Medway Estuary and Swale Flood and Coastal Erosion Strategy

Report – Technical Appendix K: Habitats Regulations Assessment

V6 August 2018

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Medway Estuary and Swale Coastal Flood and Erosion Risk Strategy

Technical Appendix K: Habitats Regulations Assessment

August 2018

Environment Agency

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Contents

1 Introduction

1.1 Background

Mott MacDonald has been appointed by the Environment Agency to develop the Medway Estuary and Swale Coastal Flood and Erosion Strategy, with the aim of providing a Flood and Coastal Erosion Risk Management (FCERM) Strategy for the Tidal Medway Estuary, mainland Swale and the Isle of Sheppey. The aim of the Strategy is to protect people, properties, designated habitats and agricultural land. As with all flood and erosion risk management work, the wider impacts must be considered. This means that the best technical solutions for flood and erosion defences need to be found, while also considering the impacts and benefits for local communities, the environment and the cost to the tax payer.

The Medway Estuary and Swale Coastal Flood and Erosion Strategy will build upon previous work including the Medway Estuary and Swale SMP (2010) and the Isle of Grain to South Foreland SMP (2010). To help develop the Strategy, a wide range of studies have been carried out to understand the likely impacts of climate change and sea level rise over the short, medium and long-term on:

- The existing flood and erosion defences (type, standard of protection and current maintenance regime)
- The flood and erosion risk to communities and infrastructure
- Internationally important habitat and other land

This Strategy could result in significant changes to the local area so it is important that local communities and landowners are involved in shaping the schemes. Local knowledge will enhance resilience and help identify opportunities for local amenity, access and recreation improvements.

The outcome will be a Strategy Business Case which will recommend the preferred options for coastal erosion and flood risk management over the next 100 years and will be presented to the Environment Agency's Large Project Review Group for approval. A key element of this is a Strategy Implementation Plan, which will be adopted by the Environment Agency and the Local Authorities (Medway Borough Council, Swale Borough Council, Tonbridge and Malling Borough Council and Kent County Council).

1.2 Purpose of this Report

This Habitat Regulations Assessment (HRA) forms an appendix to the MEASS Business Case and to the Strategic Environmental Assessment. It aims to provide evidence to the Competent Authority to allow them to confidently make a decision as to the Strategy's compliance with the Habitats Regulations.

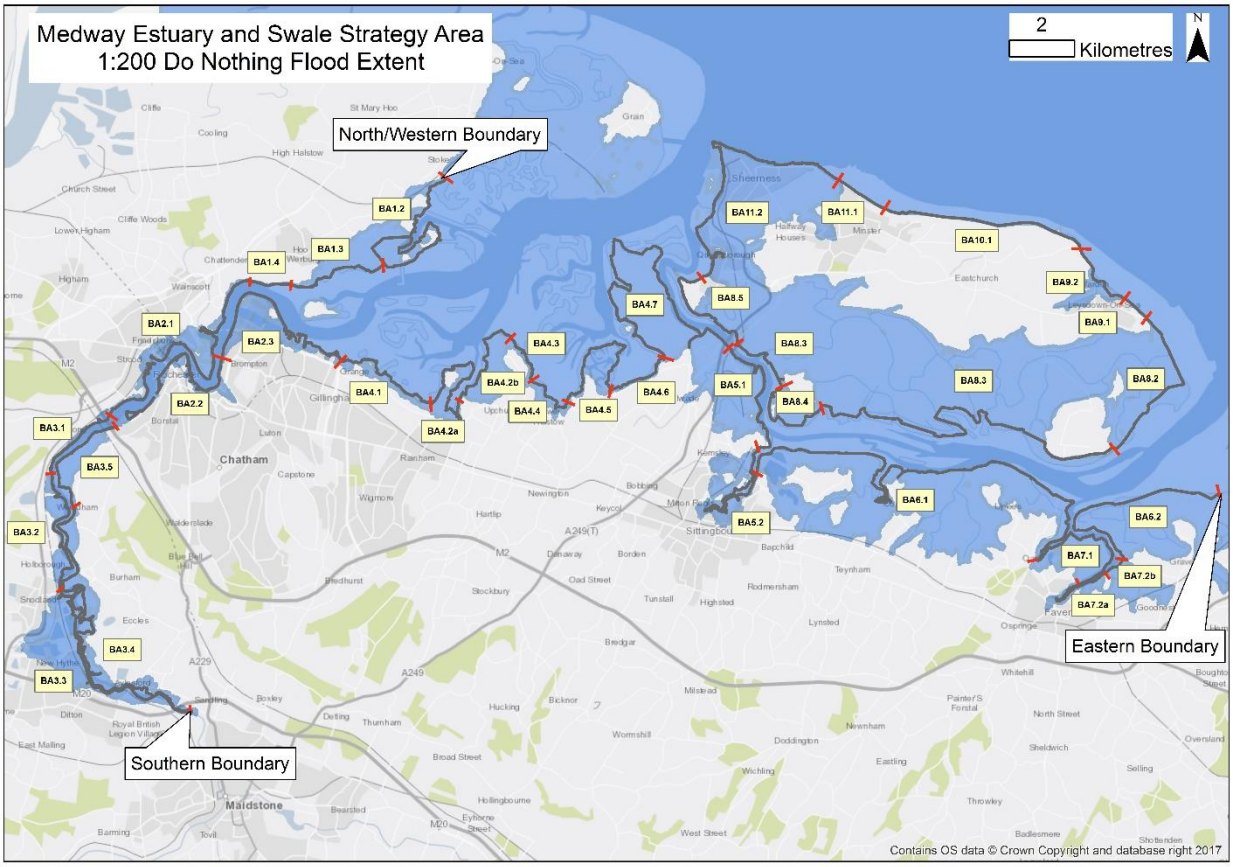
As the Strategy is likely to have a significant effect on European sites, it is necessary to undertake an appropriate assessment. The purpose of this report is to provide sufficient evidence for the Competent Authority to be able to carry out this assessment.

1.3 Location

The Strategy area includes the Isle of Sheppey, Medway Estuary and Swale, as illustrated in Figure 1.1. The Strategy includes the whole of the shoreline around the Isle of Sheppey. It also includes the Medway Estuary and Swale including the large urban areas of the Medway Towns

(Rochester, Strood, Chatham and Gillingham), major industrial and commercial areas, as well as large swaths of rural farmland and extensive saltmarsh and mudflats. Many of the rural areas are internationally designated and protected for their heritage, landscape and biodiversity value. Furthermore, large areas of the designated farmland are under stewardship, providing economic benefits to the area through wildlife friendly farming.

Figure 1: Medway Estuary and Swale Strategy area. The blue line delineates the extent of potential flooding under a 0.5% Annual Exceedance Probability (1 in 200 year) event. Based on this worst-case scenario approximately 17,226 residential properties are thought to be at risk of flooding over the next 100 years.



The boundaries of the Strategy area are:

- Southern: Allington Sluice as the upstream tidal limit of the Medway
- Northern/Western: the village of Stoke on the Hoo Peninsula
- Eastern: the Sportsman Public House on Cleve Marshes near Faversham

Currently, the majority of the Strategy frontage is heavily defended, especially around the Isle of Sheppey to protect the important port at Sheerness, and along the tidal River Medway to protect the Medway Towns. However, a significant proportion of the defences in the area are nearing the end of their design lives and therefore maintenance costs and risk of failure during a storm event is high. It is not considered sustainable in the long term to continue to maintain defences in their current position.

1.4 Benefit Areas

The Strategy area frontage is approximately 120km in length and therefore it has been broken down into a series of Benefit Areas (BAs) based on the extent of discrete flood cells and also land use. These BAs have been broken down further into 35 sub-BAs based on the SMP Policy Units (Figure 1.2).

During the early stages of the Strategy formulation, it was concluded that the SMP's Policy Units would be revised slightly. This was carried out primarily as a result of the flood and coastal erosion modelling, to allow the areas considered to more closely reflect modelled flood cells. The terminology was changed too, from Policy Units in the SMPs to Benefit Areas and their various constituent Benefit Units (to reflect the small changes outlined above).

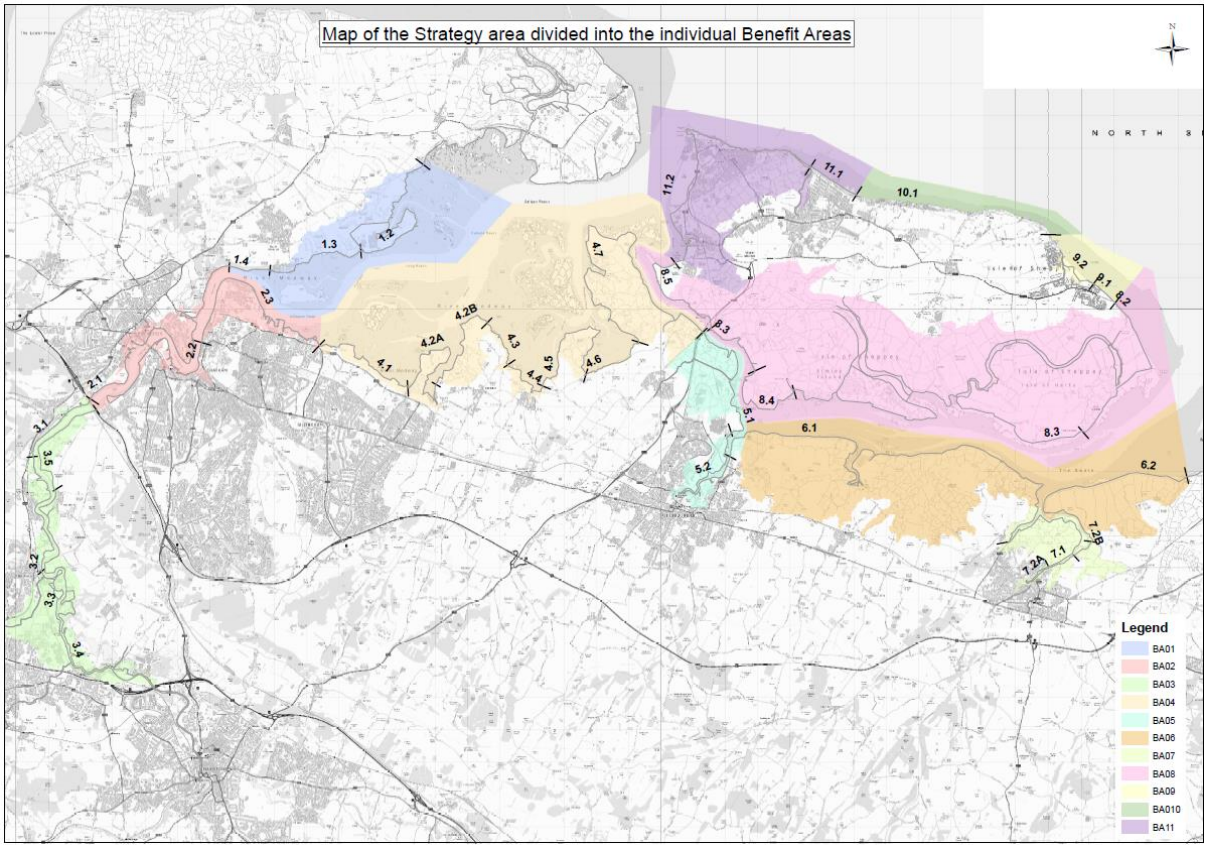
Table 2 below shows the relationship between the SMP Policy Units and the MEASS Benefit Areas and Unit going forward.

