservation (SINC) not yet designated as LWSs: Huttoft Bank Sand Dunes and Anderby Creek, as shown on Figure 3.2 in the SCD. The LWSs include:

- Chapel Pit Nature Reserve;
- Moggs Eye Sea Bank Ponds;
- Huttoft Dykes Green Lane;
- Anderby Creek Sand Dunes;
- Chapel Point Dunes, South;
- Sandilands Golf Course and Dunes;
- Huttoft Car Terrace to Marsh Yard Dunes;
- Marsh Yard to Anderby Creek Dunes;
- Wolla Bank South; Chapel Six Marshes; and
- Chapel Point Dunes, North.

Other local designations/projects of particular interest include the Coastal Country Park and the Lincolnshire Grazing Marsh Partnership.

Habitats and Species of Principal Importance

There are several Habitats of Principal Importance⁴ (designated under the Natural Environment and Rural Communities (NERC) Act 2006) within the strategy area (including but not limited to):

Arable field margins	River
Traditional orchards	Lowland calcareous grassland
Hedgerows	Lowland meadows
Coastal saltmarsh	Subtidal sands and gravels
Coastal sand dunes	Tide-swept channels
Intertidal mudflats	Coastal and floodplain grazing marsh
Ponds	Reedbeds

These are shown on Figure 3.3 in the SCD and should be considered when developing the strategy in order to ensure that where possible, all biodiversity is conserved/enhanced, and not just the most valued sites.

Other notable or protected species that are known to be present within the strategy area and its hinterland include Natterjack toad *Epidalea calamita* present in the Saltfleetby-Theddlethorpe dunes, and at Gibraltar Point, various species of bat, water vole *Arvicola amphibious* in the Lincolnshire coastal grazing marshes and smooth newt *Lissotriton vulgaris,* and great crested newt *Triturus cristatus*.

⁴ Source: <u>www.magic.gov.uk</u>

Marine mammals present or using the marine waters within and offshore of the strategy area include a nationally important grey seal *Halichoerus grypus* breeding ground at the sand dunes at Donna Nook, to the north of the strategy area, and common seals *Phoca vitulina* that breed in The Wash to the south of the strategy area, with haul-out sites in The Wash and at Donna Nook.

Marine ecology and fish

There are important spawning and nursery grounds for sprat *Sprattus sprattus*, lesser pipefish *Syngnathus rostellatus*, lemon sole *Microstomus kitt*, plaice *Pleuronectes platessa* and herring *Clupea harengus* off the coast of the strategy area, as well as commercial species including sole *Solea solea*, edible crab *Cancer pagurus* and lobster *Homarus gammarus*, which are also key components of the marine ecosystem. Over-fishing is a major threat to these fish species.

The area of proposed works is characterised by relatively species-poor communities of intertidal benthic invertebrates (organisms living within the sediment) demonstrating seasonal fluctuations in species richness. The invertebrate species recorded are typical of a sandy shore environment, dominated by crustaceans, together with a number of species of polychaete worms. Benthic and epibenthic monitoring has been in place along the Mablethorpe to northern Gibraltar Point coastline since 1996 and has been supplemented by baseline data from 1992. This has found ecological communities within the dynamic and high energy intertidal environment of the Lincshore coastline to be naturally impoverished.

Monitoring surveys of the animals living on or just above the seabed close to the shore (epibenthic animals) have been undertaken at five locations along the coast (Environment Agency, 2016b) and have recorded a variety of species including small crustaceans such as shrimps and crabs, in addition to a range of fish species such as the sand goby *Pomatoschistus minitus*, pipefish *Syngnathinae* sp., plaice *Pleuronectes platessa*, herring *Clupea harengus* and Dover sole *Solea solea*. The most abundant epibenthic species is the brown shrimp *Crangon crangon*, which forms an important inshore fishery (see Fisheries Section below), and the isopod crustacean *Idotea linearis*.

Sabellaria reefs are designated as a priority habitat under the UK's Biodiversity Action Plan; they have also been named as an interest feature of The Wash and North Norfolk Coast Marine SAC, and the Inshore Holderness MCZ. The location of *Sabellaria* reefs within the strategy area are currently unknown; however, surveys undertaken by Eastern IFCA with a sidescan sonar and grab samples around Lynn Knock (approximately 8km south of the southern works) identified the distribution of *Sabellaria* as patchy, within their district.

As discussed in Section A.1, The Wash contains important mussel and cockle beds and shrimp populations which form an important component of the local fishery.

E.4. Soils, geology and geomorphology

Designated earth heritage sites

The nationally designated earth heritage sites within the study area are shown on Figure 3.1 in the SCD. There are two geological/geomorphological SSSIs within the strategy area that support important geomorphological and geological features:

- <u>Chapel Point-Wolla Bank SSSI</u> important geological site for its intertidal sediments, which
 record the evidence of early Holocene sea level change. Some of the geological sites along
 the frontage are currently underwater (e.g. the Chapel Point to Wolla Bank SSSI), and
 accelerated erosion of designated features should be avoided.
- <u>Gibraltar Point SSSI</u> in addition to its nature conservation value (see Section A.3), this site is also identified as a nationally important site for the study of coastal geomorphology.

In addition, the following sites within the strategy area (see Figure 3.2) are identified as Regionally Important Geological Sites (RIGS) and receive protection through the statutory planning process:

- Huttoft Bank Foreshore;
- Sutton-on-Sea Foreshore;
- Vickers Point Foreshore; and
- Wolla Bank Foreshore.

In addition to the above nationally and locally important geological sites, peat and clay exposures of geological interest have been identified at various points along the coastline. The exposures of postglacial deposits along the coastline have now been wholly or partially covered with beach nourishment material. The deposits exposed at any one time are a function of the shifting ridge and runnel system operating on the lower beach.

Soils and geology

The solid geology of the coastal frontage is Cretaceous chalk. There is a relatively small outcrop of resistant sandstone south of the frontage, at the northern entrance to The Wash.

Along the coastline, marine alluvium deposits, with deep clay and a calcareous character, provide fertile soils, which are beneficial for agricultural production, but can easily be eroded.

Contaminated land

Land that is contaminated includes any historical land use that may have given rise to environmental contaminants or where intense industrial activity such as chemical manufacturing, gas production and landfilling has occurred. There are many of these sites around The Wash. ELDC is currently preparing a Brownfield Land register to support their 2016 Local Plan.

There are over 20 landfill sites (based on Environment Agency records, 2014) within the strategy area within the tidal floodplain. Of these, two sites are active landfills; Middlemarsh Lane in Skegness and Anchor Land in Ingoldmells.

Additional sites that could potentially pose a pollution risk as a result of changes in flood management are recorded by Local Authorities; details of these have not been obtained at this stage.

Geomorphology

The Lincolnshire coastline is bounded by the Humber and The Wash estuaries and aligns north-south from Gibraltar Point to Ingoldmells and north-north-west from Ingoldmells to Donna Nook. The coastline is exposed to the North Sea and is characterised by sandy beaches, backed by dune and saltmarsh at the northern and southern ends of the Lincshore frontage, and by hard defences between Mablethorpe and Skegness.

The beaches of Lincshore are underlain by boulder clay. Prior to nourishment works the beach comprised a thin veneer of sand. There is a limited sediment supply to the coast, which results in a net loss of material from the beaches.

The bathymetry of the offshore area between Mablethorpe and Skegness is relatively flat (Environment Agency 2004a). The natural beach material on the north-east Lincolnshire coast is derived largely from the erosion of the Holderness coast and also from offshore banks (Robinson 1970). To the north east, these banks feed Trusthorpe, Theddlethorpe and Saltfleet Overfalls, which in turn supply sediment to the Saltfleet nearshore banks and south west to the Skegness nearshore banks (Environment Agency 2004b).

The present sedimentology of the strategy area is directly influenced by the nourishment works (CH2MHill, 2013). Sediment sampling prior to the nourishments indicated the sediments were largely

well sorted fine sands, but sediments are now considered to be coarser and moderately-well to poorly sorted (Blott & Pye 2004).

Physical Regime

The Lincshore coastline is macrotidal, meaning that it experiences 'large tides', with a tidal range of 6m for mean spring tides and 2.8m for mean neap tides (Admiralty, 2008). However, extremes analysis indicates storm surge tides may exceed astronomical tides by up to 2m (Environment Agency 2004c).

There are two main sediment transport pathways along the Lincshore coast: via the central northnorth eastern channel between the Silver Pit and The Wash, and via southerly longshore transport, which is roughly parallel to the Lincolnshire coastline. Most of the southerly transport that feeds into The Wash takes place in the nearshore zone. These pathways are most pronounced on surges and spring tides and diminish to a local effect around the entrance to The Wash on neap tides. The two pathways ultimately join near the entrance to The Wash, where the southerly flow feeds sediment via the Gibraltar Point nearshore banks into the central channel of The Wash (HR Wallingford 2002).

In addition to the sediment transport pathways into The Wash, offshore banks feed sediment northwest and southwest towards the coast. To the north (near Donna Nook), this sediment feeds into the nearshore banks, inshore bar and beach system thus connecting into the net southerly longshore transport system (Environment Agency 2004a).

E.5. Land use and management

The strategy area encompasses a range of land use classifications at risk of tidal flooding, as shown on Figure 3.4 in the SCD. Some of this agricultural land is classified as Grades 1 (very good soil quality for crop production) to 3a (moderate) as classified by Defra (MAFF at the time). Flood risk management actions to realign parts of the coastline and create new habitat could change these existing land uses in some areas.

There are significant areas of residential, commercial and industrial development in the large conurbations along the coast (see Section A.1).

Land use management has a role to play in controlling future run-off, controlling diffuse pollution and mitigating the effects of climate change. It is important that our policies and actions for managing future flood risk are aligned with existing and future agri-environment policy.

E.6. Water and hydromorphology

Water Framework Directive

Numerous drainage channels and managed watercourses outfall to the North Sea. Within the Strategy area, there are three coastal water bodies, two transitional water bodies, 11 river water bodies and one groundwater body. Details of these water bodies and their current status and overall objective are set out in Table A.1.

The Water Framework Directive (WFD) 2000/60/EC requires all natural water bodies to achieve both good chemical status and Good Ecological Status (GES) and Good Ecological Potential (GEP) for artificial and heavily modified water bodies. The strategy area falls within the Anglian River Basin District and the River Basin Management Plan (RBMP) (Environment Agency 2015), sets out the actions required to enable the water bodies to achieve GES/GEP.

Water body name	Water body Reference	Туре	Current classification	Objectives
Coastal		•		
Lincolnshire	GB640402492000	Heavily modified	Moderate	Moderate by 2015
Wash Outer	GB640523160000	-	Moderate	Moderate by 2015
River				
South Dike and Grayfleet Drain	GB105029061680	Heavily modified	Moderate	Good by 2027
Long Eau	GB105029061670	Heavily modified	Moderate	Moderate by 2015
Great Eau (downstream of South Thoresby)	GB105029061660	Heavily modified	Poor	Good by 2027
Trusthorpe Pump Drain (upper end)	GB105029061640	Artificial	Moderate	Good by 2027
Woldgrift Drain	GB105029061750	Artificial	Moderate	Moderate by 2015
Trusthorpe Pump Drain (lower end)	GB105029061760	Artificial	Good	Good by 2015
Boygrift Drain	GB105029061720	Artificial	Moderate	Good by 2027
Anderby Main Drain	GB105029061730	Artificial	Moderate	Good by 2027
Willoughby High Drain	GB105029061710	Artificial	Moderate	Good by 2027
Ingoldmells Main Drain	GB105029061700	Artificial	Moderate	Good by 2027
Cow Bank Drain	GB105030056440	Artificial	Moderate	Good by 2027
Lym/Steeping	GB105030062430	Heavily modified	Moderate	Good by 2027
Groundwater		•		
Steeping Long Eau Little Eau Chalk Unit	GB40501G401600	-	Poor	Poor by 2015

Γable E.1: WFD water bodies within	/immediately adjacent to	o the strategy area⁵
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The WFD also identifies water-related Protected Areas in the strategy area (see Figure 3.5 in the SCD), which may require the achievement of more stringent standards than GES/GEP to meet the requirements of other, related, EU Directives. Those within the strategy area, which will require further

⁵ Source: <u>http://environment.data.gov.uk/catchment-planning/</u>

consideration during the development of the strategy include those designated under the following Directives:

- Habitats and Conservation of Wild Birds Directives (see international conservation sites in Section A.3);
- Shellfish Directive Shellfish Waters at West Wash, South-East Wash and North-East Wash;
- Drinking Water Directive Steeping Long Eau Chalk Unit Groundwater;
- Bathing Water Directive Mablethorpe, Sutton-on-Sea, Moggs Eye, Anderby, Chapel St Leonards, Ingoldmells South and Skegness;
- Nitrates Directive; and
- Urban Waste Water Treatment Directive.

Groundwater quality

Groundwater provides vital resources for public supply, industry, agriculture and for numerous rural communities, and they also feed rivers and support wetlands.

In addition to the WFD requirements, several Groundwater Source Protection Zones (SPZs) are present landward of Mablethorpe and Ingoldmells. These groundwater sources used for public drinking water supply are identified by the Environment Agency and are areas that are vulnerable to a risk of contamination from activities that might cause pollution. Issues potentially affecting groundwater quality include:

- tidal influence within coastal areas, which could result in saline intrusion into freshwater bodies;
- increased levels of nitrate and phosphates in agricultural areas; and
- industrial land use or landfills.

E.7. Air and climatic factors

Air quality

Lincolnshire is predominantly rural in nature, with the exception of coastal resorts. The main source of air pollution generally arises from road traffic emissions, particularly along the A16, A158 and A52. There are currently no Air Quality Management Areas (AQMA) declared in East Lindsey (ELDC 2016).

As air quality will not influence or be affected by the recommendations of this strategy, further consideration will not be given to potential air quality issues.

Climatic factors

As global warming is predicted to increase pressure on coastal defences due to rising sea levels from thermal expansion and the melting of glaciers, the strategy will take the most up to date climate change predictions into account when identifying policies and strategic options for the future management of the coast.

In the strategy area, the historic rate of sea level rise is cited in the SMP2 (HECAG 2010) as being just over 1.1mm per year, based on the sea level measured at Immingham over the period between 1960 and 1995.

The latest sea level rise guidance for the East of England and East Midlands is shown in Table A.2. The allowances account for slow land movement. This is due to 'glacial isostatic adjustment' resulting from the release of pressure after ice that covered large parts of northern Britain melted at the end of the last ice age. The northern part of the country is slowly rising and the southern part is slowly sinking.

Sea level rise, together with any potential increase in storm surge wave activity will reduce the effectiveness of the existing coastal defences and increase the current flood risk posed to the communities located in the hinterland of the coastal defences. Offshore wind speed and extreme wave height allowances⁶ are currently estimated to be +5% to +10% from the 1990 (baseline) to 2115.

Time period	Sea level rise per year (mm)	Cumulative rise 1990 to 2115 (m)
Epoch 1 (1990 – 2025)	4.0	
Epoch 2 (2026 – 2055)	8.5	1.21 m
Epoch 3a (2056 – 2085)	12.0	(1990 baseline)
Epoch 3b (2086 – 2120)	15.0	

Table E.2: Environment Agency sea level rise guidance⁵ for East of England and East Midlands

E.8. Historic environment

Historic landscape/townscape

The coastal heritage of the seaside towns⁷, historic characteristics of its townscape/landscape/seascape, and archaeology of the strategy area provide significant benefits to the local community particularly the aspects of wellbeing and a "sense of place", and contribute economically via heritage tourism⁸. Consideration of these aspects is included within the SEA.

Details of the historic landscape character is described in Section A.9.

Designated and/or known features

The strategy area has been heavily influenced by human activity, with medieval and post medieval features in the marshes (e.g. Tetney and Somercotes). Earlier activity from the Iron Age and Roman periods is often buried under the silts.

Within the strategy area, the following heritage sites are currently known⁹ to be at risk from flooding/potentially affected by flood risk management actions (see Figure 3.6 in the SCD):

- 12 Scheduled Monuments;
- More than 90 Listed Buildings;

⁶ Source: <u>https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances</u>

⁷ Source: Williams, P (2013) The English Seaside. https://historicengland.org.uk/imagesbooks/publications/english-seaside/

⁸ https://content.historicengland.org.uk/images-books/publications/heritage-and-the-economy/heritage-and-the-economy-2015.pdf/

⁹ Source: <u>www.magic.gov.uk</u> and previous environmental assessments

- Two Registered parks and gardens;
- Three Conservation Areas;
- Numerous wreck sites; and
- Numerous undesignated heritage features (e.g. Winthorpe windmill).