Table 1: The relationship between the Policy Units of the two component SMPs and the MEASS Benefit Areas and Units

SMP Policy Unit Code	SMP Policy Unit Name	MEASS Benefit Area Code	MEASS Benefit Area Name	MEASS Benefit Unit Code	MEASS Benefit Unit Name
E4 01	Grain Tower to Colemouth Creek				Not included in MEASS, as it is included in TE2100 instead.
E4 02	Colemouth Creek to Bee Ness Jetty				As above.
E4 03	Kingsnorth Power Station	1	Hoo Peninsula	1.2	Kingsnorth Power Station
E4 04	Power Station to Cockham Wood			1.3	Kingsnorth Power Station to Cockham Wood
E4 05 and E4 30a	Cockham Wood			1.4	Cockham Wood
E4 06	Lower Upnor to Medway Bridge	2	Medway Towns	2.1	Lower Upnor to Medway Bridge
E4 12				2.2	Medway Bridge to West St Mary's Island
E4 12 and E4 13	Medway Bridge to west St Mary's Island, and St Mary's Island to the Strand			2.3	St Mary's Island to the Strand
E4 07	Medway Bridge to North Halling	3	Upper Medway	3.1	Medway Bridge to North Halling
E4 08	North Halling to Snodland			3.2	North Halling to Snodland
E4 09	Snodland to Allington Lock			3.3	Snodland to Allington Lock
E4 10	Allington Lock to north Wouldham			3.4	Allington Lock to North Wouldham
E4 11	Wouldham Marshes			3.5	Wouldham Marshes
E4 14	The Strand to west Motney Hill	4	Medway Marshes	4.1	The Strand to West Motney Hill
E4 15	Motney Hill to Ham Green			4.2A	Motney Hill to Ham Green

SMP Policy Unit Code	SMP Policy Unit Name	MEASS Benefit Area Code	MEASS Benefit Area Name	MEASS Benefit Unit Code	MEASS Benefit Unit Name
E4 15	Motney Hill to Ham Green			4.2B	Motney Hill to Ham Green
E4 16	Ham Green to east of Upchurch			4.3	Ham Green to east of Upchurch
E4 17	East of Upchurch to east Lower Halstow			4.4	East of Upchurch to east of Lower Halstow
E4 18	Barksore Marshes			4.5	Barksore Marshes
E4 19	Funton to Raspberry Hill			4.6	Funton to Raspberry Hill
E4 20 and E4 30a	Chetney Marshes, and Medway Islands			4.7	Chetney Marshes
E4 21 and E4 22	Kingsferry Bridge to Milton Creek, and Milton Creek	5	Milton Creek and Sittingbourne	5.1	Kingsferry Bridge to Milton Creek
E4 22	Milton Creek			5.2	Milton Creek
E4 23	Murston Pits to Faversham	6	Swale Mainland	6.1	Murston Pits to Faversham (Murston Pits to Oare Creek only)
-	-			6.2	Faversham Creek to The Sportsman Pub
E4 24	Faversham to Nagden	7	Faversham Creek	7.1	Murston Pits to Faversham
E4 24	Faversham to Nagden			7.2A	Faversham to Nagden (Front Brents and Town)
E4 24	Faversham to Nagden			7.2B	Faversham to Nagden (Abbey Fields)
E4 25 and 4a06	Shell Ness to Sayes Court, and Leysdwon-on-Sea to Shell Ness	8	South Sheppey	8.2	Leysdown to Shellness (from Park Avenue to Shellness only) Shellness to Sayes Court
E4 26 and E4 27	Sayes Court to north Elmley Island, and north Elmley Island to Kingsferry Bridge			8.3	Sayes Court to Kingsferry Bridge (excluding Elmley Island)
E4 26	Sayes Court to north Elmley Island			8.4	North Elmley Island
E4 28	Kingsferry Bridge to Rushenden			8.5	Kingsferry Bridge to Rushenden
4a05	Warden Bay to Leysdown-on-Sea	9	Leysdown	9.1	Leysdown to Shellness
4a05	Warden Bay to Leysdown-on-Sea			9.2	Warden Point to Leysdown
4a04	Minster Slopes to Warden Bay	10	Minster Cliffs	10.1	Minster Slopes
4a03	Minster Town	11	Sheerness	11.1	Minster Town to Royal Oak
E4 29 and 4a02	Rushenden to Sheerness, and Garrison Point to Minster			11.2	Sheerness to Minster and Rushenden to Sheerness

Figure 2: The division of the frontage into 11 BAs and 35 sub BAs based on discrete flood cells (determined from modelling) and land use. Please note that BA1.1 is now included in the Thames Estuary 2100 Strategy. BA8.1 and 8.2 were merged to form BA8.2 to reflect the interconnectivity between these areas

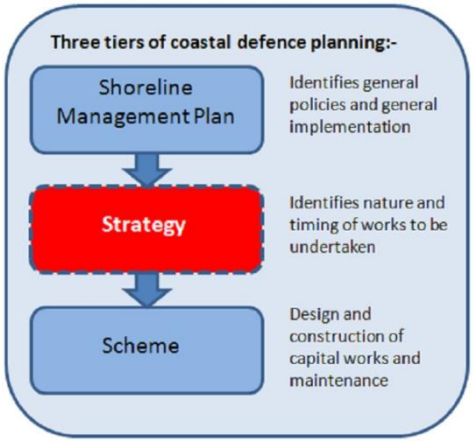


Source: Mott MacDonald, 2016. Ordnance Survey basemap

1.5 Shoreline Management Plans

This Strategy builds upon the previous Medway Estuary and Swale SMP and the Isle of Grain to South Foreland SMP. Figure 1.3 presents the general process from SMP to Strategy to the development of individual schemes.

Figure 3: The different stages in the development of a coastal defence scheme



The SMPs defined management policies for each of the sub BAs over the next 100 years over the short (year 0-20), medium (year 20-50) and long term (year 50-100). These policies include:

- 'Hold the Line' (HTL) – assumes that defences are maintained or new defences installed to protect the coastline along the current alignment.
- 'Managed Realignment' (MR) - establishing a new defence line, often set back from the existing position, with the aim of improving the long-term sustainability of the line, or contributing to other aims such as habitat creation. Managed realignment may be referred to as 'managed retreat' or 'setback'.
- 'No Active Intervention' (NAI) - assumes that there is no intervention, and natural and other external processes are allowed to take their course. Monitoring for health and safety is still undertaken.

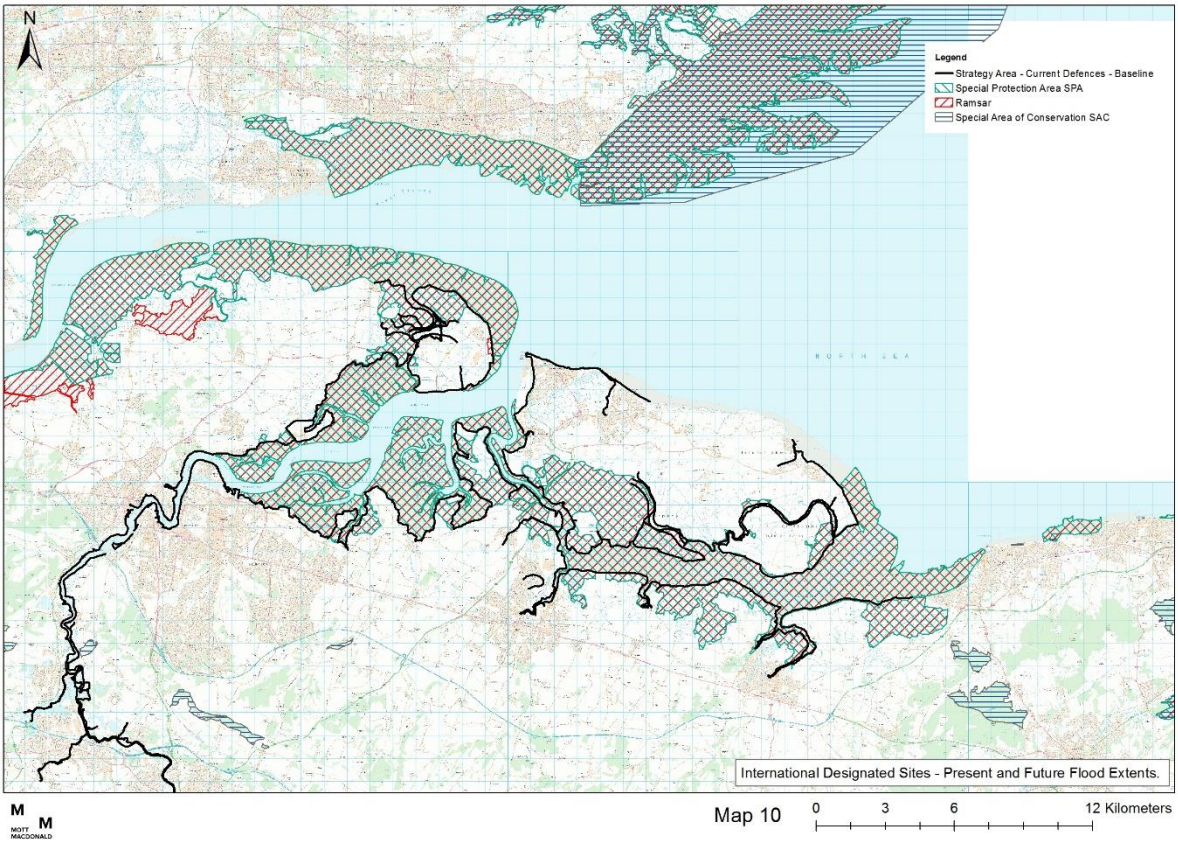
These policies have been used to help define the options that have been assessed during the formulation of the Strategy. However, it should be noted that it has been necessary to propose alternatives for some of the SMP policies to meet the demands of current guidance and legislation, especially around the impacts of coastal squeeze and the need to create inter-tidal habitats, as well as where opportunities to provide economic and sustainability opportunities have been identified. Furthermore, when producing the Implementation Plan for the Strategy (Technical Appendix H of the Strategy) it has been highlighted that it is important to work with the natural coastal processes to provide resilient flood and erosion defences, promote the optimum solutions, but also present a realistic Strategy in which confidence can be had in the implementation and follow-through of the recommendations on the ground. These alternatives are documented within the Appraisal Summary Table Report (Technical Appendix E of the Strategy), and are described as appropriate in this document.

1.6 Environmental Designations

As well as taking account of the SMP recommendations, the environmentally designated sites have been very important during the development of the Strategy. Much of the area is nationally and internationally designated habitat (Figure 1.4) that will be lost as sea levels rise and 'squeeze' it against the existing defences. As well as impacts of coastal squeeze on intertidal habitat, there are further impacts of increasing overtopping behind the defences due to sea level rise which can cause adverse impacts on freshwater designated habitat. Part of this Strategy will be to plan how these designated habitats and their integrity can be retained, by realigning

defences or creating compensatory areas in other locations as well as looking at strategically locating designated freshwater habitat inland.

Figure 4: The European Environmental Designations within the MEASS area.



Source: Natural England, 2015.

1.7 Objectives of the MEASS Strategy

This Strategy will assess and consider a variety of economic, environmental, social and technically appropriate approaches to manage the flood and erosion risk, in order to balance the wide range of features and interests within the area.