Initial consultation with the Lincolnshire County Council Historic Environment Officer (LCC HEO) and Historic England in July 2016 has identified that the readily available historic environment data regarding designated sites/features from the MAGIC site as presented in this SCD would not adequately represent the potential effects of the strategy on the historic environment along the coastal frontage within the strategy area. Therefore, it was agreed that the data set out in this SCD should be supplemented with data from the Lincolnshire Historic Environment Record (LCC HEO) for the strategy area and in particular, the coastal frontage that could be directly affected. It was agreed that a high level strategic review of potentially affected non-designated sites would be undertaken in consultation with the LCC HEO using GIS to identify the sites present and screen in terms of their potential sensitivity to flood risk management actions. The results of this review would then be used strategically to inform the assessment of options and the recommendations of the proposed strategy.

Archaeological potential

There is the potential for buried archaeological features or buildings of cultural heritage value within the strategy area, which could be revealed or damaged during excavation or other works on the shore.

A Rapid Coastal Zone Assessment (RCZA) was undertaken in 2007 by Humber Field Archaeology on behalf of English Heritage (now Historic England) between Donna Nook and Gibraltar Point, in order to provide an assessment of the archaeological potential of the coast. The RCZA covered the shoreline (to Lowest Astronomical Tide) and a 1km band of cliff and coastal hinterland. Features below low-water mark, such as records of shipwrecks, wreck fastenings, dive sites and dredgings were not generally included.

The coastal study area as a whole contains a wide variety of monuments and artefacts, representing a substantial portion of the time which has elapsed since the last glaciation. These include features which are maritime-related, such as fish weirs, jetties, fish and shellfish tanks, revetments, pleasure piers, harbour installations, lifeboat stations, coastguard buildings, wreck sites, as well as others relating to agricultural practices, residential or leisure activity, and industrial processes. Similarly, artefacts may be found which relate to shipping, fishing, hunting, domestic activity or craft/industrial occupations, covering many periods.

The assessment considers that the principal risk to the potential archaeological resource of the area comes from potential erosion and development processes, and from potential managed realignment schemes.

E.9. Landscape and visual amenity

Landscape designations

There are no Areas of Outstanding Natural Beauty (AONB) or Heritage Coastline within the study area.

Landscape character

The baseline landscape character of the study area has been assessed and classified by various landscape character assessments (LCA). These include:

- European Landscape Character (ELC) this is dedicated to the development of policies for the protection, management and planning of all landscapes in Europe and to establish measures to encourage participation by the public and stakeholders in producing landscape policies. The strategy will consider the ELC as the central framework for managing landscape changes, which will allow the development of key policies for the protection, management and planning of the study area.
- National Countryside Character the study area lies within the Lincolnshire Coast and Marshes Character Area (Natural England), which is characterised by predominantly open, medium scale agricultural landscape, dispersed settlement patterns, large coastal settlements, an eroding and accreting coast and coastal dune systems, saltmarsh and artificial sea defences. This area is also characterised by a coastal strip significantly altered by discordant 20th century development including seaside resorts, theme parks, bungalows, caravan parks and industry.
- Local Landscape Character (ELDC, 2009) The county has been divided into different LCAs. Those within the strategy area comprise:
 - J1: Tetney Lock to Skegness Coastal Outmarsh, comprising:
 - Low lying, drained coastal plain contained to the east by sea embankments, sand dunes and sea defences.
 - Mostly flat with some areas of gentle undulations including saltern mounds.
 - Some wide open views and big skies. Some views enclosed by landform, embankments, sand dunes or trees.
 - Extensive network of drains, ditches and dykes with strong geometric patterns in the northern and central parts of the area.
 - Rivers and the historic Louth Canal cross from the Lincolnshire Wolds in the west towards the coast.
 - Predominantly mixed agricultural arable and pasture land uses.
 - Several coastal nature reserves with a high level of conservation designation with associated wildlife.
 - Sparsely scattered settlements with mature ornamental trees and hedgerows.
 - A stretch of coastal resorts from Mablethorpe to Skegness with caravan parks, and new residential and commercial developments on their outskirts.
 - An extensive network of raised minor roads with few larger A roads serving the coastal resorts.
 - A predominantly intact and distinctive rural landscape with some man-made influences including a gas terminal, oil storage facility and several wind farms.
 - K1: Donna Nook to Gibraltar Point Naturalistic Coast, comprising:
 - Flat tidal strip with some stretches of long sandy beaches, mudflats and saltmarsh.
 - Wide open views with big skies which extend out to sea.
 - Views influenced by and contained in some areas by concrete promenades defending coastal resorts, vegetated sea banks or coastal sand dunes.
 - Large areas used by the Ministry of Defence (MoD).

- Drains flowing onto the tidal marshes create intricate dendritic patterns emphasised by the saltmarsh vegetation.
- Mosaic of coastal, dune, mudflat and saltmarsh vegetation.
- No settlements but occasional small scale built structures in MoD designated Danger Areas.
- Protected by international, national and local nature conservation designations.
- Remote and tranquil except adjacent to coastal resorts and designated MoD Danger Areas.
- Very distinctive and unspoilt natural landscape with very few detractors.

Seascape Character

The seascape character of the strategy area is described in the URS/Scott Wilson (2011) report prepared for Natural England; a pilot study that defined seascape character at a strategic scale for the MMO's marine plan areas: 3 (East inshore – which includes the strategy area), 4 (East offshore) and part of 6 (South inshore). The approach used followed the draft Seascape Character Assessment Guidance for Great Britain (Natural England 2011)^{10.}

The strategy area is situated within Character Area 7, the East Midlands Coastal Waters; the key characteristics of which are summarised below. These were refined following informal consultation on the pilot study, reported in MMO (2012).

- Flat, low lying coastal landscape demonstrating a complex array of dynamic natural processes.
- Wild and dynamic nature of the seascape with strong wave action over generally shallow waters.
- Shallow waters divided by a deeper water channel called The Well.
- Extensive submerged sand flats.
- Temporal seascape character heavily influenced by the tides and the exposure of vast sand flats at low tide.
- Extensive linear coastal geometry creating long sweeping views along the coastline and out to sea.
- Gently rolling dune systems and intertidal sand flats supporting a variety of coastal habitats and supporting a rich diversity of wildlife.
- Perception of land and sea is strongly influenced by dunes and intertidal areas which present a wild and remote character.
- Remote character influenced in places by concentrated urban settlements, commercial activities and both on and offshore wind farm developments.
- Sediment accretion influencing coastal economies.
- Coastal defence and beach replenishment activity.
- Recreational value of seascape represented by coastal resorts with much of the coastal waters recognised as RYA racing and sailing areas.

¹⁰ Now superseded by the Natural England (2012) guidance: An approach to seascape character assessment. <u>https://www.gov.uk/government/publications/seascape-character-assessments-identify-and-describe-seascape-types</u>

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- Commercial offshore activities such as dredging and dumping have localised influence on benthic and pelagic environments.
- Important fisheries areas, particularly shellfish fisheries.
- Important archaeological features present.
- Significant for its buried peat deposits.
- World War 2 coastal defence infrastructure.
- Extensive areas of salt marsh, and grazing marsh.

Historic Landscape Character

Lincolnshire County Council and English Heritage (now Historic England) undertook a Historic Landscape Characterisation (HLC) project for the county (Lincolnshire County Council *et al.*, 2011). HLC is a method for understanding and mapping the present day landscape with reference to its historical development.

The Lincolnshire HLC identified ten Regional Character Areas (RCA); the study area falls within RCA 8 'The Grazing Marshes'. The existing landscape of the Lincolnshire coast (notably Skegness, Mablethorpe and Ingoldmells) within RCA 8 is described as comprising a facade of amusement arcades, holiday shops and fast food restaurants, which have replaced the pre-nineteenth century character of the towns. The character of this area is noted to change from '*bustling tourist honeypots to one of shuttered desertion from October to April*'.

This HLC data will be reviewed as part of the SEA and will be used to inform option and impact assessment and mitigation at both the strategic and project level.

Visual amenity

The approximate extent of the zone of visual influence for pedestrians, residents and holiday-makers, which is largely influenced by the sea defences, mounding, dunes and low-lying land in the hinterland of the defences, will be appraised in the SEA.

References

Blott, S.J. and Pye, K.(2004) *Morphological and Sedimentological Changes on an Artificially Nourished Beach*, Lincolnshire, UK. Journal of Coastal Research, 20 (1) pg: 241-233.

CEFAS (2007) The Coastal Fisheries of England and Wales, Part V: a review of their status 2005-6.

CH2M Hill (2013) Shoreline behaviour and response to inform strategy option appraisal. Technical note prepared for the Environment Agency.

Eastern IFCA (2013) Research Report.

ECUS Ltd (2009) East Lindsey District Landscape Character Assessment. Prepared on behalf of East Lindsey District Council.

Environment Agency (2004a) Lincshore 2005 – 2010 Project Appraisal Report (PAR) Appendix F: Beach Management Plan.

Environment Agency (2004b) Lincshore Strategy Review.

Environment Agency (2004c) Lincshore Sea Defences 2005 - 2010. Environmental Statement.

Environment Agency (2013) Climate Change Allowances for Planners.

Environment Agency (2015) Anglian River Basin District River Basin Management Plan.

Environment Agency (2016a) Lincshore 2016 - 2020 Environmental Statement.

Environment Agency (2016b) Lincshore Coastal Defence Strategy. Environmental Monitoring 2015.

ELDC (2009) *East Lindsey District Landscape Character Assessment,* prepared by ECUS Ltd for ELDC.

ELDC (2016) Local Plan Core Strategy. Publication version, subject to consultation.

Humber Field Archaeology (2007) Yorkshire and Lincolnshire Rapid Coastal Zone Assessment Survey. Report for English Heritage.

Halcrow (2009) *Technical Note: Review of Wash Sublittoral Grab 1991, 1993, 1999 and 2002 Survey Report on Biotopes in the Wash.* Technical Appendix to the Lincshore 2016-2020 Environmental Statement.

HECAG (2010) Flamborough Head to Gibraltar Point Shoreline Management Plan.

HR Wallingford (2002) Southern North Sea Sediment Transport Study Phase 2.

Lincolnshire County Council (2015) <u>www.lincolnshire.gov.uk/residents/environment-and-</u> planning/flood-risk-management/coastal-flood-risk/112427

Lincolnshire County Council and English Heritage (2011) *The Historic Character of the County of Lincolnshire.*

Lincolnshire Research Observatory (LRO) (2011) *2011 Census Population Estimates Lincolnshire.* Marine Management Organisation (2012) Seascape character assessment. East Inshore and East Offshore marine plan areas.

URS/Scott Wilson (2012) Seascape Characterisation around the English Coast (Marine Plan Areas 3 and 4 and Part of Area 6 Pilot Study). Natural England Commissioned Report NECR106.

Williams, P (2013) The English Seaside. https://historicengland.org.uk/imagesbooks/publications/english-seaside/

APPENDIX F: Baseline data sources used

Note: taken directly from the SGPS Scoping Consultation Document (Environment Agency, 2016). Any relevant updates are included within the Environmental Report.

Sub-topic	Receptors scoped in	Data sources used
Population, health ar	nd local economy	
Population and health	Population and properties (up to 24,300 ¹¹ (22,000 residential and 2,300 commercial) at risk from a flood with a 0.5% probability of occurring in any one year), and an additional 22,000 seasonally occupied caravans, within the tidal floodplain.	• Property data taken from the National Receptors Dataset (NRD) as this dataset contains property locations (which were matched to the LiDAR levels to generate threshold data) as well as the Multi Colour Manual (MCM) property codes.
	Growing population, in particular the numbers of older people. Future viability of local communities at risk from flooding, particularly in rural locations.	 2011 census data: <u>http://www.research-lincs.org.uk/2011-census.aspx</u> 2010 Index of Multiple Deprivation East Lindsey Core Strategy (Draft, February 2016) East Lindsey Economic Baseline 2010 (EkoCen, 2010 for
Social deprivation	Localised areas of socially deprived and vulnerable communities (in particular in Mablethorpe and Skegness) whose quality of life is at risk from flooding and who may be affected by flood risk management actions.	 East Lindsey Economic Baseline 2010 (EkoGen, 2010 for ELDC) Lincolnshire Coastal Study <u>https://www.lincolnshire.gov.uk/residents/environment-and- planning/environment/lincolnshire-coastal-study/</u>

¹¹ Based on 2009 property counts, assuming that subsequent new developments are sufficient in terms of their own flood mitigation provision.

Sub-topic	Receptors scoped in	Data sources used
Tourism and recreation	Durism and ccreationRegionally important tourist facilities and attractions (e.g. beach, key tourist resorts, visitor attractions) along the coastal frontage and within the tidal floodplain at risk from flooding or flood risk management actions. Importance of retention of access to/use of amenity beach and nearby amenities to attract visitors.	 East Lindsey Core Strategy (Draft, February 2016) East Lindsey Economic Baseline 2010 (EkoGen, 2010 for ELDC) OS maps Visitor numbers: Greater Lincolnshire LEP
	Regionally and locally important recreational and amenity resources (e.g. footpaths (including the England Coast Path), promenade access, cycle routes, public/open spaces, recreation/sports grounds (e.g. golf courses), informal pursuits (e.g. bird watching, angling), Lincolnshire Coastal Country Park) along the coastal frontage and within the tidal floodplain at risk from flooding or flood risk management actions.	 http://www.greaterlincolnshirelep.co.uk/growth/visitor- economy General information: https://visiteastlincolnshire.com/ Bathing Water quality: http://environment.data.gov.uk/bwq/profiles/ England Coast Path route: https://www.gov.uk/government/publications/england-coast-
	Consideration of opportunities to improve or create new attractions/resources and diversify the visitor experience/tourism offer.	 https://www.gov.uk/government/publications/england-coast- path-in-the-north-east-of-england Lincolnshire Coastal Country Park: https://www.lincolnshire.gov.uk/Coastalcountrypark
Economic activity	 Existing industry, commercial and economic activities at risk from flooding or potentially affected by flood risk management actions, with impacts on employment and the local economy. Key sectors include: Agriculture – land within the tidal floodplain (<i>covered under Land use topic</i>). Seasonal seaside tourism – significant contribution to local economy (accommodation, holiday parks, visitor attractions). Commercial fisheries and shellfisheries in the adjacent waters and within the Wash, including beach-launched boats. 	 East Lindsey Economic Baseline 2010 (EkoGen, 2010 for ELDC) East Lindsey Core Strategy (Draft, February 2016) East Lindsey Settlement Proposals Development Plan Document (ELDC, February 2016) <u>http://www.research-lincs.org.uk/Home.aspx</u> Value of visitor economy: Greater Lincolnshire LEP <u>http://www.greaterlincolnshirelep.co.uk/growth/visitor-economy</u>
	 Other significant commercial activities and service industries. Consideration of potential opportunities to encourage additional investment and diversify the economy, overcoming seasonal limitations. 	 Commercial fisheries/shellfisheries: <u>Eastern IFCA -</u> <u>http://www.eastern-ifca.gov.uk/</u> Fisheries mapping project (2010 charts) Shrimp bylaw 2016 Finfish project (Eastern IFCA, 2013)

Sub-topic	Receptors scoped in	Data sources used
		 Research report (Eastern IFCA, 2013) – including marine benthic surveys and environmental monitoring Fish landing data Historic ESFJC annual reports and data (e.g. fishing activities)
Material assets		
Transport infrastructure	Key transport routes (e.g. A-roads and local roads) within the strategy area at risk from flooding or potentially affected by flood risk management actions.	OS maps
Critical infrastructure and commercial/ industrial services	Critical infrastructure and services (e.g. access for emergency services/lifeboats, power/water infrastructure/facilities (e.g. Theddlethorpe gas terminal)) and wind farm cable landings/connections and the Viking Link) within the strategy area at risk from flooding or potentially affected by flood risk management actions.	OS mapsWeb based sources
Availability of finite resources e.g. building materials	Long term sustainability and available supply of required materials to construct structures or nourish beaches.	Re-nourishment material needs to conform to the given specification/grading curve) and is currently the contractor's responsibility to source, essentially from designated licensed sites. The control of those sites is with the Marine Management Organisation which determines the allowable extent of dredging. Further details of the true extent of the source are hard to obtain due to commercial sensitivity. The present incumbent contractor has confirmed that supplies of the current specification are plentiful in the foreseeable future.
Biodiversity, flora and fauna		
International/ national nature conservation sites	Proposed or formally designated European sites (SACs, SPAs), Ramsar sites, MCZs, SSSIs and NNRs between the Humber estuary and The Wash/North Norfolk Coast, including those offshore and inland within the coastal floodplain, at risk from flooding or potentially affected by flood risk management actions.	 MAGIC website: <u>www.magic,gov.uk</u> For each European site, information from <u>https://www.gov.uk/government/publications/:</u> Site information Site maps

Sub-topic	Receptors scoped in	Data sources used
	Consideration of potential opportunities for actions to contribute to maintain/achieving favourable conservation or condition status.	 Background information and geography Conservation objectives Supplementary advice on conserving and restoring the site features Advice on operations Key information regarding SSSIs from: <u>https://www.gov.uk/guidance/protected-areas-sites-of-special-scientific-interest</u> Key information regarding NNRs from: <u>https://www.gov.uk/government/collections/national-nature-reserves-in-england</u> Key information regarding MCZs from: <u>https://www.gov.uk/government/collections/marine-conservation-zone-designations-in-england</u> Lincshore rMCZ - <u>https://www.wildlifetrusts.org/MCZ/lincs-belt</u> Additional available information provided by Natural England during the Lincshore beach nourishment scheme 2016-2020 HRA (Environment Agency, 2015)
Local nature conservation sites	Locally important designated sites (i.e. LNRs, LWSs and SINCs (where still designated)) within the strategy area, at risk from flooding or potentially affected by flood risk management actions.	 Greater Lincolnshire Nature Partnership: data regarding LWSs, SNCIs – site maps and citations
	Consideration of potential opportunities for actions to contribute to maintain/achieving desired site status.	