The vision statement of the Strategy is to “work with the community to plan how we will sustainably reduce flood and erosion risk to 17,266 homes in the Medway Estuary, Swale and Sheppey over the next 100 years (under a 0.1% AEP event), whilst also protecting and enhancing the local environment.”

Building on from this vision statement a series of primary and secondary objectives for the Strategy have been developed (Table 1). Please note that the coastal squeeze figures that are part of the objectives come from the Coastal Processes Study undertaken by Mott MacDonald.

Table 2: MEASS Primary and Secondary Objectives

Primary Objectives	Secondary Objectives
1. Reduce flood and erosion risk to all properties and infrastructure at significant or very significant risk in light of coastal change over the next 100 years.	3. Favour options that reduce the whole life costs of current defences.
2. Maintain the integrity of Natura 2000 sites (protected under the Habitats and Birds Directives) assuming the loss due to coastal squeeze of 113ha of intertidal habitat between years 0-20 and a further 140ha of intertidal habitat between years 20-50.*	4. Favour options that support delivery of the Thames River Basin Management Plan. 5. Help enable local plan objectives to be realised where possible.

*It is to be noted that although the primary objective focuses on only the first two epochs, the assessment is over the 3 epochs (or 100 years).

These objectives have been used in the options appraisal process to test the suitability of the proposed management Options. The Options are first tested against the primary objectives and then the secondary objectives. Where options did not fully meet primary objective 2, assessment of alternatives was undertaken under this HRA process to consider whether additional less damaging options could be taken forward.

Note that the areas of habitat lost to coastal squeeze are taken from the Coastal Processes Study Technical Note, which was based on detailed modelling of the topography and sediment movement within the Strategy area.

1.8 Structure of this Report

An outline of this report's structure is provided below:

This Report has been structured to align with the specific requirements of the Habitats Directive. A key objective of the Strategy, as demonstrated in Section 1.7 was to assess both negative and positive effects on the Natura 2000 sites, and the Strategy process has been iterative to allow a process of identifying potential impacts, amending proposals to reduce impacts and maximise sustainability benefits and provide a final Strategy which looks at maximising outcomes in a long term sustainable way.

The report is therefore comprised of the following sections:

- Introduction and Requirement for Habitats Regulations Assessment (Chapters 1 and 2)
- Review of existing Shoreline Management Plans and HRAs (Chapter 3)
- Stage 1: Screening (on the Short List of Options) (Chapter 4)
- Stage 2: Appropriate Assessment of the Leading Options (Chapter 5)
- Stage 3: Consideration of the Alternatives (Chapter 6)
- Stage 4: Approval or Refusal of the Plan, including Imperative Reasons on Overriding Public Interest and Compensation (Chapter 7)

2 The Requirement for Habitats Regulations Assessment

2.1 The Need for Habitats Regulations Assessment

Under the European Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora (also known as the 'Habitats Directive'), and the resulting Conservation of Habitats and Species Regulations 2010 (as amended), a Habitats Regulations Assessment (HRA) is required where a plan or project may give rise to significant effects on European designated sites, known as Natura 2000 sites.

Natura 2000 sites consist of Special Areas of Conservation (SAC), Special Protection Areas (SPA), and also include candidate SACs and potential SPAs. Although not strictly classified as Natura 2000 sites, Ramsar sites are included in the HRA process, because this is how the UK Government have chosen to implement the Ramsar convention. Throughout this report, the term Natura 2000 site is therefore taken to include Ramsar sites.

Within and around the MEASS area there are several SACs, SPAs and Ramsar Sites, and therefore a Habitats Regulations Assessment (HRA) is required.

2.2 Role of Organisations in Habitats Regulations Assessment

2.2.1 Competent Authorities and their Responsibilities

Habitats Regulations Assessments are carried out by the Competent Authority, taking into account the conservation objectives for the site. It is the responsibility of the applicant to provide sufficient robust evidence to the Competent Authority to allow them to confidently make a decision as to application's compliance with the Habitats Regulations. The purpose of this report is therefore to provide sufficient evidence for the Competent Authority to be able to carry out their assessment. For this Strategy, the Environment Agency is the Competent Authority.

The responsibilities of the Competent Authority are:

- To make an appropriate assessment before deciding to undertake, or give any consent, permission or other authorisation for a plan or project likely to have a significant effect on a European site, either alone or in combination with other plans and projects.
- For the purposes of the assessment, consulting the appropriate nature conservation body and having regard to its representations.
- Ensuring that if there is a negative assessment of a plan or project, agreement to that plan or programme is only given if there are no alternative solutions, it must be carried out for imperative reasons of overriding public interest, and any compensatory measures that are required to ensure the integrity of the designated sites are maintained and suitable.
- If the HRA concludes no alternative, the IROPI case is required to go to DEFRA for approval.

2.3 Method of Assessment

Strategies are policy-setting documents that generally determine one of four ways of managing the shoreline and its coastal defences over the next 100 years: Hold the Line, Advance the Line, Managed Realignment or No Active Intervention. As already indicated, two SMPs are already in

place that relate to the Strategy area. Each of these has been subject to their Habitats Regulations Assessment, as outlined in Chapter 4.

Due to the changes that the Strategy is seeking to make on the SMP policy and the more detailed appraisal that is given at strategy level, the Strategy requires its own HRA.

A map of the Study Area, drawing number MM/347800/GIS/001/053/A, is included in Appendix A.

2.3.1 Stage 1: Screening

The Screening stage of the HRA process (HR01) is undertaken to identify the likely impacts of a plan or project upon a European site, either alone or in combination with other plans and projects, and to consider whether the impacts are likely to be significant.

The Screening process - a low level test for Likely Significant Effects -considers whether an impact is likely to have a significant effect on the designated site. The Strategy used the screening approach to ensure that the decision process in assessing a long list of options provided evidence/assurance that HRA-related issues, and the conservation objectives for the sites, were primary considerations. The HRA process has taken place alongside the Strategic Environmental Assessment process, hydrodynamic modelling, and flood and erosion risk assessment. Incorporated into these are assessments of the residual life of existing flood and erosion defences, existing heights above sea level and flood levels, both now and in the future accounting for climate change and sea level projections.

There are a large number of options on the short list for consideration at Screening, and the unitary nature of each option – each likely to be a single component in a wider scheme – means that the assessment of In-Combination effects, and the Significance therein, is undertaken at a fairly high level. The screening process has been carried out with a precautionary approach, such that no options are ruled out as having no potential significant effects in combination with other projects, plans and policies.

2.3.2 Stage 2: Appropriate Assessment

The Appropriate Assessment follows the Stage 1: Screening if the plan or project has been identified as having Likely Significant Effects. An Appropriate Assessment is required to determine whether there would be any adverse effect on the integrity of the European site, either alone or in combination with other plans and projects, and with regard to the site's structure and function and its conservation objectives. Where there are adverse impacts, an assessment of constraints is carried out to determine whether the adverse effects have an adverse effect on the integrity of the site.

This Appropriate Assessment will consider the Preferred Option for the Strategy, and (as with above) will incorporate the HRA requirements, restrictions and opportunities in the decision-making process. It also reflects consultation with Natural England, as well as specialists working on the project from the Environment Agency, the RSPB and Kent Wildlife Trust.

Alongside the HRA process, a large number of other constraints and factors have been considered to enable selection of the Preferred Option. These include, but are not limited to, preparation of preliminary and detailed Appraisal Summary Tables, the ongoing Strategic Environmental Assessment process, Water Framework Directive assessment, Ecosystems Services Assessment input (where appropriate), economic assessment, and of course extensive stakeholder engagement and input from SEB the Stakeholder Engagement Group representatives on the wider project team.

2.3.3 Stage 3: Assessment of Alternatives

Where mitigation options cannot avoid adverse effects then the project would only be allowed to progress if the following two stages are completed.

The first is to assess to see if there are alternatives to the proposed plans which are not as damaging. An assessment of alternative solutions would need to take place, examining alternative ways of achieving the objectives of the project to establish whether there are solutions that would avoid or have a lesser effect on European sites.

2.3.4 Stage 4: Imperative Reasons of Overriding Public Interest and Compensation

Should there be no alternatives, the plan will have to be assessed in terms of whether there are imperative reasons of overriding public interest (IROPI). This final assessment takes place where no alternative solution exists, and where adverse impacts remain. It assesses whether the development is necessary for IROPI and, if so, it would identify the potential compensatory measures needed to maintain the overall coherence of the site and integrity of the European site network.

2.4 Background to the European Sites

The seven Natura 2000 sites that could be directly affected by the plans include:

- Medway Estuary & Marshes SPA & Ramsar Site
- The Swale SPA & Ramsar Site
- Thames Estuary & Marshes SPA & Ramsar Site
- Outer Thames Estuary SPA

The above four sites are therefore considered in this report. Each is described briefly below, and a narrative on their qualifying features is given in Chapter 4 Screening. Full Citations are included in Appendix B. The locations of these sites are shown in Appendix A.

2.4.1 Medway Estuary and Marshes SPA and Ramsar Site

The Medway Estuary and Marshes SPA and Ramsar Site located in the Medway Estuary, on the north Kent coast. It extends upstream from Grain on the northern side and Queenborough on the southern side (on the Isle of Sheppey), upstream for around 12.5 km, to where the river is more constrained and canalised in nature, north of Gillingham. It covers 4686 hectares.

It has a complex arrangement of tidal channels, which drain around large islands of saltmarsh and peninsulas of grazing marsh. The mud-flats are rich in invertebrates and also support beds of *Enteromorpha* and some Eelgrass *Zostera* spp. Small shell beaches occur, particularly in the outer part of the estuary. Grazing marshes are present inside the sea walls around the estuary.

Habitats present include tidal rivers, estuaries, mud flats, sand flats and lagoons (67%); salt marshes, salt pastures and salt steppes (15%); inland water bodies (1%); bogs, marshes, water fringed vegetation and fens (1%); dry grassland and steppes (1%); humid grassland and mesophile grassland (15%).

The complex and diverse mixes of coastal habitats support important numbers of waterbirds throughout the year. In summer, the estuary supports breeding waders and terns, whilst in winter it holds important numbers of geese, ducks, grebes and waders. The site is also of importance during spring and autumn migration periods, especially for waders.

Various Benefit Areas considered in this report completely overlap with this SPA.

2.4.2 The Swale SPA and Ramsar Site

The Swale SPA and Ramsar Site is located between the Swale mainland and the Isle of Sheppey, immediately adjacent to the Medway Estuary and Marshes SPA. It covers an area of 6510 hectares, from Kingsferry at its western end to Whitstable at the eastern end (beyond the extent of the MEASS study area).

It is a complex of brackish and freshwater, floodplain grazing marsh with ditches, and intertidal saltmarshes and mud-flats. Its constituent habitats include tidal rivers, estuaries, mud flats, sand flats and lagoons; salt marshes, salt pastures and salt steppes (5%); inland water bodies (2%); other arable land (47%); other land (including towns, villages, roads, waste places, mines, industrial sites (6%)).

The intertidal flats are extensive, especially in the east of the site, and support a dense invertebrate fauna. These invertebrates, together with beds of algae and Eelgrass *Zostera* spp., are important food sources for waterbirds. Locally there are large Mussel beds formed on harder areas of substrate. The SPA contains the largest extent of grazing marsh in Kent (although much reduced from its former extent). There is much diversity both in the salinity of the dykes (which range from fresh to strongly brackish) and in the topography of the fields. The wide diversity of coastal habitats found on the Swale combine to support important numbers of waterbirds throughout the year. In summer, the site is of importance for Marsh Harrier, breeding waders and Mediterranean Gull. In spring and autumn migration periods, as well as during winter, the Swale supports very large numbers of geese, ducks and waders.