Sub-topic	Receptors scoped in	Data sources used
Coastal/terrestrial ecology	Habitats of Principal Importance recorded within the coastal and terrestrial areas of the strategy area at risk from flooding or potentially affected by flood risk management actions.	 Habitat distribution – MAGIC website: <u>www.magic.gov.uk</u> Habitats and species of principal importance identified under the 2006 NERC Act: <u>http://webarchive.nationalarchives.gov.uk/20140711133551/h</u>
	Consideration of impacts on specific legally protected species/those of conservation concern (e.g. Species of Principal Importance) known to be present along the coastal frontage within the strategy area, located outside of designated sites.	 ttp://www.naturalengland.org.uk/ourwork/conservation/biodiv ersity/protectandmanage/habsandspeciesimportance.aspx Natural England (2012) UK Post-2010 Biodiversity Framework: http://webarchive.nationalarchives.gov.uk/20140711133551/h
	Consideration of potential opportunities for habitat creation/improvement to benefit key habitats and species.	 ttp://jncc.defra.gov.uk/page-6189 UK BAP priority species and habitats: http://webarchive.nationalarchives.gov.uk/20140711133551/h
Marine/intertidal/subt idal ecology and fish	Benthic and epibenthic invertebrates, e.g. <i>Sabellaria</i> , of conservation concern/legally protected known to be present within the strategy area and located outside designated site boundaries and potentially affected by flood risk management actions, where information is readily available from monitoring/surveys. Fish and shellfish species, including nursery/spawning grounds, that are locally important (i.e. mainly shrimp, mussels and cockles), either within the strategy area or potentially affected by flood risk management actions, where information is readily available from existing monitoring/surveys.	 ttp://jncc.defra.gov.uk/page-5705 Eastern IFCA - http://www.eastern-ifca.gov.uk/ Fisheries mapping project (2010 charts) Shrimp bylaw 2016 Finfish project (Eastern IFCA, 2013) Research report (e.g. Eastern IFCA, 2013) – including marine benthic surveys and environmental monitoring Fish landing data Eastern IFCA annual reports Historic ESFJC annual reports and data (e.g. fishing activities)
	to benefit key habitats and species.	• CEFAS data and a series of sublittoral grab surveys of The Wash reviewed in relation to the Lincshore scheme in the <i>Technical Note: Review of Wash Sublittoral Grab 1991, 1993,</i> <i>1999 and 2002 Survey Report on Biotopes in The Wash</i> (Halcrow, 2009). In addition a series of surveys undertaken as part of the research reports published by the Eastern IFCA include mapping of <i>Sabellaria</i> Reefs, Cockle surveys, Mussel Surveys and fish stock surveys.

Sub-topic	Receptors scoped in	Data sources used
		Lincshore annual environmental monitoring reports (latest is Environment Agency, 2016b)
Soils, geology and g	eomorphology/sediment	·
Designated earth heritage sites	Designated earth heritage sites (geological SSSIs, RIGSs and LGSs) within the strategy area at risk from flooding or potentially affected by flood risk management actions e.g. erosion, direct impacts.	 Key information regarding SSSIs from: <u>https://www.gov.uk/guidance/protected-areas-sites-of-special-scientific-interest</u> Greater Lincolnshire Nature Partnership: data regarding RIGSs, LGSs – site maps and citations
Geomorphology and sediment	Geomorphology and the sediment system within the strategy area and downdrift into The Wash, that could be affected by flood risk management actions.	 Halcrow/CH2M Hill (2013) Shoreline behaviour and response to inform strategy option appraisal. Technical note for the Environment Agency. Incorporates an overview of the contemporary processes and controls that affect this coastline and behaviours, based on previous studies of the area (not listed individually here) Van Oord (2009) Sediment dispersion study. Technical note for the Environment Agency.
Contaminated land	Areas of known contaminated land or licensed landfill sites within the strategy area at risk from flooding or potentially affected by flood risk management actions.	Licensed landfills – Environment Agency: <u>http://apps.environment-agency.gov.uk/wiyby/37823.aspx</u>
Land use and manag	ement	·
Land use	Principal land uses (notably agricultural land) within the strategy area at risk from flooding or potentially affected by flood risk management actions. <i>Properties and caravan parks are considered under the 'Population, health and local economy' receptor heading.</i>	 Natural England regional agricultural Land Classification maps: <u>http://publications.naturalengland.org.uk/category/595414853</u> <u>7204736</u> OS maps
Water and hydromor	phology	

Sub-topic	Receptors scoped in	Data sources used
Surface water and groundwater quality	WFD waterbodies (coastal (2), river (12) and groundwater (1)) and associated Protected Areas (e.g. Bathing Water Directive, Shellfish Directive) within the strategy area potentially affected by flood risk management actions – compliance with objectives to maintain/achieve good ecological status/potential and delivery of morphological mitigation measures, to include consideration of all relevant biological, chemical and supporting elements.	 WFD data: <u>http://environment.data.gov.uk/catchment-planning/</u> Anglian River Basin District, River Basin Management Plan (Environment Agency, 2015): <u>https://www.gov.uk/government/publications/anglian-river-basin-district-river-basin-management-plan</u> Protected Areas: data from Environment Agency/Natural England covering, where applicable: Bathing Waters Directive Shellfish Directive Conservation of Wild Birds Directive Drinking Water Directive
Air and climatic facto	ors	
Climatic factors	Potential contribution of flood risk management actions to climate change (e.g. carbon emissions, use of materials). Vulnerability of flood risk management actions to climate change. Adaptability of flood risk management actions to address future changes in sea level rise/climate change.	 Sea level rise (SLR) comparisons for various climate change scenarios under UKCP09 have been reviewed for this strategy. Northern Area tidal Modelling (NATM) used the Defra 2006 prediction model for its climate change inundations. Whichever model is chosen (but excluding the H++ scenario) infers that 0.5m SLR is predicted to occur between 50 to 80 years' time. Three upper end models (again excluding the H++ scenario) predict circa 1m SLR in 100 years' time. Even if we select one scenario, we will be able adjust the economic damages to adapt to different predictions. Wave climate is also predicted to be affected by climate change scenarios.
Historic environment	t in the second s	
Saltfleet to Gibraltar Point Strategy Environmental Report: Appendices E and F

Sub-topic	Receptors scoped in	Data sources used
Contribution to heritage and landscape	The coastal heritage of the seaside towns, historic townscape/landscape/seascape and archaeology of the strategy area providing significant benefits to the local community particularly the aspects of wellbeing and a "sense of place"; and contributing economically via heritage tourism.	 Williams, P (2013) The English Seaside. https://historicengland.org.uk/images- books/publications/english-seaside/ Lincolnshire County Council and English Heritage (2011) The Historic Character of the County of Lincolnshire. https://www.lincolnshire.gov.uk/residents/environment-and- planning/conservation/archaeology/lincolnshire-historic- landscape-characterisation-project/ ECUS Ltd (2009) East Lindsey District Landscape Character Assessment. Prepared on behalf of East Lindsey District Council. URS/Scott Wilson (2011) Seascape Characterisation around the English Coast (Marine Plan Areas 3 and 4 and Part of Area 6 Pilot Study). Natural England Commissioned Report NECR106. Description of key characteristics updated in Marine Management Organisation (2012) Seascape character assessment. East Inshore and East Offshore marine plan areas.
Designated heritage assets	Nationally or locally significant designated heritage assets and their settings (i.e. scheduled monuments, registered parks and gardens, protected wreck sites, listed buildings, conservation areas) within the strategy area at risk from flooding or potentially affected by flood risk management actions.	 Designated sites – MAGIC website: <u>www.magic.gov.uk</u> Conservation Areas – <u>ELDC Local Plan</u>
Non-designated heritage assets	Significant known non-designated heritage assets or 'clusters' of known non-designated heritage assets and their setting within the strategy area based on the Lincolnshire Historic Environment Record (HER). This will be agreed with LCC to screen and strategically determine the potentially sensitive features that could be affected by the strategy.	English Heritage, Yorkshire and Lincolnshire_Rapid Coastal Zone Assessment Survey Humber Field Archaeology (2009): <u>http://archaeologydataservice.ac.uk/archives/view/yorksrcza_eh_2009/</u>
Landscape and visual amenity		

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Sub-topic	Receptors scoped in	Data sources used
Landscape/ seascape character	Landscape character (using ELDC Landscape Character Assessments), seascape character (using the 2011 seascape character assessments; refined by consultation in 2012) and historic landscapes (using data from the Lincolnshire Historic Landscape Characterisation project) of the strategy area, in particular along the coastal frontage, at risk from flooding or potentially affected by flood risk management actions.	 ECUS Ltd (2009) East Lindsey District Landscape Character Assessment. Prepared on behalf of East Lindsey District Council. URS/Scott Wilson (2011) Seascape Characterisation around the English Coast (Marine Plan Areas 3 and 4 and Part of Area 6 Pilot Study). Natural England Commissioned Report NECR106. Description of key characteristics updated in Marine Management Organisation (2012) Seascape character assessment. East Inshore and East Offshore marine plan areas. Historic landscape: <u>https://www.lincolnshire.gov.uk/residents/environment-and- planning/conservation/archaeology/lincolnshire-historic- landscape-characterisation-project/</u>
Visual amenity	Significant changes in views for beach users/residents/visitors along the coastal frontage will be considered where appropriate.	Site knowledge and consultation with ELDC

Saltfleet to Gibraltar Point Strategy

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Appendix G: Saltfleet to Gibraltar Point Strategy: Plan figures included in the Saltfleet to Gibraltar Point Strategy SEA Environmental Report

- Figure G1: Population Economy and Infrastructure
- Figure G2: Statutory Biological and Geological Sites
- Figure G3: Non-statutory Biological and Geological Conservation Sites
- Figure G4: Habitats of Principal Importance
- Figure G5: Land Use
- Figure G6: WFD Waterbodies and Protected Areas
- Figure G7: Historic Landscape Classifications
- Figure G8: Designated Historic Environment Assets
- Figure G9a: Historic Environment Record HER Data Strategy Area
- Figure G9b: Historic Environment Record HER Data Zone A
- Figure G9c: Historic Environment Record HER Data Zone B1
- Figure G9d: Historic Environment Record HER Data Zone B2



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Appendix H – Scope of the SEA

Table H.1: Summary of topics and issues considered and scoped in or out of the SEA (as described in the Scoping Consultation Document (Environment Agency, 2016))

	Scope and Justification	
Sub-topic	Scoped in	Scoped out
Population, health ar	nd local economy	
Population and health	Population and properties (up to 22,000 ¹ (20,000 residential and 1,700 commercial) at risk from a flood with a 0.5% probability of occurring in any one year), and an additional 24,500 seasonally occupied caravans, within the tidal floodplain.	
	Growing population, in particular the numbers of older people. Future viability of local communities at risk from flooding, particularly in rural locations.	
Social deprivation	Localised areas of socially deprived and vulnerable communities (in particular in Mablethorpe and Skegness) whose quality of life is at risk from flooding and who may be affected by flood risk management actions.	
Tourism and recreation	Regionally important tourist facilities and attractions (e.g. beach, key tourist resorts, visitor attractions) along the coastal frontage and within the tidal floodplain at risk from flooding or flood risk management actions. Importance of retention of access to/use of amenity beach and nearby amenities to attract visitors.	
	Regionally and locally important recreational and amenity resources (e.g. footpaths (including the England Coast Path), promenade access, cycle routes, public/open spaces, recreation/sports grounds (e.g. golf courses), informal pursuits	

¹ Based on 2009 property counts, assuming that subsequent new developments are sufficient in terms of their own flood mitigation provision.

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	Scope and Justification	
Sub-topic	Scoped in	Scoped out
	 (e.g. bird watching, angling), Lincolnshire Coastal Country Park) along the coastal frontage and within the tidal floodplain at risk from flooding or flood risk management actions. Consideration of opportunities to improve or create new attractions/resources and diversify the visitor experience/tourism offer. 	
Economic activity	 Existing industry, commercial and economic activities at risk from flooding or potentially affected by flood risk management actions, with impacts on employment and the local economy. Key sectors include: Agriculture – land within the tidal floodplain (<i>covered under Land use topic</i>). Seasonal seaside tourism – significant contribution to local economy (accommodation, holiday parks, visitor attractions). Commercial fisheries and shellfisheries in the adjacent waters and within The Wash, including beach-launched boats. Other significant commercial activities and service industries. Consideration of potential opportunities to encourage additional investment and diversify the economy, overcoming seasonal limitations. 	
Noise		The strategy will not have a significant effect on noise at a regional level. The effects of any flood risk management activities on noise levels would be considered further at the project-level assessment stage.

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	Scope and Justification	
Sub-topic	Scoped in	Scoped out
Material assets		
Transport infrastructure	Key transport routes (e.g. A-roads and local roads) within the strategy area at risk from flooding or potentially affected by flood risk management actions.	
Critical infrastructure and commercial/ industrial services	Critical infrastructure and services (e.g. access for emergency services/lifeboats, power/water infrastructure/facilities), existing/proposed windfarm cable landings/connections (e.g. the proposed Viking Link) within the strategy area at risk from flooding or potentially affected by flood risk management actions.	
Availability of finite resources e.g. building materials	Long term sustainability and available supply of required materials to construct structures or nourish beaches.	
Biodiversity, flora an	d fauna	
International/ national nature conservation sites	Proposed or formally designated European sites (SACs, SPAs), Ramsar sites, MCZs, SSSIs and NNRs between the Humber estuary and The Wash/North Norfolk Coast, including those offshore and inland within the coastal floodplain, at risk from flooding or potentially affected by flood risk management actions.	
	Liaison will be undertaken with Natural England to identify the requirement for and scope of HRA of the strategy in relation to the European and Ramsar sites.	
	Consideration of potential opportunities for actions to contribute to maintaining/achieving favourable conservation or condition status.	

	Scope and Justification		
Sub-topic	Scoped in	Scoped out	
Local nature conservation sites	Locally important designated sites (i.e. LNRs, LWSs and SINCs (where still designated)) within the strategy area, at risk from flooding or potentially affected by flood risk management actions. Consideration of potential opportunities for actions to contribute to maintaining/achieving desired site status.		
Coastal/ terrestrial ecology	Habitats of Principal Importance recorded within the coastal and terrestrial areas of the strategy area at risk from flooding or potentially affected by flood risk management actions. Consideration of impacts on specific legally protected species/those of conservation concern (e.g. Species of Principal Importance) known to be present along the coastal frontage within the strategy area, located outside of designated sites. Consideration of potential opportunities for habitat creation/ improvement to benefit key habitats and species.	Consideration of impacts on all other species or habitats receiving legal protection/are of conservation concern located outside designated site boundaries, but within the wider strategy area. Where potentially affected by flood risk management actions, either directly or indirectly, these will be considered further, where appropriate, as part of individual scheme development.	
Marine/intertidal/ subtidal ecology and fish	 Benthic and epibenthic invertebrates, e.g. Sabellaria, of conservation concern/legally protected known to be present within the strategy area and located outside designated site boundaries and potentially affected by flood risk management actions, where information is readily available from monitoring/surveys. Fish and shellfish species, including nursery/spawning grounds, that are locally important (i.e. mainly shrimp, mussels and cockles), either within the strategy area or potentially affected by flood risk management actions, where information is readily available from cockles). Consideration of potential opportunities for habitat creation/improvement to benefit key habitats and species. 	Impacts on other fish or shellfish species within the coastal waters.	