Various Benefit Areas considered in this report completely overlap with this SPA.

2.4.3 Thames Estuary and Marshes SPA and Ramsar Site

The Thames Estuary and Marshes SPA and Ramsar Site extends for about 15 km along the south side of the estuary from an area west of Cliffe to the village of Grain, where it abuts the Medway Estuary and Marshes SPA. It also includes intertidal areas on the north side of the estuary from the east of Tilbury to Stanford-le-Hope. It covers a total of 4686 hectares. This SPA is located just outside the MEASS study area, but was within the SMP areas, and hence requires continued consideration as there is the potential for the Strategy to affect it.

To the south of the river, much of the area is brackish grazing marsh, although some of this has been converted to arable use. Specific habitats include tidal rivers, estuaries, mud flats, sand flats and lagoons (57.3%); salt marshes, salt pastures and salt steppes (1.5%); shingle, sea cliffs and islets (0.9%); inland water bodies (5.6%); bogs, marshes, water fringed vegetation and fens (3.7%); dry grassland and steppes (1.9%); and humid grassland and mesophile grassland (29.1%).

The estuary and adjacent grazing marsh areas support an important assemblage of wintering waterbirds including grebes, geese, ducks and waders. The site is also important in spring and autumn migration periods. The site also provides suitable conditions for a number of notable plants and invertebrates associated with these wetland habitats.

The SPA is located at the western end of the Benefit Areas.

2.4.4 Outer Thames Estuary SPA

The Outer Thames Estuary SPA is entirely marine; it covers an area of 379,823.8 hectares, in three distinct areas. The main area is the outer part of the estuary (east of a line north from Sheerness, Kent to Shoebury Ness, Essex). A second area extends south along the coast of east Norfolk (from Caister-on-Sea) to Woodbridge, Suffolk generally within the 12 nautical mile

zone, and a third area lies slightly further north and partly within 12 nm, but also with a larger area extending well beyond the 12 nm zone).

The Outer Thames Estuary SPA is classified for the protection of the largest aggregation of wintering red-throated diver (*Gavia stellata)* in the UK, an estimated population of 6,466 individuals, which is 38% of the wintering population of Great Britain. It also protects foraging areas for common tern (*Sterna hirundo)* and little tern (*Sternula albifrons*) during the breeding season.

3 Review of the Shoreline Management Plans and HRAs

3.1 Background

Shoreline Management Plans (SMPs) provide a large-scale assessment of the risks associated with coastal erosion, and present a policy framework to address these risks to people and the developed, historic and natural environment in a sustainable manner over the longer term (100 years). The plans enable social, environmental and economic assets affected by coastal flood and erosion to be managed in the best way over the long term. In doing so, an SMP is a high-level document that forms an important part of the Department for Environment, Food and Rural Affairs (Defra) strategy for coastal flood and erosion risk management planning (Defra, 2001).

Two SMPS were produced by the South East Coastal Group in 2008, the Medway Estuary and Swale SMP (Halcrow, 2008) and Isle of Grain SMP (Halcrow, 2010). Both were produced according to latest government guidance at the time (Defra, 2006). The shoreline management policies considered were those defined in the Defra guidance:

- Hold the [defence] Line, by maintaining or changing the standard of protection.
- Advance the Line, by building new defences on the seaward side of the original defences.
- Managed Realignment, by allowing the shoreline to move backwards or forwards, with management to control or limit movement.
- No Active Intervention, where there is no investment in coastal defences or operations.

The two SMPs were high level, strategic plans. The policies they set are further developed and appraised prior to implementation of any new flood defence and coastal erosion works – in this case through undertaking a flood and coastal erosion risk management strategy, informed by technical and environmental studies. The SMPs took account of other existing planning initiatives and legislative requirements, and intend to inform wider strategic planning. They do not set policy for anything other than coastal defence management.

The SMPs were structured to consider objectives, policy setting and management requirements for 3 main epochs; from the (then) present day, medium-term and long-term (corresponding broadly to time periods of 0 to 20 years, 20 to 50 years, and 50 to 100 years respectively).

3.2 SMP Objectives

The objectives of the two SMPs, defined during the early stages of its production, were as follows:

- To define, in general terms, the flooding and erosion risks to people and the developed, historic and natural environment within the SMP area over the next century.
- To identify the preferred policies for managing those risks.
- To identify the consequences of implementing the preferred policies.
- To set out procedures for monitoring the effectiveness of the SMP policies.
- To inform planners, developers and others of the risks identified within the SMP and preferred SMP policies when considering future development of the shoreline and land use changes.

- To comply with international and national nature conservation legislation and biodiversity obligations.
- To highlight areas where knowledge gaps exist

These objectives are given in the SMP documents themselves.

3.3 The SMP Process

The two SMPs, for the Medway Estuary and Swale and the Isle of Grain, shared a common structure, and as such were presented in five parts:

- Part one: detailed the principles, aims, structure and background to its development.
- Part two: detailed how the SMP meets the requirements of a Strategic Environmental Assessment (SEA).
- Part three: development of the Plan including: sustainable policy, constraints, and limitations on adoption of certain policies.
- Part four: presentation of the preferred Plan discussing: rationale, implications, and requirements to manage change.
- Part five: provided a series of statements for each of the policy units including: proposed location-specific policies and their implications.

3.3.1 Competent Authorities

Development of the SMPs was led by a Client Steering Group (CSG) comprising relevant members of the South East Coastal Group. This included technical officers and representatives from Kent County Council, Swale Borough Council, Medway Council, Tonbridge and Malling Council, Canterbury City Council, the Environment Agency, Natural England and Historic England. The Client Steering Group also included a representative from Herrington Consultants.

The development of the SMPs was also assisted by regular involvement of members representing each of the operating authorities (the councils and the Environment Agency), through an Elected Members Forum (EMF). This group comprised elected members from each of the councils, Medway District Council, Swale Borough Council, Tonbridge and Malling Borough Council and Kent County Council (generally the relevant Cabinet Portfolio holder) and a representative from the Regional Flood Defence Committee.

On completion, both SMPs were adopted by the implicated Local Authorities, DEFRA and the Environment Agency.

3.4 Medway Estuary and Swale Shoreline Management Plan

3.4.1 Areas Covered

The boundaries of the Medway Estuary and Swale SMP were determined as follows:

- Upstream limit (Medway): Normal tidal limit at Allington Lock Gate
- Upstream limit (Swale): Boundary with the Medway Estuary
- Downstream limit (Medway): River Medway Schedule 4 (Coast Protection Act 1949) Boundary with the coast and thus junction with the Isle of Grain to South Foreland SMP
- Downstream limit (Swale): The Swale Schedule 4 (Coast Protection Act 1949) Boundary with the coast and thus junction with the Isle of Grain to South Foreland SMP

Note that the Grain and Stoke Saltings areas are not included within the Medway Estuary and Swale Strategy.

3.4.2 Outputs of the SMP

In general terms, the SMP management policies are described below:

At the village of Grain and around the Grain Power Station the coastline would be protected, with Hold the Line proposed for all epochs, in the vicinity of the Grain power station. Managed Realignment is proposed for all epochs for the Stoke Saltings area, between this and the Kingsnorth power station where the proposal again reverts to Hold the Line for all epochs. (As described above, the Grain and Stoke Salting areas are not included in this Strategy).

West of Kingsnorth power station Managed Realignment is proposed for all epochs as far as Cockham Wood, where the naturally steep topography allow No Active Intervention to be assigned.

All built-up areas of Rochester, Gillingham and Chatham are designated as Hold the Line for all epochs, but further upstream the river corridor as far as Allington the policies recommend as a combination of Managed Realignment and Hold the Line for the first epoch, giving way to Managed Realignment for the second and third epochs for all areas.

Along the southern bank of the Medway estuary, to the east of Rochester, the assigned management is a combination of Managed Realignment and No Active Intervention, as far as the Kingsferry Bridge, where the Swale begins. Between here and Sittingbourne, including Milton Creek, Hold the Line is assigned for all epochs, to protect the built-up area and the industries to the north including a paper mill and other factories.

Further east still, along the mainland Swale, Hold the Line is advocated for the first epoch, reverting to Managed Realignment for the second and third epochs. This is the case as far as The Sportsman pub at Seasalter.

The north-west quadrant of the Isle of Sheppey, around Queenborough, Sheerness and Minster, is designated as Hold the Line for all epochs, to protect these urban areas. From Queenborough south and east all the way to Warden on the north-east coast of Sheppey, Managed Realignment is allocated for all epochs, except for the stretch around the Kingsferry bridge where Hold the line is proposed for the first epoch, reverting to Managed Realignment after this. This stretch includes Elmley Island and the Isle of Harty, both extensive areas of freshwater grazing marsh etc., with very little infrastructure. Between Warden and Minster No Active Intervention is proposed, for all three epochs.

At the time of production, the SMP indicated that the predicted extents of the SMP Managed Realignment policies for Policy Units E402, E404, E414, E415, E418, E420, E428 would result in the creation of 242ha of intertidal habitat, but this would be counteracted by the displacement an equivalent 242ha of freshwater habitat.

The creation of intertidal habitat from each of these policies was considered a Beneficial Effect on site integrity and important for the wider Natura 2000 network.

Similarly, the SMP indicated that SMP Managed Realignment policies for Policy Units E423, 25 & 26 would result in the creation of 945ha of intertidal habitat but would displace 945ha of freshwater habitat.

The creation of intertidal habitat from each of these policies was considered a Beneficial Effect on site integrity and important for the wider Natura 2000 network.

3.5 Review of the Medway Estuary and Swale SMP Habitats Regulations Assessment (Environment Agency, 2008)

3.5.1 Introduction

The Medway Estuary and Swale SMP Habitats Regulations Assessment (2008) concluded that the SMP included or had the potential to affect several European sites (Special Protection Areas, Ramsar sites and a Special Area of Conservation). Consequently, the requirements of the European Union Habitats Directive (92/43/EEC) and European Union Birds Directive (2009/147/EC), as implemented in the UK by the Conservation (Natural Habitats &c) Regulations 1994 ("Habitats Regulations" as amended in 2007), were addressed. The implications of the plan on these European sites and the interaction with the requirements of the Habitats Regulations were critical to the development of a realistic and legally viable strategy.

For a SMP, the objective of the HRA is to determine the impact of all policy options proposed by the plan where there is a likelihood of an adverse effect on the integrity of a European site, either alone or in combination with other plans, programmes and projects, and advise potential compensation requirements to the Kent and South London Habitat Creation Programme.

3.5.2 Assessment of Likely Significant Effect

Four sites that could be directly affected by the SMP were identified due to freshwater habitat displacement and intertidal habitat growth through Managed Realignment Policies. These included:

- Medway Estuary and Marshes SPA and Ramsar Site
- The Swale SPA and Ramsar Site
- Thames Estuary and Marshes SPA and Ramsar Site
- Peter's Pit SAC

Peter's Pit SAC was initially identified as a site that could be directly affected by the SMP, but was ruled out in Stage 2 due to no likely significant effect occurring.

3.5.3 Appropriate Assessment

Medway Estuary & Marshes SPA and Ramsar Site

Alone, the Managed Realignment policies in units within the plan that affect this site were predicted to have a beneficial effect on the intertidal habitats and an adverse effect through displacement of grazing marsh habitat. It was decided that displacement of other freshwater features (including standing water) was an acceptable modification to this site or could be addressed through application of conditions and compensation.

In Combination, the Managed Realignment Policies from the rest of the SMP, the recommendations of local strategic plans (TE2100, Isle of Grain SMP2, South East Plan, Local Development Frameworks) and effects on other local European Sites were concluded to have a beneficial effect on the intertidal habitats and an adverse effect through displacement of grazing marsh and standing water habitat. However, the regional habitat plan would seek to address this though creation of new freshwater habitat.

The Swale SPA and Ramsar Site

Alone, the Managed Realignment policies in units within the plan that affect this site were predicted to have a beneficial effect on the intertidal habitats and an adverse effect through displacement of grazing marsh habitat. Displacement of other freshwater features (including

standing water) is acceptable modification to the site or can be mitigated through application of conditions and compensation.

In Combination, the Managed Realignment Policies from the rest of the SMP, the recommendations of local strategic plans (TE2100, Isle of Grain SMP2, South East Plan, Local Development Frameworks) and effects on other local European Sites would have a beneficial effect on the intertidal habitats and an adverse effect through displacement of grazing marsh and standing water habitat. However, the regional habitat plan would seek to address this though creation of new freshwater habitat.

Thames Estuary & Marshes SPA and Ramsar Site

Alone, the Hold the Line policies of the plan that affect this site were predicted to have an adverse effect through coastal squeeze of intertidal habitat.

In Combination, the Managed Realignment Policies in the adjacent Isle of Grain to South Foreland SMP2 and the current Thames Estuary 2100 (TE2100) project were predicted to counter these coastal squeeze losses with no adverse effect on site integrity, although the HRA was produced at a time when the TE2100 project was still in progress, so it was pointed out in the HRA that this was the best consideration at the time of production.

3.5.4 Conclusions of the Medway Estuary and Swale SMP HRA

Appropriate Assessment Conclusion (Indicative Extents)

The Appropriate Assessment concluded that, alone and in combination, the Indicative Extents of Managed Realignment within the Medway Estuary & Swale SMP would have an Adverse Effect on the integrity of the Medway Estuary and Marshes and The Swale SPA/Ramsar network, through displacement of grazing marsh and standing water habitats.

The assessment therefore progressed to Stage 4: Alternatives, Imperative Reasons for Overriding Public Interest (IROPI) and Compensation.

Alternatives

The following potentially less damaging alternatives were identified:

a. Hold the Line, or
b. Managed Realignment with a Controlled Extent (to minimise ecological impact) i.e. a controlled alternative to the ‘indicative extents’.

Natural England was invited to formally advise on the least damaging of these alternatives. The advice from Natural England was as follows:

“Hold the Line: Based on the best available information recently produced under the Greater Thames CHaMP project, Hold the Line is now considered a damaging policy within all epochs due to its predicted loss of intertidal habitat through coastal squeeze. Natural England do not consider Hold the Line to be the least damaging alternative for any epoch of the plan based on this information.

Managed Realignment with a Controlled Extent: Following a review of the SMP policies within and outside the designated areas plus their respective timing, Managed Realignment with a Controlled Extent (to minimise ecological impact) is the least damaging alternative for all Managed Realignment Policies affecting the designated sites. This would allow the creation of a more natural coastline. This is therefore the approach that the SMP has adopted subject to the following conditions that define the actions and controls required to implement the plan in the least damaging way.”

IROPI

At the time of production of this report, it was concluded that it was not possible to guarantee that the least damaging alternative for implementing this plan would not cause adverse effect either through freshwater habitat displacement or coastal squeeze. Adopting the precautionary principle of the Habitats Regulations, it was concluded that the plan would have an adverse effect even with controls in place and when taking the least damaging approach. As such, it was concluded that consideration for 'Imperative Reasons of Overriding Public Interest' was required.

Compensation

The HRA outlined that compensation provisions were developed in partnership with Natural England using the best available information. The partnership agreed that, at SMP level, it was appropriate to follow Defra Policy Guidance on Coastal Squeeze and consider compensatory habitat 'secured' if it is suitably programmed and resourced within a Regional Habitat Creation Programme (RHCP). The development of Great Bells Farm was part of the implementation to address the compensation requirement of the SMP.

3.6 Isle of Grain Shoreline Management Plan

3.6.1 Areas Covered

The boundaries of the Isle of Grain SMP were determined as follows:

- Isle of Grain component: Allhallows-on-Sea to the village of Grain
- Isle of Sheppey Component: Garrison Point, Sheerness to Shell Ness (north-facing coastline of Sheppey only
- Kent mainland component: Nagden Marshes, Faversham, to South Foreland, close to Dover

Note that, as described for the previous SMP, the Allhallows-on-Sea to Grain section is not included within the Medway Estuary and Swale Strategy. Only a small proportion of the Nagden Marshes, Faversham, to South Foreland section is included in the Strategy (between Nagden Marshes and the Sportsman pub, west of Whitstable.

3.6.2 Outputs of the SMP

In relation to those lengths of coastline that coincide with the MEASS strategy, the following proposals were formulated in the SMP.

For the first epoch, Hold the Line was proposed for the coastline between Allhallows-on-Sea and Grain, followed in the second and third epochs by Managed Realignment (although this section of coastline is not included within the Strategy). Garrison Point to Minster, taking in the main residential areas on the Isle of Sheppey were proposed as Hold the Line for all epochs, as was Minster Town.

No Active Intervention was proposed for Minster Slopes to Warden Bay for all epochs. Hold the Line with localised Managed Realignment was proposed for all epochs for the coastline between Warden Bay and Leysdown-on-Sea, and Managed Realignment for all epochs was proposed for Leysdown-on-Sea to Shell Ness.

Hold the Line was recommended for the stretch from Faverhsam Creek to Seasalter (which goes just beyond the end of the MEASS study area at The Sportsman pub) for the first epoch, with Managed Realignment for the second and third epochs.

3.7 Review of the Isle of Grain to South Foreland Shoreline Management Plan Habitats Regulations Assessment (Environment Agency, 2010)

3.7.1 Introduction

The Isle of Grain SMP Habitats Regulations Assessment concluded that the SMP included or had the potential to affect several European sites (Special Protection Areas, Ramsar sites and a Special Area of Conservation). Consequently, the requirements of the European Union Habitats Directive (92/43/EEC) and European Union Birds Directive 79/409/EEC), as implemented in the UK by the Conservation (Natural Habitats &c) Regulations 1994 ("Habitats Regulations" as amended in 2007), were addressed. The implications of the plan on these European sites and the interaction with the requirements of the Habitats Regulations were critical to the development of a realistic and legally viable strategy.

For an SMP, the objective of the Habitats Regulations Assessment (HRA) is to determine the impact of all policy options proposed by the plan where there is a likelihood of an adverse effect on the integrity of a European site, either alone or in combination with other plans, programmes and projects.

3.7.2 Assessment of Likely Significant Effect

It was suggested that the Isle of Grain to South Foreland Shoreline Management Plan (SMP) could have potential effects on the following designated European Habitats Directive Sites and Ramsar sites (“European Sites”) in the local area:

- Thames Estuary & Marshes Ramsar / Special Protection Area (SPA)
- The Swale Ramsar / SPA
- Thanet Coast & Sandwich Bay Ramsar / SPA
- Thanet Coast Special Area of Conservation (SAC)
- Sandwich Bay (SAC)
- Dover to Kingsdown Cliffs (SAC)

The process concluded that there would be No Likely Significant Effect on Sandwich Bay and Dover to Kingsdown Cliffs SACs.

3.7.3 Appropriate Assessment

Thames Estuary & Marshes SPA / Ramsar

Alone, the creation of intertidal habitat from this policy was considered a Beneficial effect on site integrity, and important for the wider Natura 2000 network. However, on the assessed extent of managed realignment, and based on the information available, it was not possible to demonstrate that the SMP did not have an Adverse effect due to the displacement of freshwater habitats.

In Combination, the Hold the Line policies in the adjacent Medway Estuary SMP2 have an Adverse effect through coastal squeeze of intertidal habitat. The Thames Estuary 2100 project, Thames Gateway project, the South East Plan and the Local Development Framework are recommending increased commercial development in the coastal plain protected by the defences.

The Swale SPA / Ramsar

Alone, the creation of intertidal habitat from this policy was considered a Beneficial effect on site integrity, and important for the wider Natura 2000 network. However, on the assessed extent of

managed realignment, and based on the information available, it was not possible to demonstrate that the SMP does not have Adverse effect due to the displacement of freshwater habitats.

In Combination, the Managed Realignment Policies from the Medway Estuary SMP2, the recommendations of local strategic plans (TE2100, Thames Gateway project, South East Plan, Local Development Frameworks) have a Beneficial effect on the intertidal habitats and an Adverse effect through displacement of grazing marsh and standing water habitat.

Thanet Coast & Sandwich Bay SPA / Ramsar

Alone, the creation of intertidal habitat from this policy is considered a Beneficial effect on site integrity, and important for the wider Natura 2000 network. Based on the assessed extent of Hold the Line and available information, the prevented gain of potential chalk reef cannot be controlled by conditions. As the actual and prevented gain of chalk reef is outside the SPA & Ramsar site, and therefore has no actual or potential effect on the existing designated chalk reef habitat, it is concluded that these policies have No Adverse Effect on site integrity.

In Combination, the Medway Estuary SMP2 and Pegwell Bay to Kingsdown Cliffs Coastal Strategy are recommending changes to the adjacent coastline, the latter of which agrees with the policies in the Isle of Grain to South Foreland SMP.

Thanet Coast SAC

Alone, the creation of intertidal habitat from this policy is considered a Beneficial effect on site integrity, and important for the wider Natura 2000 network. Based on the assessed extent of Hold the Line and available information, the prevented gain of potential chalk reef cannot be controlled by conditions. As the actual and prevented gain of chalk reef is outside the SAC, and therefore has no actual or potential effect on the existing designated chalk reef habitat, it is concluded that these policies have No Adverse Effect on site integrity.

In Combination, the Medway Estuary SMP2 and Pegwell Bay to Kingsdown Cliffs Coastal Strategy are recommending changes to the adjacent coastline, the latter of which agrees with the policies in the Isle of Grain to South Foreland SMP.

3.7.4 Conclusions of the Isle of Grain to South Foreland SMP HRA

Appropriate Assessment Conclusion (Indicative Extents)

The Habitats Regulations Assessment concluded that, Alone and In Combination, Managed Realignment policies could potentially have an Adverse effect on the integrity of the Thames Estuary and Marshes and The Swale SPA / Ramsar sites through displacement of grazing marsh and standing water habitats.

Alternatives

The competent authority identified the following less damaging alternatives:

a. Hold the Line
b. Managed Realignment with a Controlled Extent (to minimise ecological impact)

As with the Medway Estuary and Swale SMP HRA, Natural England were invited to formally advise on the least damaging of these alternatives and requested that the most timescales of the policies be considered. The advice from Natural England was as follows:

“Hold the Line: Based on the best available information recently produced under the Greater Thames Coastal Habitat Management Plan (CHaMP) project, Hold the Line is now considered a

damaging policy within all epochs due to it's predicted loss of intertidal habitat through coastal squeeze. Natural England does not consider Hold the Line to be the least damaging alternative for any epoch of the plan based on this information.