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	Scope and Justification	
Sub-topic	Scoped in	Scoped out
Soils, geology and ge	omorphology/sediment	
Designated earth heritage sites	Designated earth heritage sites (geological SSSI, RIGS and LGS) within the strategy area at risk from flooding or potentially affected by flood risk management actions e.g. erosion, direct impacts.	
Soils and geology		The strategy is unlikely to have a significant effect on geology or soils but these may require consideration, where appropriate, as part of individual scheme development.
Geomorphology and sediment	Geomorphology and the sediment system within the strategy area and downdrift into The Wash, that could be affected by flood risk management actions.	
Contaminated land	Areas of known contaminated land or licensed landfill sites within the strategy area at risk from flooding or potentially affected by flood risk management actions.	
Land use and manag	ement	
Land use	Principal land uses (notably agricultural land) within the strategy area at risk from flooding or potentially affected by flood risk management actions. Properties and caravan parks are considered under the	
	'Population, health and local economy' receptor heading.	
Water and hydromorphology		
Surface water and groundwater quality	WFD waterbodies (coastal (2), river (12) and groundwater (1) and associated Protected Areas (e.g. Bathing Water Directive, Shellfish Directive) within the strategy area potentially affected by flood risk management actions – compliance with objectives to maintain/achieve good ecological status/potential and delivery of morphological mitigation measures, to include consideration of all relevant biological, chemical and supporting elements.	

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	Scope and Justification			
Sub-topic	Scoped in	Scoped out		
Air and climatic facto	Air and climatic factors			
Air quality		Strategic measures will not be affected by or have a significant effect on air quality at a regional level. The effects of the strategy recommendations on air quality may require consideration, where appropriate, as part of individual scheme development.		
Climatic factors	 Potential contribution of flood risk management actions to climate change (e.g. carbon emissions, use of materials). Vulnerability of flood risk management actions to climate change. Adaptability of flood risk management actions to address future changes in sea level rise/climate change. 			
Historic environment				
Contribution to heritage and landscape	The coastal heritage of the seaside towns, historic townscape/landscape/seascape and archaeology of the strategy area providing significant benefits to the local community particularly the aspects of wellbeing and a "sense of place"; and contributing economically via heritage tourism.			
Designated heritage assets	Nationally or locally significant designated heritage assets and their settings (i.e. scheduled monuments, registered parks and gardens, protected wreck sites, listed buildings, conservation areas) within the strategy area at risk from flooding or potentially affected by flood risk management actions.			
Non-designated heritage assets	Significant known non-designated heritage assets or 'clusters' of known non-designated heritage assets and their setting within the strategy area, based on the Lincolnshire Historic Environment Record (HER). This will be agreed with LCC to screen and strategically determine the potentially sensitive features that could be affected by the strategy.	It is not practicable to determine the effects of the strategy on every local site of undesignated heritage value. Therefore, consultation will be undertaken with LCC to agree those sites/features that could be affected by the proposed strategy and therefore are screened into the assessment. Following the		

SALTFLEET TO GIBRALTAR POINT STRATEGY ENVIRONMENTAL REPORT: APPENDIX H

	Scope and Justification	
Sub-topic	Scoped in	Scoped out
		strategy, scheme level desk-based assessment will be undertaken develop a better understanding of these and other locally known/ unknown heritage assets and archaeological resource, where appropriate, as part of individual scheme development.
		Consideration of the risk of encountering previously unknown heritage/archaeological features will be considered, where appropriate, as part of individual scheme development.
Landscape and visua	l amenity	
Landscape/seascape character	Landscape character (using ELDC Landscape Character Assessments ²), seascape character (using the 2011 seascape character assessments; refined by consultation in 2012) ³ and historic landscapes (using data from the Lincolnshire Historic Landscape Characterisation project ⁴) of the strategy area, in particular along the coastal frontage, at risk from flooding or potentially affected by flood risk management actions.	
Visual amenity	Significant changes in views for beach users/residents/visitors along the coastal frontage will be considered where appropriate.	Detailed consideration of changes in visual amenity is not included as these changes will be subject to the nature of scheme implementation – to be assessed further at scheme assessment level.
All receptors		

² ECUS Ltd (2009) East Lindsey District Landscape Character Assessment. Prepared on behalf of East Lindsey District Council.

³ URS/Scott Wilson (2011) Seascape Characterisation around the English Coast (Marine Plan Areas 3 and 4 and Part of Area 6 Pilot Study). Natural England Commissioned Report NECR106. Description of key characteristics updated in Marine Management Organisation (2012) Seascape character assessment. East Inshore and East Offshore marine plan areas.

⁴ https://www.lincolnshire.gov.uk/residents/environment-and-planning/conservation/archaeology/lincolnshire-historic-landscape-characterisation-project/

SALTFLEET TO GIBRALTAR POINT STRATEGY ENVIRONMENTAL REPORT: APPENDIX H

	Scope and Justification	
Sub-topic	Scoped in	Scoped out
Inter-relationships and cumulative effects	Inter-relationships between receptors will be considered where relevant i.e. where there is potential for secondary, synergistic or cumulative effects.	
Appendix I: Stakeholder engagement – specific information

Levels of engagement and communication

The proposed level of engagement and communication for each individual/group was classified as follows:

- **Monitor** for those with low influence, are least affected by the strategy and are unlikely to receive or instigate direct engagement, but may become more interested as the strategy develops. It is important to monitor their interest regularly and prepare for potential changes in their status. Stakeholders in this group may include residents, business owners or political figures who live and work outside of the strategy area.
- **Inform** those with low influence, who are most affected by the strategy and are likely to want to engage with the strategy to get the latest information, share ideas, or challenge process or decision-making. It is important to keep this group fully informed of progress, but also to provide opportunities for these stakeholders to inform the development of the strategy.
- **Consult** those with high influence, yet are least affected by the strategy and have the potential to become supporters or sceptics and may sway the opinions of others. It is beneficial to identify key stakeholders with whom to engage more proactively, especially if they can support the delivery of wider benefits.
- *Involve* those with high influence, who are most affected by the strategy and may be directly involved in funding the project, project development, key decision-making and issue management. They are project partners, funding partners, landowners, community groups, subject matter specialists, tenants and residents directly affected by the strategy.

Age UK Lindsey	Mablethorpe Tourist Information Centre
AMEC	Marine Conservation Society
Amusements	Marine Management Organisation
Anglian Coastal Authorities Group	Maritime and Coastguard Agency
Anglian Water	Members of Parliament
Angling clubs	National Association of Boat Angling Clubs
Bed & Breakfasts	National Federation of Anglers
Beach landowners	National Federation of Fishermen's Association
Beach users	National Federation of Sea Anglers
Boston & District Fishermen's Association	National Grid
Bridlington & Flamborough Fishermens' Association	National Monuments Record Centre, Maritime
British Association for Shooting and Conservation	National Trust
British Gas Transco	Natural England
British Holiday and Home Parks Association	National Farmers Union
British Pipeline Agency	North East Coastal Group
British Telecom	North Lincolnshire Wildfowlers Club
Butlins	North Norfolk Coast Advisory Group
Caravan and camping clubs	North Norfolk District Council
Caravan park residents (owners)	North Norfolk Shellfisheries Association
Caravan park site owners	North Shore Sailboard Club
Caravan Watch	Parish/Town Councils
Centre for Ecology, Fisheries and Aquaculture Science	Pleasure Beach Amusements
Chapel St Leonards Beach Angling	Port of Boston
Chapel St Leonards Residents Association	Port of Sutton (Harbour Master)
Coastal BID	Port of Wisbech (Port Manager & Harbour Master)

List of stakeholders

SALTFLEET TO GIBRALTAR POINT STRATEGY

ENVIRONMENTAL REPORT: APPENDIX I

Coastal Communities Alliance	Ramblers
Coastal Developers Forum	Residents
Commercial fishing groups	Residents
CONOCO	Regional F
Council for British Archaeology	Royal Nati
Council for the Protection of Rural England	Rotary Clu
Country, Land and Business Association	Royal Soci
Crown Estates	Royal Yach
Defence Estates	Royal Soci
Defence of Britain Project	Salmon ar
Department for Environment, Food and Rural Affairs	Saltfleet a
Donkeys/beach activities	Saltfleet H
East Lincolnshire Destination Management Group	Saltfleetby
East Midlands Conservancy	Sea Fish Ir
East Midlands Electricity	Seafish Te
East Midlands Tourist Board	Shellfish A
East of England Tourist Board	Skegness
Eastern Area Forum	Skegness
Eastern Inshore Fisheries and Conservation Authority	Skegness
East Lindsey District Council Members	Skegness
East Lindsey District Council Officers	Skegness
Energy suppliers	Skegness
Fantasy Island	Skegness
Farming & Wildlife Advisory Group	Skegness
Federation of Small Businesses	Skegness
Flood Wardens/Emergency Volunteers	Skegness
Forestry Commission	Skegness
Greater Lincoinsnire Local Enterprise Partnersnips	Skegness
Golf clubs	Skegness
Helploeg & Lynn Snrimpers Ltd	Skegness
Her Majesty's Coastguard	Skegness
Historic England	Skegness
Hotel owners	Skognoss -
Humber Coastguard	Skegness
Huttoft Boat Club	Skegness '
John Lake Shellfish	Society fo
King's Lynn Fishing Vessel Owners & Skippers Association	South Line
King's Lynn Fishing Industry Co-operative Ltd	Sport Eng
Landlords	Sports and
Lincolnshire County Council Members	Sustrans
Lincolnshire County Council Officers	The Camp
Lincolnshire Bird Club	The Landr
Lincolnshire Chamber of Commerce	The Natio
Lincolnshire Coast Fishermen's Association	The Wash
Lincolnshire Coastal Country Park	Managem
Lincolnshire Fieldpaths Association	The Wood
Lincolnshire Landyacht Club	Theddleth
Lincolnshire Naturalists Union	Tourists
Lincolnshire Water Management Strategy Group	Visit East
Lincolnshire Wildlife Trust	Wash Estu
Lindsey Archeological Services	Wash Sea
Lindsey Marsh Internal Drainage Board	Wells and
Local residents	Western F
Local Resilience Forum	Wildfowla
Mablethorpe Library	Winthorp
Mablethorpe Motorcycle Sand Racing Club	Youth and
Mablethorpe Seal Sanctuary	Youth Par

Association associations/forums lood and Coastal Committee ional Lifeboat Institution - Skegness station ıbs iety for the Conservation of Nature nting Association ety for the Protection of Birds nd Trout Association nd Skidbrooke Wildfowling & Shooting Club laven boat club y to Theddlethorpe Dunes National Nature Reserve ndustry Authority chnology ssociation of Great Britain East Coast and Wolds Hospitality Association and Alford Drainage Board and District Seniors Forum and Wainfleet and District Wildfowlers Aquarium boating club Business Forum Chamber of Commerce Electric Tramway Natureland Seal Sanctuary Partnership Pier Pier Angling Club Ramblers Association Sea Angling Club Sub Aqua Club Tourist Information Centre Town Centre Manager Water Leisure Park Yacht Club r Lincolnshire History and Archeology colnshire Wildfowlers Club land (East Midlands) d leisure centres ing and Caravan Club nark Trust nal Grid Company PLC and North Norfolk Coast European Marine Site ent Scheme lland Trust orpe Gas Terminal Lincolnshire ary Strategy Group foods - King's Lynn Fishing Industry Cooperative Ltd **District Inshore Fishermens Association** ower Distribution and Wetlands Trust e surfing club community centres Youth Parliament

27/07/2017



Our reference: ENVIMAN002226

Dr Helen Woodhouse Inspector of Ancient Monuments Historic England <u>helen.woodhouse@HistoricEngland.org.uk</u> Via email only

Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Consultation

Dear Helen,

Many thanks for the Historic England (HE) response to the consultation on the Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Report.

Please accept my apologies for the delay in acknowledging your response. We have reviewed your comments and queries and provided responses, split by topic below.

Management approaches

We note that HE consider Approach 5 to be the best management approach from a historic environment perspective. Consultee feedback on management approaches will inform the high level appraisal of the long list of options, in combination with the feedback obtained from the November 2016 stakeholder workshops.

Baseline conditions

The palaeoenvironmental value of peat exposures along shoreline is included as a receptor within the SEA and Strategy development.

Proposed scope of the SEA

We note that HE welcome the acknowledgement of the need to include both designated and non-designated heritage assets in the scope of the SEA and that HE strongly advise against the scoping out of any non-designated heritage assets and palaeoenvironmental material.

We acknowledge the concern regarding the scoping out of any non-designated heritage assets and palaeoenvironmental material, which will be fully reflected in the baseline review. We have been liaising with Lincolnshire County Council (LCC) to determine the non-designated heritage assets from the Historic Environment Record (HER) that should be scoped into the SEA, as described in the Scoping Report. This information has been incorporated within a Method Statement which outlines how the historic environment will be considered as part of the SEA. This will include information on the datasets to be used, the proposed author of the heritage element of the assessment, and when the chapter will be written. The method statement will be issued to HE and LCC for comment in August.

The SEA will not be able to fully address risks relating to the unknown archaeological resource and no detailed desk study or site-based investigation can be incorporated, in accordance with SEA good practice. However, we are considering the findings of the Rapid



Coastal Zone Assessment (RCZA) and it is recognised that there is potential for impacts on the highly significant palaeolandscape, depending on the locations and types of actions recommended by the Strategy. Therefore, the Strategy will identify these potential risks and data gaps and recommend specific actions to define baseline conditions, identify potential impacts and recommend appropriate mitigation during the next stage of its implementation and the associated environmental assessment. The recommendations made in this response are acknowledged and will be reflected within the recommendations of the SEA Environmental Report, where appropriate.

The Strategy will recommend a programme of strategic actions to be implemented over the Strategy period which will need to be further developed into location-specific coastal flood risk management scheme(s) prior to any works taking place. Therefore, there is an opportunity to consider the results of such baseline investigations to inform the siting and design of any structures/realignment areas.

The SEA will utilise all readily available baseline data to best represent the known archaeological and heritage resource within the study area, reflecting both designated and non-designated features. Risks, gaps and uncertainties will be identified and appropriate actions recommended for the implementation stage.

We note that HE welcome recognition of the potential for both inter-relationships between receptors and cumulative effects in the proposed scope of the SEA. We can confirm that the assessment will consider all designated and non-designated assets (where considered relevant in consultation with LCC) as part of the assessment in an integrated manner.

We agree that the SEA will need to identify the particular types of impact associated with episodes of flooding and proposed flood management options and look to prioritise heritage assets for assessment on the basis of their sensitivity and level of risk to those impacts, rather than prioritising on other factors such as a perceived comparative value in heritage terms. Accordingly, the SEA will take into account both the sensitivity (to flooding) and value of the designated and undesignated heritage assets and the associated level of flood risk/associated impact as a result of the proposed flood risk management options and the proposed Strategy. We will take the recommended HE guidance into account.

We note that HE wish to see a very close association between the landscape and visual amenity and heritage assessments and welcome reference to the Lincolnshire Historic Landscape Characterisation project. We agree with this approach and can confirm that consideration of related impacts will be undertaken.

Proposed SEA assessment methodology

We note the HE comment that the SEA will also need to consider how any loss or damage considered to be justified in the overall interests of the Strategy priorities (of which the historic environment must be a key factor) might potentially be mitigated. The SEA will identify all potential adverse effects and identify any actions required to avoid or mitigate adverse effects across all topics. In terms of the historic environment, mitigation may include measures to address potential effects on specific features, or recommendations for further studies and investigations.

We note the HE comments in relation to the level of assessment and the suitability of the SEA to inform the Environment Agency's development of the Strategy. The proposed approach is consistent with SEA good practice in that it accepts that there will be some uncertainty in terms of fully determining potential effects. The assumptions made and resulting limitations on the assessment will be clearly set out so that the results of the assessment can be considered in this context.

The information to be used within the SEA represents the best available data and is in accordance with relevant guidance and good practice and is consistent with our coastal strategies elsewhere in England.

We thank HE for the suggested data sources which will be utilised within the next stage of the SEA.

We do not plan to produce a separate scoping document in relation to historic environment impacts, however the proposed work identifying the likely sensitivity of potentially affected non-designated assets will describe how these features will inform the SEA. In addition, we have prepared a method statement for the heritage assessment, which we will issue to HE and LCC for comment in August.

This work and our proposed approach to considering effects on the historic environment (including designated and non-designated assets and other important aspects such as historic landscape and seafront heritage) within the SEA will take account of published good practice guidance, including those referenced by HE within their scoping response. The methodology and sources used will be clearly stated within the SEA ER.

We agree with HE's recommendations regarding the approach to the significance of designated heritage assets. However, it is important to note that whilst the SEA will utilise best available information to establish the aspects of the historic environment affected and their sensitivity and value/significance consideration of specific impacts will be limited by the level of detail available in the Strategy regarding the type and location of proposed actions (e.g. if the Strategy proposes new structures it may not define where these would be located). The sources suggested by HE will inform the assessment where appropriate and will be referenced within the SEA ER.

The proposed approach will take the potential sensitivity of historic assets into account as far as possible.

We note the HE comment that the SEA should also take appropriate account of the potential temporary effects which activities associated with any of the proposed management approaches might have upon perceptions, understanding and appreciation of the heritage assets affected. In response to this comment we wish to highlight that the purpose of SEA is to consider the strategic implications of the proposed Strategy (and the component preferred option(s)). Details of proposed construction methods will not be available and are therefore not considered. However, the assessment will take into account the frequency, duration and permanence of the actions required to implement the proposed Strategy/preferred options, which will include, for example, consideration of temporary but frequent impacts (e.g. nourishment) versus permanent long term changes (e.g. new structures with no subsequent intervention).

Next steps

We note HE's willingness to work collaboratively with the other agencies involved. As part of the development of the Strategy we will seek to identify any opportunities for environmental improvement and welcome your proposed involvement.

With regards to the Lincshore programme information requested, the 2017 campaign is now complete and we would welcome clarification of your programme request ahead of works to be undertaken in 2018.

Preparation of Method Statement for consultation with HE and LCC

As discussed above we are currently preparing a method statement setting out how we propose to undertake the heritage assessment as part of the SEA process. This method statement will be issued to HE and LCC in August for comment and we would be grateful for feedback on it.

Development of preferred approach/option

Multi Criteria Analysis (MCA) has been used to evaluate the options being considered as part of the Strategy in order to reduce the number to a shorter list. Details of the MCA process is included in the Options Selection and Appraisal briefing note which I enclose. The SEA objectives are incorporated in the MCA process to ensure that environmental factors influence the selection of options.

The short listed options were presented at a series of workshops held in July 2017. The outputs of these workshops are currently being reviewed and will influence a preferred approach/option(s) for managing the Saltfleet to Gibraltar Point coastline over the next 100 years.

Having arrived at the preferred approach/option for the Strategy, a detailed environmental assessment will be undertaken to identify, describe and evaluate its significant effects. Where significant negative effects are identified, appropriate mitigation will be proposed. Any environmental problems that may result from the build-up of many, small, often indirect effects will also be assessed.

This process and the result of the assessment will be documented in the Environmental Report, which will be published alongside the draft Strategy for formal consultation towards the end of 2017 / early 2018.

Thank you once again for your consultation response and participation in the development of the Strategy thus far. If you have any further questions please do not hesitate to contact us.

Yours sincerely,

David Cook

pp Josh Ystenes Senior Environmental Project Manager National Environmental Assessment Service Environment Agency Kingfisher House, Goldhay Way Orton Goldhay, Peterborough PE2 5ZR Landline: 02030 256054 Mobile: 07879 114837 Email : josh.ystenes@environment-agency.gov.uk 27/07/2017



Tammy Smalley Lincolnshire Wildlife Trust tsmalley@lincstrust.co.uk Via email only Our reference: ENVIMAN002226

Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Consultation

Dear Tammy,

Many thanks for the Lincolnshire Wildlife Trust (LWT) response to the consultation on the Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Report.

Please accept my apologies for the delay in acknowledging your response. We have reviewed your comments and queries and provided responses, split by topic below.

Strategy area

We note the LWT comments regarding extensions to the Strategy area. The northern and southern limits of the Strategy area were identified to align with the Strategy areas for the Humber (to the north) and The Wash (to the south). The inland boundary represents the limit of the flood hazard zone as indicated in the Scoping Report. We are not proposing to universally extend the proposed study area but, as stated in the Scoping Report, this boundary will be extended as needed to ensure that all potential effects are fully considered.

Baseline data

Many thanks for raising the issue of the incomplete Local Wildlife Site (LWS) data. Through our subsequent communications it has been confirmed that the information provided by the Greater Lincolnshire Nature Partnership in May 2016 was not comprehensive. The missing data has now been obtained and will be utilised as part of the assessment.

The missing habitats of principal importance data has also been obtained and incorporated into the mapping. This information will be fully considered in the assessment. The Lincolnshire Coastal Grazing Marshes reports have been obtained and this information, where appropriate, will be incorporated into the assessment.

Other plans

In relation to your useful comments regarding other plans, the relevant aspects/requirements of these plans and proposals will be considered.

Issues, constraints and opportunities

We note the LWT agreement that the issues, constraints and opportunities identified are relevant to the Strategy.



The option of setting back the floodbanks of the discharging watercourses has not been considered as flooding from the sea is the major flood risk. Even with surge tides there are cycles of low water when outfalls can discharge. It is however recognised that setting back floodbanks could provide habitat benefits and WFD improvements on these artificial water bodies.

Other proposals

We note that LWT is not aware of any additional development proposals or studies within the study area.

Scope of the SEA

We note the LWT comments regarding the scoping of receptors and the expectation of LWT for the Strategy to result in a net gain for biodiversity.

With regards to Tourism and Recreation, nature reserves are included as part of the described tourism 'offer' within the Scoping Report, and more specific reference will be made within the SEA.

Assessment methodology and criteria

We agree that explicit reference to nature conservation related tourism (e.g. nature reserves, Coastal Country Park) should be included. Specific references are now included within the scoped in receptors in Table 4.1 under the Tourism and Recreation category and accordingly, in the assessment criteria in Table 5.1 under Objective 2.

In relation to Proposed SEA Objective 6 we accept the following proposed change to the sub-objective;

Avoid damage to/loss of coastal, marine, <u>terrestrial and fresh water habitats</u> of principal importance and dependent species of conservation concern, where known to be present.

Data regarding grazing marsh and its use by birds has been obtained and incorporated into the baseline information. This data will be used to inform the assessment, where appropriate.

We note the LWT comment regarding the assessment of enhancements. Enhancement measures/opportunities will be considered as the Strategy is developed, in consultation with relevant external organisations, and we note the suggested potential for more subtle enhancement measures such as actions to improve the condition status of designated sites. Any measures included within the proposed Strategy will be assessed as part of the overall Strategy.

Other

We note the LWT comments in relation to the impact of Strategy development outside of the Strategy boundary. The SEA will include consideration of the effects of the need to dredge sand from offshore sandbanks to implement the present management/nourishment options. Whilst the study area has been defined relatively tightly around the zone of potential direct impacts, the definition of the study area allows for broader consideration beyond this area i.e. where other impacts resulting from the Strategy may occur e.g. offshore, downdrift.

Next steps

Multi Criteria Analysis (MCA) has been used to evaluate the options being considered as part of the Strategy in order to reduce the number to a shorter list. Details of the MCA process is included in the Options Selection and Appraisal briefing note which I enclose. The

SEA objectives are incorporated in the MCA process to ensure that environmental factors influence the selection of options.

The short listed options were presented at a series of workshops held in July 2017. The outputs of these workshops are currently being reviewed and will influence a preferred approach/option(s) for managing the Saltfleet to Gibraltar Point coastline over the next 100 years.

Having arrived at the preferred approach/option for the Strategy, a detailed environmental assessment will be undertaken to identify, describe and evaluate its significant effects. Where significant negative effects are identified, appropriate mitigation will be proposed. Any environmental problems that may result from the build-up of many, small, often indirect effects will also be assessed.

This process and the result of the assessment will be documented in the Environmental Report, which will be published alongside the draft Strategy for formal consultation towards the end of 2017 / early 2018.

Thank you once again for your consultation response and participation in the development of the Strategy thus far. If you have any further questions please do not hesitate to contact us.

Yours sincerely,

David Cook

pp Josh Ystenes Senior Environmental Project Manager National Environmental Assessment Service Environment Agency Kingfisher House, Goldhay Way Orton Goldhay, Peterborough PE2 5ZR Landline: 02030 256054 Mobile: 07879 114837 Email : josh.ystenes@environment-agency.gov.uk



27/07/2017

Roslyn Deeming (Natural England Roslyn.Deeming@naturalengland.org.uk Via email only

Our reference: ENVIMAN002226

Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Consultation

Dear Roslyn,

Many thanks for the Natural England response to the consultation on the Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Report.

Please accept my apologies for the delay in acknowledging your response.

We note that Natural England is satisfied with the SEA methodology, baseline information, scope, and SEA objectives and assessment criteria.

Next steps

Multi Criteria Analysis (MCA) has been used to evaluate the options being considered as part of the Strategy in order to reduce the number to a shorter list. Details of the MCA process is included in the Options Selection and Appraisal briefing note which I enclose. The SEA objectives are incorporated in the MCA process to ensure that environmental factors influence the selection of options.

The short listed options were presented at a series of workshops held in July 2017. The outputs of these workshops are currently being reviewed and will influence a preferred approach/option(s) for managing the Saltfleet to Gibraltar Point coastline over the next 100 years.

Having arrived at the preferred approach/option for the Strategy, a detailed environmental assessment will be undertaken to identify, describe and evaluate its significant effects. Where significant negative effects are identified, appropriate mitigation will be proposed. Any environmental problems that may result from the build-up of many, small, often indirect effects will also be assessed.

This process and the result of the assessment will be documented in the Environmental Report, which will be published alongside the draft Strategy for formal consultation towards the end of 2017 / early 2018.

Thank you once again for your consultation response and participation in the development of the Strategy thus far. If you have any further questions please do not hesitate to contact us.



Yours sincerely,

David Cook

pp Josh Ystenes Senior Environmental Project Manager National Environmental Assessment Service Environment Agency Kingfisher House, Goldhay Way Orton Goldhay, Peterborough PE2 5ZR Landline: 02030 256054 Mobile: 07879 114837 Email : josh.ystenes@environment-agency.gov.uk



27/07/2017

Greg Brown Eastern Inshore Fisheries and Conservation Authority <u>gregbrown@eastern-ifca.gov.uk</u> Via email only Our reference: ENVIMAN002226

Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Consultation

Dear Greg,

Many thanks for the Eastern Inshore Fisheries and Conservation Authority (EIFCA) response to the consultation on the Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Report.

Please accept my apologies for the delay in acknowledging your response. We have reviewed your comments and queries and provided responses, split by topic below.

Strategy area

The seaward boundary of the Strategy area is shown at 5km offshore. We are investigating changes in bathymetry as part of our studies as this can help to identify changes in sediment loadings through time. 5km is considered more than adequate as a seaward extent in that it includes the complex bathymetry up to 1.5km offshore and the relatively consistent water depth range of 8 to 10m (at mean sea level) beyond 1.5km. We are proposing to increase our seabed topographic baseline to align better with the proposed seaward boundary. Moreover, as stated within the Scoping Report, consideration of the effects on the marine environment within the SEA is not limited to the Strategy area, but will extend further offshore as required to include, for example, the locations of potential sources of offshore nourishment material.

Baseline data

We note the EIFCA request for consideration of potting (for crab, lobster and whelk) and potential impacts on bivalve shellfish and/or larger crustacea. These activities and receptors will be incorporated into the full environmental assessment of options which will be published in the Environmental Report. We welcome the provision of data by the EIFCA or direction to where it can be obtained.

The importance of avoiding disturbance and damage to fish/shellfish and their spawning/nursery grounds is noted and will be fully considered during the development of the Strategy.

Information from the Lincolnshire Biodiversity Action Plan is included within the baseline conditions presented within the Scoping Report. However, the plan and baseline information will be reviewed to ensure that all relevant coastal/marine elements are considered during the development of the Strategy.



We note that the EIFCA considers that Scott, C (1994) Marine Environmental Baseline Survey for the Mablethorpe to Skegness Sea Defences Beach Nourishment remains relevant to the current Strategy. We have been unable to locate an electronic copy of the document and would welcome a copy if the EIFCA can provide it to us.

Issues, constraints and opportunities

We note the EIFCA agreement that those issues, constraints and opportunities identified within the Scoping Report are relevant to the Strategy. We note the suggested opportunities to enhance fisheries, which will be considered during the development of the Strategy.

Scope of the SEA

We note the EIFCA comments on the importance of whelk, lobster and crab in terms of the local and regional fisheries and economic value. Therefore, these species will be incorporated into the full environmental assessment of options which will be published in the Environmental Report, subject to the receipt of available data.

We note that the EIFCA considers the proposed objectives and assessment criteria to be appropriate and comprehensive. As discussed above, additional fisheries species (i.e. whelk, lobster and crab) will be considered during the development of the Strategy.

The planned nature conservation assessment will consider areas/features outside of designated sites, subject to data availability. The assessment that we are applying is not limited to designated sites but a broader consideration of impacts to undesignated sites can only be undertaken where sufficient baseline data is available.

Next steps

Multi Criteria Analysis (MCA) has been used to evaluate the options being considered as part of the Strategy in order to reduce the number to a shorter list. Details of the MCA process is included in the Options Selection and Appraisal briefing note which I enclose. The SEA objectives are incorporated in the MCA process to ensure that environmental factors influence the selection of options.

The short listed options were presented at a series of workshops held in July 2017. The outputs of these workshops are currently being reviewed and will influence a preferred approach/option(s) for managing the Saltfleet to Gibraltar Point coastline over the next 100 years.

Having arrived at the preferred approach/option for the Strategy, a detailed environmental assessment will be undertaken to identify, describe and evaluate its significant effects. Where significant negative effects are identified, appropriate mitigation will be proposed. Any environmental problems that may result from the build-up of many, small, often indirect effects will also be assessed.

This process and the result of the assessment will be documented in the Environmental Report, which will be published alongside the draft Strategy for formal consultation towards the end of 2017 / early 2018.

Thank you once again for your consultation response and participation in the development of the Strategy thus far. If you have any further questions please do not hesitate to contact us.

Yours sincerely,

David Cook

pp Josh Ystenes

Senior Environmental Project Manager National Environmental Assessment Service Environment Agency Kingfisher House, Goldhay Way Orton Goldhay, Peterborough PE2 5ZR Landline: 02030 256054 Mobile: 07879 114837 Email : josh.ystenes@environment-agency.gov.uk 27/07/2017



Matthew Harrison Senior Commissioning Officer Flood Risk Lincolnshire County Council <u>Matthew.Harrison@lincolnshire.gov.uk</u> Via email only Our reference: ENVIMAN002226

Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Consultation

Dear Matthew,

Many thanks for the Lincolnshire County Council (LCC) response to the consultation on the Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Report.

Please accept my apologies for the delay in acknowledging your response. We have reviewed your comments and queries and provided responses, split by topic below.

SMP tables

Many thanks for highlighting the error in Table 2.1 of the Scoping Report. This will be corrected in subsequent documentation.

Economic issues

We note the LCC comments in relation to the SEA objectives. The objectives cover the range of topics and issues that are required under the SEA Directive/Regulations, adapted to reflect local conditions and the requirements of the Strategy. The purpose of the SEA is to enable the identification of the environmentally preferred option and identify the potential environmental effects of the proposed Strategy/preferred options.

The objectives/criteria used in the SEA form one part of a multi- staged and multi-criteria decision making process that also takes into account and gives appropriate weight to economic (costs/benefits) and social (e.g. numbers of properties for which flood risk is reduced) factors. This will be used to determine the preferred option(s) and proposed Strategy. This process also allows for the weighting of the criteria to reflect local conditions/priorities. These criteria also include consideration of high grade agricultural land, amongst other factors.

The potential withdrawal of Conoco Phillips from the Theddlethorpe terminal is beyond the scope of the assessment.

Historic environment

Many thanks for reiterating the comments provided by Louise Jennings. We have received further comments from Louise in response to this consultation exercise and Louise has confirmed that the heritage and archaeology elements of the project will be given due consideration.



Biodiversity, flora and fauna

We note the comments from LCC's Natural Environment team.

Consideration will be given to the aims and objectives of the Lincolnshire Heritage Coast document when developing the Strategy and identifying potential opportunities for improvement.

Baseline data regarding designated sites has been obtained from the Greater Lincolnshire Nature Partnership (GLNP) and additional data has been obtained as advised by LWT.