Managed Realignment with a Controlled Extent: Following a review of the SMP policies within and outside the designated areas plus their respective timing, Managed Realignment with a Controlled Extent (to minimise ecological impact) is the least damaging alternative for all Managed Realignment Policies affecting the designated sites.

Timing and Coastal Squeeze Compensation Outside Designated Areas: With respect to timing and coastal habitat gains outside designated areas, the scales of coastal squeeze losses predicted by the Greater Thames CHaMP within the first epoch are greater than the potential Coastal Habitat gains in suitable undesignated areas within the whole SMP area. As such, both the Competent Authority and Natural England agree that the least damaging alternative will have to change the current composition of the Natura sites affected by the SMP. In turn, both parties agree that the SMP is likely to have an adverse effect in the first and latter epochs of the plan."

IROPI

At the time, it was concluded that the least damaging alternative for implementing this plan was likely to cause adverse effect either through freshwater habitat displacement or coastal squeeze. As such, the competent authority needed to consider whether the plan was necessary and needed to be implemented for 'IROPI.' It was considered that the SMP was necessary and had the following 'Imperative Reasons of Overriding Public Importance:'

- A need to address a serious risk to human health and public safety (uncoordinated and uncontrolled flood and erosion risks to large residential populations and major infrastructure).
- Where failure to proceed would have unacceptable social and/or economic consequences (loss of economic infrastructure, commercial property and community areas) through coastal flood and erosion damage.
- Whilst this is a damaging plan, it is the least damaging option for the designated sites in adjusting to the climate change impacts of sea level rise. This SMP therefore has beneficial consequences of primary importance for the environment.

Due to the necessity of the SMP, it was assumed that implementation of the plan would only adversely impact freshwater habitat rather than impacts through coastal squeeze.

Compensation

The SMP HRA concluded that it would be necessary to provide compensatory habitat for habitats lost due to the Scheme. It identified that the loss of freshwater habitat due to managed realignment would need direct and equal compensatory habitat, a total of 679 hectares over the three epochs.

For intertidal habitats, the SMP HRA concluded that the amounts of intertidal habitats lost versus that created inside and outside of Designated Sites by the proposed managed realignment were at least equal, so no compensatory intertidal habitat was required.

4 Stage 1– Screening (HR01)

This chapter follows the structure of the Environment Agency's HR01 pro-forma which is used by the Environment Agency for screening plans and projects that may need to go forward to Appropriate Assessment.

It is important to understand that the MEASS Benefit Areas differ slightly from those in the Shoreline Management Plan. Each Benefit Area has been assessed, in the wider project and hence in this report, against a number of different options.

It is the revised set of Benefit Units, and the Short List of options for each, that is considered in this chapter.

4.1 Type of Permission/Activity

Development of a Flood and Coastal Erosion Risk Management Strategy.

4.2 Brief Description of Proposal

See Chapter 4.

4.2.1 Benefit Area Proposals

At Screening stage, the proposals for each Benefit Area are varied. Under the broad headings of either No Active Intervention, Hold the Line or Managed Realignment from the SMP, the various potential proposals for each Benefit Area include a refined set of options (the Short List) that include measure to maintain, sustain or upgrade flood and coastal erosion protection (see the definitions in Section 2.3), managed realignment etc. in direct relation to the various forms of existing coastal protection. The various potential proposals for each Benefit Area are shown in Table 4.2 later in this Chapter.

A plan showing the Benefit Areas and their component units can be found in Appendix A.

4.3 European Site Name(s) and Status

Those European Sites considered here are:

- Medway Estuary & Marshes SPA
- Medway Estuary & Marshes Ramsar Site
- The Swale SPA
- The Swale Ramsar Site
- Thames Estuary & Marshes SPA
- Thames Estuary & Marshes Ramsar Site
- Outer Thames Estuary SPA

4.4 Qualifying Features of International Importance

4.4.1 Special Protection Area Designations

4.4.1.1 Medway Estuary and Marshes SPA Qualifying Features

This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

During the breeding season;

- Avocet *Recurvirostra avosetta*, 28 pairs representing at least 6.2% of the breeding population in Great Britain (5 year mean, 1988-1992)
- Little Tern *Sterna albifrons*, 28 pairs representing at least 1.2% of the breeding population in Great Britain (5 year mean, 1991-1995)
- Common tern *Sterna hirundo* 77 pairs representing 0.6% of the GB breeding population count, as at 1994.

Over winter;

- Avocet *Recurvirostra avosetta*, 314 individuals representing at least 24.7% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)
- Bewick's swan *Cygnus columbianus bewickii* 16 individuals representing at least 0.2% of the GB population (5 year mean 1991/92-1995/96)

This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

On passage;

- Ringed Plover *Charadrius hiaticula*, 1,337 individuals representing at least 2.7% of the Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)

Over winter;

- Black-tailed Godwit *Limosa limosa islandica*, 957 individuals representing at least 1.4% of the wintering Iceland - breeding population (5 year peak mean 1991/2 - 1995/6)
- Common Greenshank *Tringa nebularia* 10 individuals representing at least 2.6% of the population in Great Britain (No count period specified)
- Dark-bellied Brent Goose *Branta bernicla bernicla*, 3,205 individuals representing at least 1.1% of the wintering Western Siberia/Western Europe population (5 year peak mean 1991/2 - 1995/6)
- Dunlin *Calidris alpina alpina*, 25,936 individuals representing at least 1.9% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/2 - 1995/6)
- Eurasian Teal *Anas crecca* 1824 individuals representing at least 1.3% of the population in Great Britain (5 year peak mean 1991/92-1995/96)
- Eurasian Wigeon *Anas penelope* 4346 individuals representing at least 1.6% of the population in Great Britain (5 year peak mean 1991/92-1995/96)
- Grey Plover *Pluvialis squatarola*, 3,406 individuals representing at least 2.3% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6)
- Northern Shoveler *Anas clypeata* 76 individuals representing at least 0.8% of the population in Great Britain (5 year peak mean 1991/92-1995/96)

- Pintail *Anas acuta*, 697 individuals representing at least 1.2% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)
- Red Knot *Calidris canutus* 541 individuals representing at least 0.2% of the population (5 year peak mean 1991/92-1995/96)
- Redshank *Tringa totanus*, 3,690 individuals representing at least 2.5% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6)
- Ruddy turnstone *Arenaria interpres* 561 individuals representing at least 0.9% of the population in Great Britain (5 year peak mean 1991/92-1995/96)
- Ringed Plover *Charadrius hiaticula*, 768 individuals representing at least 1.5% of the wintering Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)
- Shelduck *Tadorna tadorna*, 4,465 individuals representing at least 1.5% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Assemblage qualification: A wetland of international importance.

The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl

Over winter, the area regularly supports 65,274 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: Red throated diver *Gavia stellata*, Great Crested Grebe *Podiceps cristatus,* Cormorant *Phalacrocorax carbo,* Bewick's Swan *Cygnus columbianus bewickii,* Dark-bellied Brent Goose *Branta bernicla bernicla,* Shelduck *Tadorna tadorna*, Eurasian wigeon *Anas penelope*, Eurasian Teal *Anas crecca,* Mallard *Anas platyrhynchos,* Pintail *Anas acuta,* Northern Plover *Anas clypeata,* Common Pochard *Aythya farina*, Oystercatcher *Haematopus ostralegus,* Avocet *Recurvirostra avosetta,* Ringed Plover *Charadrius hiaticula,* Grey Plover *Pluvialis squatarola,* Lapwing *Vanellus vanellus,* Red Knot *Calidris canutus,* Dunlin *Calidris alpina alpine,* Black-tailed Godwit *Limosa limosa islandica,* Ruddy turnstone *Arenaria interpres*

The above information is taken from the most recent SPA Citation, at http://jncc.defra.gov.uk/pdf/SPA/UK9012031.pdf

Conservation Objectives:

Ensure that the integrity of the site is maintained or restored as appropriate, and 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 population of each of the qualifying features
- The distribution of the qualifying features within the site

4.4.1.2 The Swale SPA Qualifying Features

The most recent citation for the SPA includes the following species and assemblages:

Article 4.2 Overwintering Species:

- Dark Bellied Brent Goose *Branta bernicla bernicla* 1961 individuals representing at least 0.7% of the GB population (5 year peak mean 1991/92-1995/96)
- Dunlin *Calidris alpina alpine* 12,394 individuals representing at least 2.3% of the population in Great Britain (5 year peak mean 1991/92-1995/96)

- Redshank *Tringa totanus* 1640 individuals representing at least 0.9% of the population (5 year peak mean 1991/92-1995/96)

Article 4.2 Overwintering Assemblage:

Over winter the area regularly supports:65588 waterfowl (5 year peak mean 1991/92-1995/96)Including: Dark Bellied Brent Goose *Branta bernicla bernicla* , Gadwall *Anas strepera*, Teal *Anas crecca*, Oystercatcher *Haematopus ostralegus*, Ringed Plover *Charadrius hiaticula*, Grey Plover *Pluvialis squatarola*, Dunlin *Calidris alpina alpina*, Curlew *Numenius arquata*, Redshank *Tringa totanus.*

The above information is taken from the most recent SPA Citation, at http://jncc.defra.gov.uk/pdf/SPA/UK9012011.pdf

Conservation Objectives:

Ensure that the integrity of the site is maintained or restored as appropriate, and 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 population of each of the qualifying features
- The distribution of the qualifying features within the site

4.4.1.3 Thames Estuary and Marshes SPA Qualifying Features

This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

Over winter;

- Avocet *Recurvirostra avosetta*, 283 individuals representing at least 28.3% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)
- Hen Harrier *Circus cyaneus*, 7 individuals representing at least 0.9% of the wintering population in Great Britain (5 year mean 93/4-97/8)

This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following species:

Over winter;

- Black Tailed Godwit Limosa limosa islandica 1699 individuals representing at least 2.4% of the population *Five year peak mean for 1993/94 to 1997/98)
- Dunlin *Calidris alpina alpina* 29646 individuals representing at least 2.1% of the GB population (Five year peak mean for 1993/94 to 1997/98)
- Grey Plover *Pluvialis squatarola* 2593 individuals representing at least 1.7% of the population (Five year peak mean for 1993/94 to 1997/98)
- Red Knot Calidris canutus 4848 individuals representing at least 1.4% of the population (Five year peak mean for 1993/94 to 1997/98)
- Redshank *Tringa tetanus* 3251 individuals representing at least 2.2% of the population (Five year peak mean for 1993/94 to 1997/98)

Assemblage qualification: A wetland of international importance.

The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl.

Over winter, the area regularly supports 75, 019 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: Black-tailed Godwit *Limosa limosa islandica*, Dunlin *Calidris alpina alpina*, , Grey Plover *Pluvialis squatarola*, Avocet *Recurvirostra avosetta*, Red Knot *Calidris canutus*, Redshank *Tringa tetanus.*

The above information is taken from the most recent SPA Citation, at http://jncc.defra.gov.uk/pdf/SPA/UK9012021.pdf

Conservation Objectives:

Ensure that the integrity of the site is maintained or restored as appropriate, and 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 population of each of the qualifying features
- The distribution of the qualifying features within the site

4.4.1.4 Outer Thames Estuary SPA Qualifying Features

This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

Over winter:

- Red throated diver *Gavia stellata* 6,466 individuals representing 38% of the population in Great Britain peak mean over the period 1989-2006/07.

Breeding:

- Little tern *Sternula albifrons* 746 individuals representing 19.64% of the Great Britain population over the period 1989-2006/07.
- Common tern *Sterna hirundo* 532 individuals representing 2.66% of the Great Britain population over the period 1989-2006/07.

The above information is taken from the most recent SPA Citation, at http://jncc.defra.gov.uk/pdf/SPA/UK9020309.pdf Conservation Objectives:

Ensure that the integrity of the site is maintained or restored as appropriate, and 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 population of each of the qualifying features
- The distribution of the qualifying features within the site

4.4.2 Ramsar Designations

4.4.2.1 Medway Estuary and Marshes Ramsar Site Qualifying Features

Ramsar criterion 2

The site supports a number of species of rare plants and animals. The site holds several nationally scarce plants, including sea barley *Hordeum marinum*, curved hard-grass *Parapholis incurva*, annual beard-grass *Polypogon monspeliensis*, Borrer's saltmarsh-grass *Puccinellia fasciculata*, slender hare`s-ear *Bupleurum tenuissimum*, sea clover *Trifolium squamosum*, saltmarsh goose-foot *Chenopodium chenopodioides*, golden samphire Inula crithmoides, perennial glasswort *Sarcocornia perennis* and one-flowered glasswort *Salicornia pusilla*. A total of at least twelve British Red Data Book species of wetland invertebrates have been recorded on the site. These include a ground beetle *Polistichus connexus*, a fly *Cephalops perspicuus*, a dancefly *Poecilobothrus ducalis*, a fly *Anagnota collini*, a weevil *Baris scolopacea*, a water beetle *Berosus spinosus*, a beetle *Malachius vulneratus*, a rove beetle *Philonthus punctus*, the ground lackey moth *Malacosoma castrensis*, a horsefly *Atylotus latistriatuus*, a fly *Campsicnemus magius*, a solider beetle, *Cantharis fusca*, and a cranefly *Limonia danica*. A significant number of non-wetland British Red Data Book species also occur.

Ramsar criterion 5

Assemblages of international importance:

Species with peak counts in winter:

- Waterfowl (5 year peak mean 1998/99-2002/2003)

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Qualifying Species/populations (as identified at designation):

Species with peak counts in spring/autumn:

- Grey plover, *Pluvialis squatarola*, E Atlantic/W Africa –wintering 3103 individuals, representing an average of 1.2% of the population (5 year peak mean 1998/9-2002/3)
- Common redshank, *Tringa totanus totanus*, 3709 individuals, representing an average of 1.4% of the population (5 year peak mean 1998/9-2002/3)

Species with peak counts in winter:

- Dark-bellied brent goose, *Branta bernicla*, 2575 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3)
- Common shelduck, *Tadorna tadorna*, NW Europe 2627 individuals, representing an average of 3.3% of the GB population (5 year peak mean 1998/9-2002/3)
- Northern pintail, *Anas acuta*, NW Europe 1118 individuals, representing an average of 1.8% of the population (5 year peak mean 1998/9-2002/3)
- Ringed plover, *Charadrius hiaticula*, Europe/Northwest Africa 540 individuals, representing an average of 1.6% of the GB population (5 year peak mean 1998/9-2002/3)
- Red knot, *Calidris canutus islandica*, W & Southern Africa (wintering) 3021 individuals, representing an average of 1% of the GB population (5 year peak mean 1998/9-2002/3)
- Dunlin, *Calidris alpina alpina*, W Siberia/W Europe 8263 individuals, representing an average of 1.4% of the GB population (5 year peak mean1998/9-2002/3)

Species/populations identified subsequent to designation for possible future consideration under criterion 6.

Species with peak counts in spring/autumn:

- Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe 721 individuals, representing an average of 2% of the population (5 year peak mean 1998/9-2002/3)

4.4.2.2 The Swale Ramsar Site Qualifying Features

Ramsar criterion 2

The site supports nationally scarce plants and at least seven British Red data book invertebrates.

Ramsar criterion 5

Assemblages of international importance:

Species with peak counts in winter:

- Waterfowl (5 year peak mean 1998/99-2002/2003)

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Qualifying Species/populations (as identified at designation):

Species with peak counts in spring/autumn:

- Common redshank, *Tringa totanus totanus*, 1712 individuals, representing an average of 1.4% of the GB population (5 year peak mean 1998/9-2002/3)

Species with peak counts in winter:

- Dark-bellied brent goose, *Branta bernicla bernicla*, 1633 individuals, representing an average of 1.6% of the GB population (5 year peak mean 1998/9-2002/3)
- Grey plover, *Pluvialis squatarola*, E Atlantic/W Africa –wintering 2098 individuals, representing an average of 3.9% of the GB population (5 year peak mean 1998/9-2002/3)

Species/populations identified subsequent to designation for possible future consideration under criterion 6.

Species with peak counts in spring/autumn:

- Ringed plover, *Charadrius hiaticula*, Europe/Northwest Africa 917 individuals, representing an average of 1.2% of the population (5 year peak mean 1998/9-2002/3)

Species with peak counts in winter:

- Eurasian wigeon, *Anas penelope*, NW Europe 15296 individuals, representing an average of 1% of the population (5 year peak mean 1998/9-2002/3)
- Northern pintail, i, NW Europe 763 individuals, representing an average of 1.2% of the population (5 year peak mean 1998/9-2002/3)
- Northern shoveler, *Anas clypeata*, NW & C Europe 483 individuals, representing an average of 1.2% of the population (5 year peak mean 1998/9- 2002/3)
- Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe 1504 individuals, representing an average of 4.2% of the population (5 year peak mean 1998/9-2002/3)

4.4.2.3 Thames Estuary and Marshes Ramsar Site Qualifying Features

Ramsar criterion 2

The site supports one endangered plant species and at least 14 nationally scarce plants of wetland habitats. The site also supports more than 20 British Red Data Book invertebrates.

Ramsar criterion 5

Assemblages of international importance:

Species with peak counts in winter:

- Waterfowl (5 year peak mean 1998/99-2002/2003)

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Qualifying Species/populations (as identified at designation):

Species with peak counts in spring/autumn:

- Ringed plover, *Charadrius hiaticula*, Europe/Northwest Africa 595 individuals, representing an average of 1.8% of the GB population (5 year peak mean 1998/9- 2002/3)
- Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe 1640 individuals, representing an average of 4.6% of the population (5 year peak mean 1998/9-2002/3)

Species with peak counts in winter:

- Grey plover, *Pluvialis squatarola*, E Atlantic/W Africa –wintering 1643 individuals, representing an average of 3.1% of the GB population (5 year peak mean 1998/9-2002/3)
- Red knot, *Calidris canutus islandica*, W & Southern Africa (wintering) 7279 individuals, representing an average of 1.6% of the population (5 year peak mean 1998/9-2002/3)
- Dunlin, *Calidris alpina alpina*, W Siberia/W Europe 15171 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3)
- Common redshank, *Tringa totanus totanus*, 1178 individuals, representing an average of 1% of the GB population (5 year peak mean 1998/9- 2002/3)

4.5 Management of the European Sites

None of the proposed measures, in any of the Benefit Areas, are part of the management of the European Sites as the Plan is principally a flood and erosion defence strategy.

4.6 Likely Effects on Interest Features

What potential hazards are likely to affect the interest features? Are the interest features potentially exposed to the hazard?

There are a number of potential hazards and processes that could detrimentally affect the qualifying features of the Natura 2000 sites. The two key impacts will be from coastal squeeze of designated intertidal habitat, or increased flooding or erosion of freshwater designated habitat. The types of impacts will be dictated under the different policy options including: No Active Intervention, Hold the Line (Maintain, Sustain or Upgrade) or Managed Realignment. These are defined below. Although the fourth policy option which can be considered is Advance the Line, this does not feature within the Strategy and therefore has not been considered further.

No Active Intervention

A No Active Intervention approach means that the government funding will be withdrawn for the section of defences, and when the defences reach the end of their residual lives, they are likely to experience deteriorating conditions and potentially fail. This would cause erosion of the land

and likely inundation of the flood plain depending on the topography of the area. For many areas of the Strategy, a No Active Intervention approach would cause a large amount of flooding.

It should be noted that under a No Active Intervention Policy, the landowner may choose to maintain the defences, should he obtain the relevant permissions and licences. This is the case unless it is explicitly said that this will not happen.

The potential impacts of a No Active Intervention Policy include:

- Flooding of land behind – if this land has an environmental designation or is important for the interest features of a designated site, this could have adverse impacts.
- If the land is currently defended, the change could cause a change in hydrodynamics and morphology in the estuary.
- If the defences are not maintained, the intertidal habitat may be able to roll back with sea level rise. However, if the defences are maintained by the landowner, this will contribute to coastal squeeze in the estuary.

Hold the Line

A Hold the Line policy means that the coastline is continued to be defenced against flood and erosion risks through flood/erosion defences or management. This option is sub-divided into Hold the Line Maintain, Hold the Line Sustain and Hold the Line Upgrade.

Maintain

Capital works will be undertaken to improve the structures so that they continue to provide the current Standard of Protection. This option will not maintain the Standard of Protection with sea level rise. The potential impacts of this policy include:

- Flooding of the land behind in the future due to sea level rise – increased overtopping which will adversely impact freshwater designated sites over the long term.
- Coastal squeeze – all Hold the Line policies will contribute to coastal squeeze due to the presence of defences which will stop the migration landwards of saltmarsh habitat.

Sustain and Upgrade

Both options ensures that at least the existing standard of protection is met over 100 years with sea level rise, and looks to improve the standard of protection being offered in many cases to better protect properties and infrastructure. The sustain option looks at undertaking the works in a phased process (so part of the upgrade happens in year 50), whilst the upgrade options looks at undertaking all the capital works at once to the 100 year design level. The potential impacts of this policy include:

- Coastal squeeze – all Hold the Line policies will contribute to coastal squeeze due to the presence of defences which will stop the migration landwards of saltmarsh habitat.

Managed Realignment

Managed Realignment policies look to realign the coastline landwards, with an aim of achieving a more sustainable morphology and working with coastal processes to all natural rollback of habitat. Managed Realignment is the only policy option where coastal squeeze will not be an adverse impact. The potential adverse impacts of this policy include:

- Flooding of land within the Managed Realignment site - if this land has an environmental designation or is important for the interest features of a designated site, this could have adverse impacts. Potential for ongoing coastal squeeze from the HTL defence as it deteriorates in condition.

The impacts of these changes on the qualifying features of the Natura 2000 sites will be varied and potentially, in some cases, contradictory. Whilst the majority of the areas of Natura 2000 sites are estuarine/intertidal in nature, reflecting the preferred habitats of the various qualifying features, some parts of the sites are terrestrial/freshwater. So for those individual areas for Managed Realignment where the Designated Site is purely on the seaward side of coastal defences, and realignment would not be on a Designated Site, the likelihood of significant effects are low.

However, where the Designated Sites include areas on the landward side of coastal defences as well as the seaward side, any intrusion into the landward area will trigger the alteration from freshwater to brackish habitat, making the likelihood of significant effects far higher. It is to be noted that it is considered that where this conflict occurs, there is often a greater impact of Holding the Line (and causing coastal squeeze) compared to realigning over designated habitat (assuming compensation is then provided).