Other plans

Many thanks for highlighting the relevance of the Joint Lincolnshire Flood Risk and Drainage Management Strategy and the Greater Lincolnshire LEP – Water for Growth, Water Management Plan 2015-2040. Reference will be made to these documents and any relevant recommendations/requirements incorporated within the development of the Strategy.

Next steps

Multi Criteria Analysis (MCA) has been used to evaluate the options being considered as part of the Strategy in order to reduce the number to a shorter list. Details of the MCA process is included in the Options Selection and Appraisal briefing note which I enclose. The SEA objectives are incorporated in the MCA process to ensure that environmental factors influence the selection of options.

The short listed options were presented at a series of workshops held in July 2017. The outputs of these workshops are currently being reviewed and will influence a preferred approach/option(s) for managing the Saltfleet to Gibraltar Point coastline over the next 100 years.

Having arrived at the preferred approach/option for the Strategy, a detailed environmental assessment will be undertaken to identify, describe and evaluate its significant effects. Where significant negative effects are identified, appropriate mitigation will be proposed. Any environmental problems that may result from the build-up of many, small, often indirect effects will also be assessed.

This process and the result of the assessment will be documented in the Environmental Report, which will be published alongside the draft Strategy for formal consultation towards the end of 2017 / early 2018.

Thank you once again for your consultation response and participation in the development of the Strategy thus far. If you have any further questions please do not hesitate to contact us.

Yours sincerely,

David Cook

pp Josh Ystenes Senior Environmental Project Manager National Environmental Assessment Service Environment Agency Kingfisher House, Goldhay Way Orton Goldhay, Peterborough PE2 5ZR Landline: 02030 256054 Mobile: 07879 114837 Email : josh.ystenes@environment-agency.gov.uk 27/07/2017



Our reference: ENVIMAN002226

Louise Jennings Historic Environment Officer Lincolnshire County Council <u>louise.jennings@lincolnshire.gov.uk</u> Via email only

Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Consultation

Dear Louise,

Many thanks for the Lincolnshire County Council (LCC) Historic Environment response to the consultation on the Saltfleet to Gibraltar Point Strategy Strategic Environmental Assessment (SEA) Scoping Report.

Please accept my apologies for the delay in acknowledging your response. We have reviewed your comments and queries and provided responses, split by topic below.

General

We note your confirmation that all of the comments made by LCC Historic Environment at the SEA Scoping meeting on 14th July have been incorporated into the Scoping Report.

Scope of the assessment

We note your instruction that the heritage assessment/SEA needs to provide sufficient evidence to understand the impact of the proposal on the significance of any heritage assets and their settings, sufficient to meet the requirements of paragraph 128 of the National Planning Policy Framework (NPPF).

Consideration of potential effects on the historic landscape in terms of the landscape characterisation undertaken by East Lindsey District Council (ELDC) was proposed as part of the SEA within the Scoping Report.

Assessment methodology and criteria

Consideration of impacts on known heritage or archaeological assets will be made as described within the Scoping Report. We consider that determining the requirement for a desk-based assessment and field evaluation would be more appropriate at the next stage of the Strategy implementation (i.e. post the SEA), when the details of the proposed locations and form of the preferred option(s) are developed.

Consideration of impacts on setting will be undertaken as part of the SEA at a strategic level to identify any potentially significant changes and recommend appropriate mitigation. Detailed assessment of changes in views at specific receptors may not be appropriate or possible given the level of information regarding the proposed preferred option(s).



Next steps

Preparation of Method Statement for consultation with LCC and HE

We are currently preparing a method statement setting out how we propose to undertake the heritage assessment as part of the SEA process. This will include information on the datasets to be used, the proposed author of the heritage element of the assessment, and when the chapter will be written. This method statement will be issued to LCC and HE in August for comment and we would be grateful for feedback on it.

Development of preferred approach/option

Multi Criteria Analysis (MCA) has been used to evaluate the options being considered as part of the Strategy in order to reduce the number to a shorter list. Details of the MCA process is included in the Options Selection and Appraisal briefing note which I enclose. The SEA objectives are incorporated in the MCA process to ensure that environmental factors influence the selection of options.

The short listed options were presented at a series of workshops held in July 2017. The outputs of these workshops are currently being reviewed and will influence a preferred approach/option(s) for managing the Saltfleet to Gibraltar Point coastline over the next 100 years.

Having arrived at the preferred approach/option for the Strategy, a detailed environmental assessment will be undertaken to identify, describe and evaluate its significant effects. Where significant negative effects are identified, appropriate mitigation will be proposed. Any environmental problems that may result from the build-up of many, small, often indirect effects will also be assessed.

This process and the result of the assessment will be documented in the Environmental Report, which will be published alongside the draft Strategy for formal consultation towards the end of 2017 / early 2018.

Thank you once again for your consultation response and participation in the development of the Strategy thus far. If you have any further questions please do not hesitate to contact us.

Yours sincerely,

David Cook

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Appendix J: Saltfleet to Gibraltar Point Strategy: consultation responses to Scoping Consultation Document (issued September 2016)

Organisation	Comments provided	Comments relate to:
Historic England Dr Helen Woodhouse, Inspector of Ancient	 From a historic environment perspective, we consider Approach 5, dividing the coast into discrete compartments, offers the best opportunity both to tailor responses and specific management proposals to individual areas based on their particular character and sensitivities, and to ensure that the assessment of impact is site and heritage asset specific rather than needing to adopt a high level or generic approach. 	Management approaches
Monuments	 We welcome the inclusion of additional areas of sensitivity in acknowledgement of the advice provided by Historic England to date. However, we are a little disappointed to see that no work appears as yet to have commenced on drawing together the additional information required. There is in our view a high level of correlation between the historic environment and landscape and visual amenity, with comments made 	Baseline conditions
	 under this latter section in addition of relevance to the historic environment. The SEA should recognise that the peat exposures along the shoreline are of palaeoenviromental value. Whilst Historic England has brought this to the Environment Agency's attention, others beyond our organisation will also consider them to be of value. 	
	 We welcome the fact that the historic environment has been scoped in to this SEA with a broad understanding that impacts on heritage assets also encompass social aspects such as associated with tourism and economic activity as well as community identity and a sense of place. 	Proposed scope of the SEA
	 We also welcome the revised acknowledgement of the need to include both designated and non-designated heritage assets in the scope of the SEA. However, we advise strongly against the scoping out of any non-designated heritage assets and palaeoenvironmental material because these are both those assets about which we have the least information, but also those which are most likely to be affected by a different approach to management of this area of the coast. The current proposal indicates a commitment to liaise with Lincolnshire County Council with regard to which non-designated heritage assets to scope in to the SEA with a post-strategy, pre- development Desk Based Assessment (DBA) proposed. However without the input of the results of additional investigation the DBA will only provide information relating to the known archaeological resource, largely reflective of the information in the Rapid Coastal Zone Assessment. We remain of the opinion that the greater risks are associated with the unknown archaeological resource. The area covered by the proposed strategy contains a highly significant palaeolandscape some of which is likely to be relatively intact. If it is not scoped into the SEA at this stage there is potential for this to become a very difficult issue to resolve later down the line. An assessment of where palaeoenvironmental and archaeological assets are likely to be preserved is therefore required <u>through map</u> <u>regression and, through borehole analysis, shoreline regression</u>. The programme of scoring chould be feared on the shoreline regression. 	

Organisation	Comments provided	Comments relate to:
	likely to be utilised as areas for managed realignment. This would ensure that the SEA considers the most at risk non-designated and unknown archaeological remains (such as for example those lying in the intertidal zone and the areas immediately behind the present coastal defences). We advise that the Environment Agency should discuss this element of the strategy further with a geoarchaeologist and deposit modeller to help them understand the scale and complexity of the work involved.	
	• We do not consider that it will be possible for the SEA to answer many of the proposed assessment criteria set out in Table 5.1 of the scoping document without taking appropriate account of the potential archaeological implications of the range of flood risk management options during development of the strategy. In the absence of such an approach the EA will not in our view be sufficiently informed regarding the risks associated with the impacts of the strategy or how best to mitigate those impacts.	
	 We further advise that where impacts on non-designated heritage assets (including but not limited to archaeological remains) would directly affect the significance designated heritage assets derive from their settings, this should be considered as one of the relevant factors in highlighting this aspect of sensitivity and hence prioritising their inclusion at the appropriate level in the SEA. We therefore welcome recognition of the potential for both inter-relationships between receptors and cumulative effects in the proposed scope of the SEA. 	
	 We advise that the SEA will need to identify the particular types of impact associated with episodes of flooding and proposed flood management options and look to prioritise heritage assets for assessment on the basis of their sensitivity and level of risk to those impacts rather than prioritising on other factors such as a perceived comparative value in heritage terms. Our guidance on Flooding and Historic Buildings may be of assistance in relation to some aspects of the SEA: <u>https://historicengland.org.uk/images- books/publications/flooding-and-historic-buildings-2ednrev/</u> 	
	 We would wish to see a very close association between the landscape and visual amenity and heritage assessments and welcome reference to the Lincolnshire Historic Landscape Characterisation project in this regard. 	
	 We welcome a broad understanding of historic environment impacts ranging from the social to landscape as well as consideration of heritage assets and their significance as individual receptors. However, at present, the proposed assessment criteria do not specifically include a means to assess the impact on the significance of individual heritage assets as receptors and this should be taken into account. We have provided further advice on this point below. We would reiterate our advice that the proposed assessment criteria for e.g. landscape and visual amenity should also be considered where also relevant to the historic environment, such as for example where sea views contribute to the significance of designated heritage assets as part of their setting and experience. The proposed methodology rightly considers the need to avoid 	Proposed SEA assessment methodology
	damage to or loss of significance. In addition to this the SEA will also need to consider how any loss or damage considered to be justified in the overall interests of the strategy priorities (of which the historic environment must be a key factor) might potentially be mitigated.	

Organisation	Comments provided	Comments relate to:
	 We do however welcome consideration of opportunities for promotion and enhancement of the historic environment as well as the avoidance of loss and damage (to significance) under the proposed strategy. 	
	 We welcome recognition that the level of assessment included under the SEA necessarily means that some effects will not be possible to assess or determine. However, we consider it important that careful consideration at this early stage is given to whether the inability to assess or determine any of the historic environment effects associated with the strategy would render the SEA not fit for its purpose and hence unable to inform the Environment Agency's development of the 	
	 flood risk management strategy moving forward. In addition to the MAGIC site we recommend that the Environment Agency make use of the information available from the Historic England website (e.g. https://historicengland.org.uk/advice/hpg/heritage-assets/nhle/; https://historicengland.org.uk/listing/the-list/data-downloads/) to ensure that their baseline data for designated heritage assets is as up to date as possible at each stage. The Listing programme is on-going and the EA should consider the need to revise the information baseline as appropriate in relation to the timetable for both the SEA and subsequent stages of the strategy. In addition to outlining the broad assessment criteria, we would also expect a scoping document to set out a philosophy and specific methodology of assessing the historic environmental impacts associated with the strategy with reference to published good practice advice in this area. Since this has not been included in the scoping document it is vital that this is agreed prior to commencement of work on the SEA. The level of information required under the SEA process will need to be proportional to the severity of the potential issues which may arise from the proposed strategy. We have provided comments above regarding the need to understand the particular types of impact that 	
	 might be encountered and their likely effects on significance as well as in broader terms. Historic England recommends that an approach to the significance of designated heritage assets is reflective of the assessment criteria for the designation process, can be easily understood within the language of the NPPF regarding the significance of heritage assets and the impact of proposals on that significance, takes full account of the most recent published advice in the Historic Environment Good Practice Advice in Planning Notes (2015) which provide supporting information on good practice, particularly looking at the principles of how national policy and guidance can be put into practice, and references the principles set out in Historic England's Conservation Principles publication: Historic Environment Good Practice Advice Note 2 on Managing Significance in Decision Taking in the Historic Environment: https://historicengland.org.uk/images-books/publications/gpa2-managing-significance-in-decision-taking/ Historic Environment Good Practice Advice in Planning Note 3 on The Setting of Heritage Assets: https://historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/ 	

Organisation	Comments provided	Comments relate to:
	Conservation Principles, Policies and Guidance for the sustainable	
	management of the historic environment (2008)	
	https://historicengland.org.uk/advice/constructive-	
	conservation/conservation-principles/	
	https://historicengland.org.uk/images-books/publications/	
	conservation-principles-sustainable-management-historic-	
	<u>environment/</u>	
	• We advise that the approach taken to assessment of heritage impacts	
	should take its cue from the sensitivity of individual assets and groups	
	of assets to the specific types of change associated with the strategy	
	and its alternative management approaches, and their capacity to	
	absorb the effects of such change rather than focusing on the relative	
	value of individual assets.	
	• The SEA should also take appropriate account of the potential	
	temporary effects which activities associated with any of the proposed	
	management approaches might have upon perceptions,	
	understanding and appreciation of the heritage assets affected, such	
	as any construction programmes involving increased traffic and noise.	
	• Historic England will be pleased to continue to advise the Environment	Next steps
	Agency in relation to development of the strategy and the key issues	
	raised above that require further consultation.	
	We would also be keen to work collaboratively with the other	
	agencies involved, such as Natural England, to assist in identifying	
	opportunities to achieve joint objectives for e.g. biodiversity and the	
	historic environment. It would also be helpful if you could supply the	
	documentation on the Lincshore programme which we have	
	previously requested. The lack of this information is now quite an	
	urgent issue from our perspective.	
	• Keen to understand the detailed timeline for production of the SEA.	
	The feedback we provided via the stakeholder meeting would have	
	enabled some of these key issues (such as in relation to the baseline	
	archaeological data from the HER) to be addressed prior to production	
	of the scoping document. Since this opportunity was not taken we	
	advise that this should be prioritised in the next stage of the	
	programme.	
Eastern Inshore	• We have answered the questions as requested, but have done so	General
Fisheries and	whilst considering the relevant Marine Plan policies namely MPA1,	
Conservation	FISH1 and FISH2.	
Authority	 IFCA are not in the glossary of terms. 	
	• Eastern IFCA is continually seeking to improve how we respond to	
Greg Brown,	consultations, both in terms of efficiency and meaningful content.	
Marine	Therefore, if any of the points raised in this response are taken on	
Environment	board we would appreciate being informed.	
Officer	• The strategy area aligns with the previous strategy area, and therefore	Strategy area
	is logical, and based on previous experience. There does appear to be	
	a lack of clarity in regard to the seaward extent of the boundary. It is	
	unlikely that there will be direct effects of the works offshore however	
	there may be indirect impacts (increased sediment loading, activity	
	displacement etc.). Therefore, EIFCA would query what is the	
	strategy's seaward boundary?	
	• On page 14 there is a summary of existing fisheries. Although this is	Baseline data
	fairly inclusive EIFCA would request that potting (for crab, lobster and	
	whelk) is included. These are locally and regionally important fisheries	
	that may be affected by the proposed works.	

Organisation	Comments provided	Comments relate to:
	 The impacts of the activity on Brown shrimp have been assessed, EIFCA would query if the same needs to be done for bivalve shellfish and/or larger crustacea? On Page 41 the SEA states that it will avoid disturbance and damage to fish/shellfish and their spawning/nursery grounds. EIFCA would like to highlight the importance of this aim and ask if measurable targets need to be included to show how this will be achieved. Has the Lincolnshire Biodiversity Action Plan been considered? There are some coastal/marine elements, e.g. for blue mussel <i>Mytilus edulis</i> and biogenic <i>Sabellaria spinulosa</i> reef, as well as for fish spawning and nursery areas (perhaps more relevant to the source of nourishment material than where it is placed). EIFCA considers that Scott, C (1994) Marine Environmental Baseline Survey for the Mablethorpe to Skegness Sea Defences Beach Nourishment. Institute of Estuarine & Coastal Studies, University of Hull. Report to National Rivers Authority Anglian Region, Project no. 9139952/243. Report no. Z053-94-F remains relevant to the current strategy. 	
	 Agreed that those identified were relevant to the strategy. We would query if the opportunities to enhance fisheries have been assessed? Additional benefits could include, inter alia, release of monitoring data gathered in relation to the strategy to improve wider understanding of the seabed habitat; promotion of small-scale inshore fisheries for their heritage value; partnership projects to monitor ghost fishing and introduce escape gaps for potting fisheries. 	lssues, constraints and opportunities
	 Referring to page 33 EIFCA would like to query why species such as whelk, lobster and crab have been scoped out (as part of the fish or shellfish species)? These are locally and regionally important fisheries, with significant financial importance (figures available upon request). 	Scope of the SEA
	 Yes, the proposed objectives and assessment criteria appropriate and comprehensive. Potentially should include all types of fisheries. Nature conservation/enhancement should also have consideration even if it is outside of a designated site and this could still be potentially important mitigation. 	Assessment methodology and criteria
Lincolnshire County Council Louise Jennings Historic	 We made a number of comments at the at the SEA scoping meeting on the 14th of July, all of the points that we made have been incorporated into the Scoping Consultation document. We are confident that the heritage/archaeological issues will be given due consideration. 	General
Environment Officer	 The information in the heritage assessment/SEA needs to provide sufficient evidence to understand the impact of the proposal on the significance of any heritage assets and their settings, sufficient to meet the requirements of paragraph 128 of the National Planning Policy Framework (NPPF). 	Scope of the assessment
	 The National Planning Policy Framework states that 'Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation' (para 128). We would expect the SEA to contain as appropriate a full archaeological evaluation report which explores in the first place non-intrusive evaluation of the sites, and, if this suggests that further information is required we would expect intrusive evaluation in the 	Assessment methodology and criteria

Organisation	Comments provided	Comments relate to:
	statement as to presence/absence/ location, depth, survival and significance of any remains. This should inform a suitable mitigation strategy for the impact.	
	 In addition to the underground remains we would expect a report on the potential impact on the historic landscape. East Lindsey has had Historic Landscape Characterisation undertaken and this should be consulted. 	Scope of the assessment
	 Regarding setting issues, potential impacts on the settings and significance of designated and non-designated heritage assets which would experience visual change should be evidenced using accurate visual representations. Viewpoints, including views of, from, and across heritage asset receptors as well as general intervisibility, all have historic context and need to be assessed properly to determine the contribution of the setting of the heritage asset and the potential impact upon it by development or proposed mitigation measures. The NPPF states that 'Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting' (para 132), and 'The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application' (para 135). 	Assessment methodology and criteria
	• The Strategic Environmental Assessment should contain sufficient information to enable an informed decision to be made.	Scope of the assessment
Lincolnshire Wildlife Trust Caroline Steel, Head of Conservation	 No. To the north, there would be sense in extending the inland boundary slightly to include all watercourses discharging into Saltfleet Haven. To the south, we would recommend an extension beyond Gibraltar Point (as shown on the map) as the spit is growing, probably as a result of beach nourishment to the north. As sediment deposition on the edge of the Wash could have repercussions elsewhere, there would be logic in extending the strategy area boundary to pick up this 	Strategy area
	 The Local Wildlife Site (LWS) data for the strategy area appears to be incomplete as referred to in Table 3.2 and shown on Figure 3.2. There are many more than 11 LWSs in the strategy area. We would recommend that up to date LWS data obtained from the Greater Lincolnshire Nature Partnership is used as part of the SEA. The habitats of principal importance shown on Figure 3.3 (and derived from MAGIC) do not appear to be a complete and up to date representation of priority habitats in Lincolnshire. We would recommend that habitat data is obtained from the Greater Lincolnshire Nature Partnership: much ground-truthing has now been done. Lincolnshire Coastal Grazing Marshes reports relating to grazing marsh habitat and wintering and breeding birds. These are available on http://www.lincsmarshes.org.uk 	Baseline data
	 We would recommend that the Lincolnshire Biodiversity Action Plan (BAP)/Nature Strategy and the Lincolnshire Geodiversity Action Plan (GAP) should be considered and included within the SEA assessment. See http://www.glnp.org.uk Under 3.4.4, reference is made to the Greater Lincolnshire Coastal Vision 'being developed'. This has now been agreed. Reference is also made to a 'Wild Coast Vision'. It is expected that considerable progress will be made on this within the next 6 months, with possible acquisition of Heritage Coast status. The aims, as set out in the scoping document, actually refer to the Coastal Country Park. 	Other plans

Organisation	Comments provided	Comments relate to:
	 for which there is an outline business plan. Key players in this area of work are Lincolnshire County Council, EA, NE and LWT. We would like to flag up that this is an area meriting discussion at the Stakeholder meetings. The Wash and North Norfolk EMS Scheme and the Humber Management Scheme Coastal Community Teams Economic Plan (available from LWT or LCC) Lincolnshire Coastal Destination Bid? 	
	 Agreed that those identified were relevant to the strategy. There is no clear mention of the potential for setting back floodbanks on watercourses discharging along this stretch of coast. Increased capacity could be important if, for example, a surge tide coincided with a period of high rainfall. Designed appropriately, there could be significant habitat benefits as well as WFD improvements. 	Issues, constraints and opportunities Options
	 No other major development proposals or studies within the study area that we should be aware of. The Trust welcomes the receptors that have been scoped in relating to 	Other proposals Scope of the
	 The first welcomes the receptors that have been scoped in relating to biodiversity, flora and fauna and designated earth heritage sites. We appreciate where species and habitats have been scoped out that these will be assessed as part of individual scheme development. The Trust is pleased that consideration of potential opportunities for habitat creation/ improvement to benefit key habitats and species has been scoped in. We would expect the strategy to result in a net gain for biodiversity. Under 'Tourism & Recreation' we would recommend adding a reference to nature reserves as part of the tourism 'offer'. 	SEA
	 Under Proposed SEA Objective 2, we would like to see a clear reference to Nature Tourism (Nature Reserves, Coastal Country Park etc). Under Proposed SEA Objective 6, the Trust is supportive of the proposed objective, sub-objectives and assessment criteria for biodiversity, flora and fauna in Table 5.1. However, in order to ensure that the receptors listed in Table 4.1 are fully considered we would recommend that the third sub-objective is amended as follows: Avoid damage to/loss of coastal, marine, terrestrial and fresh water habitats of principal importance and dependent species of conservation concern, where known to be present.	Assessment methodology and criteria
	known to be present From the report: 5.3 Assumptions, gaps and uncertainties Consideration of effects on species of conservation concern potentially affected by the proposed strategy but outside the designated nature conservation sites will be limited to those species for which adequate survey data exists regarding their distribution. The consultation on this SCD presents an opportunity for such species to be identified and their inclusion justified, where sufficient data exists.	
	 As referred to above, there is now a significant body of evidence relating to grazing marsh and its use by wetland birds. The strategy presents threats and opportunities for these species: nationally/internationally significant numbers are now being recorded. The Trust would strongly recommend consideration of this data. For all the assessment criteria, we would like it to be clear that enhancements are also assessed. The final bullet point asks 'Are there 	

Organisation	Comments provided	Comments relate to:
	any opportunities for habitat restoration or creation?' It is also important to identify more subtle enhancement measures to existing habitat. For example, not all designated sites are in positive conservation management.	
	 A major omission which we would like to flag up relates to the impact of strategy implementation outside the strategy boundary. For example, if there is a need for import of sand, a particular concern would be from where the material is to be won. It may not be appropriate to include any detailed consideration at this stage, but different approaches will have different impacts and these should be identified. 	Other
Lincolnshire County Council	Overall LCC supports the approach taken to look at collaborative ways to address and seek potential improvements to the economic, biodiversity, historic environment and flood risk approach to this section of coastal	General
Harrison, Senior Commissioning Officer Flood Risk	To reiterate the point made in email communication between yourself and David Hickman on 15 th September, the Shoreline Management Plan policy for zone 'P' for the period 2055-2105 (Long Term) should in fact be 'Hold the Line / Managed Realignment' and <u>not</u> 'No Active Intervention / Managed Realignment' as previously indicated, this error being present in Table 2.1.of the Scoping Consultation Document (SCD). I note that this is to be amended as part of the consultation process, and this amendment will be reflected in the final Environmental Report.	SMP Tables
	Whilst the proposed objectives are supported it has been suggested whether, at a time when there isn't enough public money to invest as widely as we would like, then is there a need for prioritisation? Giving a greater priority to economy and individuals will increase tax revenue which can then be reinvested into the defences; arguably that's money better spent than on some of the other objectives.	Economic issues
	None of the objectives directly mention agriculture/food production. The area that is in scope is some of our highest grade land, it would be good to see that protected just as much as other sectors.	
	The economic challenges of the area stem from it being a location for lower value employment. The study might want to give consideration to the type of diversification to higher value employment that could be achieved in the area, such as higher value tourism (self-catering classically), artisan food production and the highest value most under represented employment sector, energy production. Could the strategy be explicit about this?	
	We are also made aware of the fact that Conoco Philips are likely to decommission the Theddlethorpe terminal in the next decade. The objectives might wish to include reference either to that, or at the very least to responding to economic shocks.	
	I am aware that Louise Jennings, Historic Environment Officer, made a number of comments at the at the SEA scoping meeting on the 14 th of July, all of the points that were made have been incorporated into the Scoping Consultation document to be given due consideration. For avoidance of doubt/clarity the comments are detailed below:	Historic Environment
	The information in the heritage assessment/SEA needs to provide sufficient evidence to understand the impact of the proposal on the significance of any	

Organisation	Comments provided	Comments relate to:
	heritage assets and their settings, sufficient to meet the requirements of paragraph 128 of the National Planning Policy Framework (NPPF).	
	The National Planning Policy Framework states that 'Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation' (para 128).	
	We would expect the SEA to contain as appropriate a full archaeological evaluation report which explores in the first place non-intrusive evaluation of the sites, and, if this suggests that further information is required we would expect intrusive evaluation in the form of trial trenching to further inform the heritage impact statement as to presence/absence/location, depth, survival and significance of any remains. This should inform a suitable mitigation strategy for the impact.	
	In addition to the underground remains we would expect a report on the potential impact on the historic landscape. East Lindsey has had Historic Landscape Characterisation undertaken and this should be consulted.	
	Regarding setting issues, potential impacts on the settings and significance of designated and non-designated heritage assets which would experience visual change should be evidenced using accurate visual representations. Viewpoints, including views of, from, and across heritage asset receptors as well as general intervisibility, all have historic context and need to be assessed properly to determine the contribution of the setting of the heritage asset and the potential impact upon it by development or proposed mitigation measures.	
	The NPPF states that 'Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting' (para 132), and 'The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application' (para 135).	
	The Strategic Environmental Assessment should contain sufficient information to enable an informed decision to be made.	
	Whilst we note that LWT form part of this consultation and will make detailed representation, the following comments have been made from LCC's natural environment team. Potential improved environmental outcomes are supported, and consideration should be given to linking existing sites where possible. Continued engagement would be welcomed.	Biodiversity, Flora and Fauna
	Reference should also be made to the Lincolnshire Heritage Coast document (which has superseded the proposed Wild Coast document). Although still in draft form awaiting sign off it should be taken into account as part of the process in looking at this section of coast. Key aims are;	
	 Conserve, enhance and create a diverse, landscape-scale network of wildlife habitats and heritage assets 	
	 Support and encourage a healthy local economy based on a year- round sustainable tourism destination 	

Organisation	Comments provided	Comments relate to:
	 Increase awareness and understanding of the natural and cultural heritage of the area; building recognition locally, nationally and internationally 	
	 Provide recreational opportunities for local residents and visitors within the natural and historic environment 	
	With regard to question 2, Page 23 of the SCD, additional baseline data/environmental receptors, reference should be made to the Environmental Records Centre, managed through the Greater Lincolnshire Nature Partnership (GLNP).	
	It is suggested the following are referenced:	Other plans
	Joint Lincolnshire Flood Risk and Drainage Management Strategy – the local strategy that all Lincolnshire RMAs are signed up to and that which is consistent with the EA <u>National FCERM Strategy</u> .	
	https://www.lincolnshire.gov.uk/residents/environment-and-planning/flood- risk-management/implementing-a-strategy-to-manage-flood-risk-countywide- and-locally/103045.article	
	Greater Lincolnshire LEP – Water for Growth, Water Management Plan 2015- 2040 – recently launched in the House of Commons the basis of which is that the effective management of flood risk and water resources is a critical factor in enabling economic growth across the area. The Lincolnshire coast is seen as key to this. http://www.greaterlincolnshirelep.co.uk/priorities-and-plans/priorities/water/ http://www.greaterlincolnshirelep.co.uk/documents/water-management-plan/	
Natural England Roslyn	Natural England generally welcomes the scoping document and considers that the methodology used to inform the report appears to meet the requirements of the SEA Directive (2001/42/EC) and associated guidance. We have the following comments:	General
Deeming Lead Adviser Sustainable	We acknowledge that the environmental baseline information included within the report provides sufficient information on the natural environment.	Baseline Information
Development Team	We are satisfied that the relevant external policies, plans and programs identified within the report regarding biodiversity, geodiversity, flora and fauna cover our interests in the natural environment.	Policies, Plans and Programmes
	We consider that the issues and receptors identified in table 4.1 and have been correctly identified. We note that Natural England will be contacted to identify the requirement for and scope of the Habitats Regulations Assessment (HRA) for the European and Ramsar sites which is welcome and we look forward to discussing this further.	Scope of the SEA (Table 4.1)
	We are satisfied that the SEA objectives and assessment criteria that have been set out are appropriate for the proposed strategy.	SEA Objectives and assessment criteria (Table 5.1)



Saltfleet to Gibraltar Point Strategy (SGPS): approach to consideration of the historic environment within the Strategic Environmental Assessment (SEA)

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APPROVED BY:	Marcello Cali

Introduction

This note sets out the proposed approach to the consideration of the historic environment within the development and Strategic Environmental Assessment (SEA) of the Saltfleet to Gibraltar Point coastal flood risk management Strategy (SGPS). This note explains the approach taken during the scoping, option appraisal and detailed assessment stages of the SEA process in accordance with relevant policy and legislative requirements.

The historic environment is only one aspect of the environment that is considered within the SEA. However, given discussions with and consultation feedback from key stakeholders, namely Historic England (HE) and Lincolnshire County Council (LCC), it was identified that this note would be beneficial to set out how this SEA considers potential effects on the historic environment.

Background

The strategy area as shown on Figure 1.1 comprises a >37 km length of the Lincolnshire coast between Saltfleet and Gibraltar Point and the low-lying Lincolnshire coastal floodplain extending up to 15 km inland. The strategy area is further sub-divided into three zones (A-C) based on the level of historic intervention: Zone A - Northern area: Saltfleet to Theddlethorpe (Meers Bank) (8 km); Zone B - Central area: Mablethorpe (Meers Bank) to Skegness (Lifeboat Avenue) (26 km); and Zone C - Southern area: Skegness (Lifeboat Avenue) to Gibraltar Point (4 km).

The SGPS is seeking to identify a sustainable approach to flood risk management along the coast within the strategy area for a 100-year timeframe. Since the early 1990s, tidal food risk has been managed along the strategy coastline between Mablethorpe and Skegness with an annual programme of beach nourishment to provide protection to the existing seawalls and banks – the 'Lincshore' scheme. This initial strategy, subsequent periodic strategy reviews and annual Lincshore schemes have required various consents and approvals, through which consideration of the historic environment has been made. This includes, most recently, the Environmental Impact Assessment (EIA) prepared in support of the marine licence application for the Lincshore scheme covering the period 2016 to 2020.

The information and studies available from these previous assessments has informed, as appropriate, the consideration of historic environment aspects at a strategic level within the current SEA.

SALTFLEET TO GIBRALTAR POINT STRATEGY (SGPS): APPROACH TO CONSIDERATION OF THE HISTORIC ENVIRONMENT WITHIN THE STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

Legislation, policy and guidance

This assessment forms part of a non-statutory SEA which, in line with best practice, is being undertaken in accordance with the EU SEA Directive and the transposing Regulations in England and Wales. Specifically, the approach to the consideration of the historic environment within the SEA takes into account the following relevant legislation, policy, advice and procedures:

- Ancient Monuments and Archaeological Area Act (1979), as amended;
- Planning (Listed Buildings and Conservation Areas) Act (1990);
- National Planning Policy Framework (NPPF) Section 12 and Planning Practice Guidance website;
- East Lindsey District Council draft core strategy Policy SP11 Historic Environment;
- Sustainability Appraisal and Strategic Environmental Assessment Historic England Advice Note 8 (2016);
- Historic England Good Practice Advice Notes 1-3;
- Environment Agency Minimum Technical Requirements: 801_12_SD01 Cultural Heritage and Archaeology Standards (2016);
- Lincolnshire Archaeological Handbook (LCC 2016).

Data sources

In establishing the relevant environmental baseline for the historic environment, the SEA has considered data from the following sources:

- National Heritage List for England (NHLE) for designated heritage assets (World Heritage Sites, Scheduled Monuments, Listed Buildings, Wrecks, Registered Parks and Gardens, and Registered Battlefields);
- Lincolnshire Historic Environment Record (HER) for non-designated assets, including archaeological sites and monuments;
- East Lindsey District Council (ELDC) for information regarding Conservation Areas and Locally Listed Buildings;
- Lincolnshire Historic Landscape Characterisation Project (HLC);
- Natural England Seascape Characterisation;
- Rapid Coastal Zone Assessment Survey (RCZA), Donna Nook to Gibraltar Point (English Heritage 2007);
- Historic England Intertidal and Coastal Peat Database;
- LiDAR data, historic mapping and aerial photographs (where appropriate).

Proposed scope and assessment criteria – COMPLETED

Documenting the key initial stage of the SEA, a Scoping Consultation Document (SCD) was prepared and issued for consultation in September 2016. For all environmental aspects, this stage of the SEA: identified an environmental baseline (refer to Annex A for details), both now and in the future; identified those receptors/features that should be 'scoped in' or 'out' for further assessment within the SEA; and proposed a series of objectives and assessment criteria that would be used to test the options and draft strategy proposals. The preparation of the SCD was informed by a stakeholder workshop held

in July 2016 to discuss the proposed scope of the SEA, and was attended by representatives from HE and LCC.

Consideration of the historic environment within the scoping process included the relevant legislation, policy and guidance and the baseline data referred to above.

Within the SCD, the topics relating to historic environment scoped into the assessment were:

- **Contribution to heritage and landscape**: the coastal heritage of the seaside towns, historic townscape/landscape/seascape and archaeology of the strategy area providing significant benefits to the local community, particularly the aspects of wellbeing and a "sense of place"; and contributing economically via heritage tourism.
- **Designated heritage assets**: nationally designated heritage assets and their settings (i.e. scheduled monuments, registered parks and gardens, protected wreck sites, listed buildings, conservation areas) within the strategy area at risk from tidal flooding or potentially affected by flood risk management actions.
- Non-designated heritage assets: significant known non-designated heritage assets or 'clusters' of known non-designated heritage assets and their setting within the strategy area, based on the Lincolnshire Historic Environment Record (HER). It was proposed that LCC would be consulted in order to screen and strategically determine the potentially sensitive features that could be affected by the strategy.

Topics scoped out of the assessment were:

- Non-designated heritage assets: it is not practicable or necessary to determine the effects of the strategy on every local site of undesignated heritage value. Therefore, as above, it was proposed that consultation would be undertaken with LCC to agree those sites/features that could be affected by the proposed strategy and therefore are screened into the assessment. Following the strategy, scheme level desk-based assessment will be undertaken develop a better understanding of these and other locally known/ unknown heritage assets and archaeological resource, where appropriate, as part of individual scheme development.
- Archaeological potential: consideration of the risk of encountering previously unknown heritage/archaeological features would only be considered, where appropriate, as part of individual scheme development.

The SCD proposed that for the consideration of effects on the historic environment, the objective, subobjectives and assessment criteria set out in Table 1 should be used.

SEA objective	Proposed sub-objectives	Proposed assessment criteria
Conserve, and where possible enhance, the historic environment, heritage assets and their settings	 Avoid damage to the key characteristics of the historic landscape/townscape along the coastal frontage, in urban areas and at the seaside resorts Manage risk to heritage assets from tidal flooding Avoid damage to/loss of, and where possible 	 Are the proposals sympathetic to the local character of the historic environment, including the characteristics of the historic landscape or areas of townscape value (e.g. Conservation Areas) and seaside resort heritage? Will the proposals affect the contribution of the historic environment to the tourism economy, sense of place and community wellbeing within the strategy area?

Table 1. Proposed objective, sub-objective and assessment criteria relating to the historic environment within the SCD.

SEA objective	Proposed sub-objectives	Proposed assessment criteria
	 enhance, nationally and locally designated heritage assets Avoid damage to/loss of locally listed and known undesignated archaeological and palaeo-environmental features along the coastal frontage, where relevant to the assessment as agreed with Lincolnshire County Council Historic Environment Officer Protect and support the contribution of the historic environment to the local tourism economy, sense of place and community well being 	 Will the proposals change the risk of flooding to nationally designated heritage assets (Scheduled Monuments, Registered Park and Gardens, Protected Wreck sites, listed buildings) and locally designated heritage assets (listed buildings, Conservation Areas) within the strategy area; or directly affect their physical structure/condition or setting? Will the proposals affect known significant locally listed or undesignated archaeological and palaeo- environmental features along the coastal frontage within the strategy area, where identified as potentially sensitive in consultation with Lincolnshire County Council Historic Environment Officer? Will the proposals encroach on undeveloped land, which may present a risk of encountering archaeological remains? Where known, is there any potential for loss of access to heritage resources? Could the proposals include/promote opportunities for heritage-led regeneration or heritage-based tourism, including traditional seaside tourism?

Consultation feedback regarding the SCD was received from HE and LCC which was considered and taken into account in the further development of the Strategy and the undertaking of the SEA. Individual responses to the specific feedback were provided. This feedback did not result in any material change to the scope of the assessment or the proposed objectives and assessment criteria, although it did influence the development of the environmental baseline.

Development of the environmental baseline – COMPLETED

Following on from the scoping stage and using the data sources described above, the environmental baseline was further developed for use in the assessment of options and the draft strategy as follows. This updated baseline is mapped, as appropriate, for inclusion within the SEA Environmental Report.

Refinement of the study area

- The historic environment study area was subdivided into the three strategy zones (A, B and C) based on the historic coastal management regimes, with Zone B further subdivided into north and south based on the character areas identified by the Lincolnshire HLC:
 - Zone B North = north of Anderby, identified as part of the Mablethorpe Outmarsh;
 - Zone B South = south of Anderby identified as the Skegness Holiday Coast.

Designated assets

- Designated asset data held by the National Heritage List for England were obtained for the whole strategy area.
- Designated assets within a 1 km radius of the High-Water Mark, as defined by the Ordnance Survey, were then assessed by zone.
- These assets were considered in relation to their contribution to the overall character of each zone and the potential impact of the strategy on their fabric and settings.

Non-designated assets and areas of potential

- Non-designated asset data held by the Lincolnshire HER were obtained for the whole strategy area.
- Non-designated assets within a 150 m radius of the High-Water Mark were then quantified and assessed by zone. These assets were considered to be at greatest risk of tidal flooding and impact from changes to their settings.
- Non-designated assets were assessed in relation to their overall contribution to the character of
 each zone and areas of sensitivity were identified with specific reference to direct impacts on
 surviving assets and areas of palaeo-environmental potential. Where particularly sensitive clusters
 of non-designated assets were identified, LiDAR data, historic mapping and aerial photographs were
 reviewed to further refine the spatial extent of these assets.
- The potential for palaeo-environmental remains was recognised along the entire coastline. Peat deposits recorded by the Historic England Intertidal and Coastal Peat Database were highlighted for each zone and areas of known potential were identified.
- The results of the RCZA from Donna Nook to Gibraltar Point was integrated into the review of the non-designated assets for each zone. Where additional assets were noted by the RCZA these were considered. In addition, the conclusions on the historical development and usage of each parish were considered within the respective zones.

Historic landscape

- Historic Landscape Characterisation data was obtained from LCC. The character of the landscape and areas of seaside resort heritage of each zone/sub-zone and the potential impacts of the strategy were considered, in consultation with the landscape specialist.
- Historic land/town/seascapes of sensitivity were identified, potential impacts described and opportunities for enhancement/heritage-led tourism highlighted.

Option appraisal and strategy development – COMPLETED

Following the scoping stage, the identified scope, assessment criteria and the updated environmental baseline were then used to inform the option appraisal stage of the strategy development. A series of stakeholder workshops were held in November 2016 to seek initial views on a range of approaches for coastal flood risk management. Details of the subsequent staged multi-criteria appraisal process will be provided in the SEA Environmental Report. The historic environment was considered within this process as follows:

- An initial high level appraisal of a long list of options (27 in number) was undertaken to consider the costs and benefits of these options using a suite of environmental, economic and social factors. In terms of historic environment, this considered the following: *Does the option conserve, and where possible, enhance, the historic environment, heritage assets and their setting?*
- Using this historic environment criterion and taking into account the scope of the assessment identified in the SCD (See Section 6), all 27 options were scored on a relative basis between 0 (worst performing) and 100 (best performing) based on whether their performance was closest to the best or worst performing option. The scores for all criteria were added and the criteria weighted to reduce the long list to a short list of 13 best-performing ranked options (plus the do-nothing base case).
- This short list of 14 options was then subject to further detailed analysis using the following: (a) SEA objectives and assessment criteria; (b) technical and social criteria; and (c) other (more global) criteria. In terms of historic environment, this utilised the relevant SEA objectives and assessment

criteria set out in Table 1 as appropriate. Options were scored in terms of whether they fully, partially or did/did not meet these criteria.

• This appraisal identified a reduced short list of six options. These were presented for further consideration via a series of stakeholder workshops held in July 2017. Feedback from these workshops was then used to identify the preferred options and the approach set out in the draft strategy.

Although all key impacts were identified in accordance with the defined scope, consideration of the historic environment within the staged option appraisal was necessarily at a strategic and more conceptual level. Impacts included, for example, the potential impacts of the introduction of new rock structures on the setting of any designated heritage assets; allowing the beach levels to decrease from present levels with any effects on the peat exposures currently protected beneath; or the effects on the traditional seaside heritage by changing the nature of the beach and promenade areas.

Assessment of preferred option(s)/draft strategy – CURRENT STAGE

The current stage of the assessment – the detailed consideration of the preferred option(s)/proposed strategy – is based on the detailed baseline, where relevant to the strategy proposals. This stage:

- Assesses the strategy proposals to identify potential effects on the historic environment using in terms of the historic environment objective, sub-objectives and assessment criteria set out in Table 1.
- Determines the significance of these effects in accordance with the generic criteria set out in the SCD to identify which are significant i.e. moderate or major adverse or beneficial.
- Recommends any specific measures that could reduce the significance of identified adverse effects and determines the significance of these residual effects.
- Recommends any monitoring required in relation to these residual effects.
- Recommends the actions needed to ensure that the strategy proposals can be implemented with minimal effects on the historic environment – e.g. guidance on the design, siting and location of potential structures in terms of areas of high sensitivity/potential or to minimise impacts on setting.
- Reporting of the above assessment within the SEA Environmental Report.

Subsequent steps – NEXT STAGE

Public consultation will be undertaken on the draft strategy and the SEA Environmental Report when the assessment of predicted effects on the historic environment and the recommended actions for the future implementation of the strategy can be reviewed by statutory organisations, stakeholders and the general public. Consultation responses received will be reviewed and any changes required, as appropriate, reflected in the published final strategy and the SEA Statement of Environmental Particulars.

Subsequent, more detailed, assessments in terms of the historic environment will then be undertaken, as appropriate, during the implementation of the strategy in support of any consents and licences required for any works arising.


SALTFLEET TO GIBRALTAR POINT STRATEGY (SGPS): APPROACH TO CONSIDERATION OF THE HISTORIC ENVIRONMENT WITHIN THE STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

ANNEX A:

TABLE A.1: Key characteristics of strategy area, at present and in the future, and key issues,
constraints and opportunities relating to the proposed strategy. (Extract from September 2016 SCD)

Summary of existing conditions	 The historic environment of the strategy area encompasses: traditional seaside towns¹, with associated heritage value, including Conservation Areas; the contribution of the historic environment to landscape² and seascape³; and numerous designated and non-designated sites and features. In terms of designated heritage sites, the strategy area contains several at risk from tidal flooding: 12 Scheduled Monuments; more than 90 listed buildings; three Conservation Areas; and two Registered Parks and Gardens. The strategy area also includes a number of undesignated sites (e.g. wreck sites) listed on the Lincolnshire Historic Environment Record (HER). It has been agreed with the LCC Historic Environment Officer that a high level screening assessment of features potentially affected by the strategy will be undertaken to inform the SEA. The peat exposures along the shoreline are considered by Historic England to be of palaeo-environmental value. These provide a record of sea level and coastal changes and preserve buried features that help us to understand how the habitats and landscape of this area and their use by people over a significant period of coastal change. Potential for the presence of previously unknown features along the coastline. A Rapid Coastal Zone Assessment (RCZA) undertaken in 2007 provides an assessment of the archaeological potential of the coastline within the strategy
Future changes in the absence of the strategy	 The character of the seaside towns are likely to change affecting the character of Conservation Areas as well as individual buildings. This could affect their historic attraction and ability to provide a basis for heritage-based tourism and improving prosperity. The archaeology and historic environment of the study area is a finite resource and will be increasingly threatened by physical changes to the coast or changes in flood risk in the short to long term. The protection of existing designated or undesignated sites, structures, buildings and unknown or buried archaeological interest will be required. It is possible that some currently non-designated assets may in future receive statutory protection.
Key issues, constraints and opportunities	• The historic environment, including the coastal heritage of the seaside towns, historic landscape and archaeology, of the strategy area provides significant benefits to the local community particularly the aspects of wellbeing and a "sense of place", with additional economic benefits from heritage tourism.

¹ Williams, P (2013) The English Seaside. https://historicengland.org.uk/images-books/publications/english-seaside/

² Lincolnshire County Council and English Heritage (2011) *The Historic Character of the County of Lincolnshire*.

³ URS/Scott Wilson (2011) Seascape Characterisation around the English Coast (Marine Plan Areas 3 and 4 and Part of Area 6 Pilot Study). Natural England Commissioned Report NECR106. Description of key characteristics updated in Marine Management Organisation (2012) Seascape character assessment. East Inshore and East Offshore marine plan areas.

These places will change and evolve and it is important to reflect on their character and what should be retained and enhanced.
 Specific identified designated and non-designated heritage features are currently at risk from tidal flooding.
• Consideration should be given to the potential to reduce the risk of tidal flooding to existing archaeological or architectural assets, in historic centres (in particular, Conservation Areas) and at individual sites dispersed throughout the study area. Consideration should also be given to the effects on the character and setting of designated heritage assets and their wider benefits to townscape heritage.
• Coastal risk management measures may be influenced by the need to protect the setting of areas of existing archaeological value.
 Opportunity to provide improved tidal flood risk reduction to identified significant heritage features in the long-term.

Appendix L: Visualisations

Contents

Concept visualisations of rock structures compared to open beach (present management) views at two locations: Huttoft and Trusthorpe.

- Figure L1: Huttoft area, rock groyne structures photomontages view from the bank
- Figure L2: Huttoft area, rock groyne structures photomontages view from the beach
- Figure L3: Huttoft area, rock fishtail structures photomontages view from the bank
- Figure L4: Trusthorpe area, rock groyne structures photomontages view from the bank
- Figure L5: Trusthorpe area, rock fishtail structures photomontages view from the bank



EXISTING VIEW AT LOW TIDE



ROCK GROYNE OPTION VIEW AT LOW TIDE



EXISTING VIEW AT HIGH TIDE



ROCK GROYNE OPTION VIEW AT HIGH TIDE

Figure L1: Huttoft area, rock groyne structures photomontages – view from the bank

SGPS_SEA_Profiles_Huttoft_Area_VIS1.1_groynes_bank

Environmental Report: Appendix L: Visualisations Saltfleet to Gibraltar Point Strategy



EXISTING VIEW AT LOW TIDE



ROCK GROYNE OPTION VIEW AT LOW TIDE





SGPS_SEA_Profiles_Huttoft_Area_VIS1.2_groynes_beach

ROCK GROYNE OPTION VIEW AT HIGH TIDE

Figure L2: Huttoft area, rock groyne structures photomontages – view from the beach



EXISTING VIEW AT LOW TIDE



ROCK FISHTAIL STRUCTURE AT LOW TIDE



EXISTING VIEW AT HIGH TIDE



ROCK FISHTAIL STRUCTURE AT HIGH TIDE

Figure L3: Huttoft area, rock fishtail structures photomontages – view from the bank

SGPS_SEA_Profiles_Huttoft_Area_VIS3.1_fishtail_bank

A Huttoft Bank

LOCATION PLAN



EXISTING VIEW AT LOW TIDE



ROCK GROYNE OPTION VIEW AT LOW TIDE



EXISTING VIEW AT HIGH TIDE



ROCK GROYNE OPTION VIEW AT HIGH TIDE

Figure L4: Trusthorpe area, rock groyne structures photomontages – view from the bank



SGPS_SEA_Profiles_Trusthorpe_Area_VIS2.1_groynes_bank



EXISTING VIEW AT LOW TIDE



ROCK FISHTAIL OPTION VIEW AT LOW TIDE



EXISTING VIEW AT HIGH TIDE







SGPS_SEA_Profiles_Trusthorpe_Area_VIS4.1_fishtail_bank