Effects associated with conversion of habitat types, triggered by Managed Realignment, are likely to be felt over long periods of time. Whilst breaches in existing coastal defences can take place over a number of days or in a single event, conversion of habitat is likely to take many seasons. During such time, it is likely to fluctuate in many of its characteristics until equilibrium is neared or reached. This would include, for example, the establishment of available habitat for birds to shelter and nest in, and establishment of macro- and micro-invertebrate populations on which the qualifying bird species or invertebrates might feed on.

It is important to note that the HRA report only considers impacts on European sites and their qualifying features. Other environmentally sensitive areas and features are addressed in the Strategic Environmental Assessment as appropriate.

4.7 Significance of Potential Effects

Is the potential scale or magnitude of any effect likely to be significant?

4.7.1 Magnitude of Effects when Considered Alone

The likely significant effects are given in Table 3 overleaf. In the table, where likely significant effects are predicted, the cells are red. Where no likely significant effects are predicted, the cells are green. Where the prediction is unsure, or predicted to be less severe than those highlighted in red, the cell is orange. The effects of different policies as identified in 4.6 have been used to determine the magnitude of effects. Generally, the following principals have been applied:

- No Active Intervention – Could cause coastal squeeze if located within a Natura 2000 site. NAI could also cause increased flooding of freshwater Natura 2000sites. No likely significant effects are predicted if NAI is not located within Natura 2000 freshwater or intertidal sites. If NAI could cause coastal squeeze, likely significant effects are predicted.
- Hold the Line (Maintain) – Will cause coastal squeeze if located within an intertidal Natura 2000 site. HTL (Maintain) will also cause increased flooding of freshwater Natura 2000 sites in the long term if present. No likely significant effects on designated sites are predicted if not located within Natura 2000 freshwater or intertidal sites, however coastal squeeze still an impact which is assessed through the Strategy Strategic Environmental Assessment. If HTL

(Maintain) is located within an intertidal Natura 2000 site, likely significant effects are predicted.

- Hold the Line (Sustain) – Will cause coastal squeeze if located within an intertidal Natura 2000 site. No likely significant effects on designated sites are predicted if not located within Natura 2000 freshwater or intertidal sites, however coastal squeeze still an impact which is assessed through the Strategy Strategic Environmental Assessment. If located within an intertidal Natura 2000 site, likely significant effects are predicted.
- Managed Realignment – Will not cause coastal squeeze, but could cause increased inundation of freshwater Natura 2000 sites if present. No likely significant effects are predicted if Managed Realignment is not located within Natura 2000 freshwater sites.

Table 3: Likely Significant Effects of the Short List of Potential Options. It is to be noted that this assessment has considered the direct impacts for each frontage, however the Strategy has then gone on to model and project impacts to habitat using an estuary-wide modelling approach. Therefore, even where the LSE is considered low for a frontage, the modelling undertaken to assess flood risk and overall Strategy impacts on habitat has included the whole area. This ensures any potential indirect impacts are also captured.

Benefit Unit	SMP Proposal	Compliance with SMP	Proximity to Natura 2000 sites	Description	Likely Significant Effects
1.2 Kingsnorth Power Station	Hold the Line (all epochs)	Agree with SMP	The existing defence line for this Benefit Unit is located adjacent to the Medway Estuary and Marshes SPA and Ramsar site.	a) No Active Intervention	There are potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term.
				b) Maintain (capital) embankment / seawall / rock revetment. (Do minimum)	
				c) Raise embankment / seawall (sustain) and new rock revetment	
				d) Raise embankment / seawall / revetment / sheet piling (upgrade) and new rock revetment	
1.3 Kingsnorth Power Station to Cockham Wood	Managed Realignment with localised Hold the Line (all epochs)	No – alternative suggested: Hold the Line with localised Managed Realignment (all epochs)	The existing defence line for this Benefit Unit is located within and adjacent to the Medway Estuary and Marshes SPA and Ramsar site.	a) No Active Intervention	There are potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term.
				b) Maintain (capital) embankment and revetment (Do minimum)	
				c) Raise embankment and revetment (sustain)	
				d) Raise embankment and revetment (upgrade)	
				e) Construct new set back embankment at identified managed realignment sites and maintain existing embankment and revetment	There may be potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and its constituent qualifying features due to the intrusion of works into Designated areas. The change from terrestrial (freshwater) to marine, or at least estuarine, habitat may alter the proportion of available habitats for the use of one or more of the qualifying features. Alternatively, it may be that the provision of additional coastal habitat, mudflat or saltmarsh, may serve to benefit one or more qualifying features by providing additional habitat.
				f) Construct new set back embankment at identified managed realignment sites and raise embankment revetment (sustain)	
				g) Construct new set back embankment at identified managed realignment sites and raise embankment revetment (upgrade)	
1.4 Cockham Wood	No Active Intervention (all epochs)	Agree with SMP	The eastern half of the existing defence line for this Benefit Unit, a length of coastline c.0.74km, is located within the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention (enforced no defences)	No defences planned for this section and No Active Intervention will be enforced. Therefore the option will not cause coastal squeeze and will not have a significant effect on any Natural 2000 sites and their constituent qualifying features.
				b) Monitoring only (Do minimum).	
2.1 Lower Upnor to Medway Bridge	Hold the Line (all epochs)	Agree with SMP	This Benefit Unit is 2.75km west (upstream) of the nearest Natura 2000 site, the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. This Benefit Unit represents the western (left hand) bank of the River Medway. This is a built-up, urban environment within Rochester, although there are areas of more naturalised banks (mostly mud flats), for example at the yacht club, Temple Marsh, Upper and Lower Upnor etc. The distance from the nearest SPA, and the already heavily engineered/protected banks along this length mean that retaining these will not affect the SPA and the coastal dynamics in the wider Medway estuary.
				b) Maintain (capital) embankments, walls, flood gates and revetments (Do minimum)	
				c) Raise (sustain) embankments, walls, flood gates and revetments	
				d) Raise (upgrade) embankments, walls, flood gates and revetments	
2.2 Medway Bridge to West St Mary's Island	Hold the Line (all epochs)	Agree with SMP	This Benefit Unit is 2.75km west (upstream) of the nearest Natura 2000 site, the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. This Benefit Unit represents the eastern (right hand) bank of the River Medway. This is a built-up, urban environment within the towns of Chatham and Gillingham, although there are areas of more naturalised banks (mostly mud flats), for example at the marina, the area adjacent to Chatham Castle, Gashouse Point etc. The distance from the nearest SPA, and the already heavily engineered/protected banks along this length mean that retaining these will not affect the SPA and the coastal dynamics in the wider Medway estuary.
				b) Maintain (capital) embankments, walls, flood gates and revetments (Do minimum)	
				c) Raise (sustain) embankments, walls, flood gates and revetments	
				d) Raise (upgrade) embankments, walls, flood gates and revetments	
2.3 St Mary's Island to the Strand	Hold the Line (all epochs)	Agree with SMP	The eastern half of the existing defence line for this Benefit Unit, a length of coastline c.0.87km, is located within the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	There are likely significant effects on the Medway Estuary and Marshes SPA and Ramsar and their constituent qualifying features due to coastal squeeze. All of these options involve the retention (or at least potential retention) of the existing coastal defence (or coastline) for the medium to long term.
				b) Maintain (capital) embankments, walls, flood gates and revetments (Do minimum)	
				c) Raise (sustain) embankments, walls, flood gates and revetments	
				d) Raise (upgrade) embankments, walls, flood gates and revetments	
3.1 Medway Bridge to North Halling	Hold the Line (all epochs)	Agree with SMP	This Benefit Unit is 6.45km south west (upstream) of the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The distance from the nearest SPA and Ramsar, and the minimal physical change to the river and estuarine environment means that these options will not affect the SPA and Ramsar and the coastal dynamics in the wider Medway estuary.
				b) Maintain (capital) embankments, walls and revetments (Do minimum)	
				c) Raise (sustain) embankments, walls and revetments.	
				d) Construct new setback embankment at identified managed realignment sites. Maintain (capital) embankments, walls and revetments around other areas	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The provision of setback embankments – Managed Realignment – at Cuxton would promote the conversion of terrestrial habitat to estuarine, most likely either mudflat or saltmarsh, which would have a generally positive effect on the provision of such habitats in the study area.
				e) Construct new setback embankment at identified managed realignment sites. Raise (sustain) embankments, walls and revetments around other areas	
				a) No Active Intervention	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features.

Benefit Unit	SMP Proposal	Compliance with SMP	Proximity to Natura 2000 sites	Description	Likely Significant Effects
3.2 North Halling to Snodland	Managed Realignment with localised Hold the Line (all epochs)	No – alternatives suggested: Hold the Line (epoch 1), followed by Managed Realignment with localised Hold the Line for epochs 2 and 3	This Benefit Unit is 8.89km south west of the Medway Estuary and Marshes SPA and Ramsar.	b) Maintain (capital) embankments, walls and flood gates (Do minimum)	The distance from the nearest SPA and Ramsar, and the minimal physical change to the river and estuarine environment means that these options will not affect the SPA and Ramsar and the coastal dynamics in the wider Medway estuary.
				c) Raise (sustain) embankments, walls and flood gates	
				d) Raise (upgrade) embankments, walls and flood gates	
				e) Construct new setback embankment at identified managed realignment sites. Raise (sustain) embankments, walls and revetments around other areas	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The provision of setback embankments – Managed Realignment – at Halling and Holborough would promote the conversion of terrestrial habitat to aquatic / estuarine, most likely either mudflat or saltmarsh, which would have a generally positive effect on the provision of such habitats in the study area.
				f) Construct new setback embankment at identified managed realignment sites. Raise (upgrade) embankments, walls and revetments around other areas	
3.3 Snodland to Allington Lock	Hold the Line (epoch 1), then Managed Realignment with localised Hold the Line (epochs 2 and 3)	Agree with SMP	This Benefit Unit is 10.88km south west (upstream) of the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The distance from the nearest SPA and Ramsar, and the minimal physical change to the river and estuarine environment means that these options will not affect the SPA and Ramsar and the coastal dynamics in the wider Medway estuary.
				b) Maintain (capital) embankments, walls and flood gates	
				c) Raise (sustain) embankments, walls and flood gates	
				d) Raise (upgrade) embankments, walls and flood gates	
				e) Construct new setback embankments at identified managed realignment sites in year 20 and sustain embankments, walls and flood gates around other areas.	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The provision of setback embankments – Managed Realignment – at Snodland and Aylseford / Forstal, would promote the conversion of terrestrial habitat to aquatic / estuarine, most likely either mudflat or saltmarsh, which would have a generally positive effect on the provision of such habitats in the study area.
				f) Construct new setback embankments at identified managed realignment sites in year 20 and upgrade embankments, walls and flood gates around other areas	
3.4 Allington Lock to North Wouldham	Hold the Line (epoch 1), then Managed Realignment with localised Hold the Line (epochs 2 and 3)	Agree with SMP	This Benefit Unit is 8.85 km south west (upstream) of the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The distance from the nearest SPA and Ramsar, and the minimal physical change to the river and estuarine environment means that these options will not affect the SPA and Ramsar and the coastal dynamics in the wider Medway estuary.
				b) Maintain (capital) embankments, walls and flood gates (Do minimum)	
				c) Raise (sustain) embankments, walls and flood gates	
				d) Raise (upgrade) embankments, walls and flood gates	
				e) Construct new setback embankments at identified managed realignment sites and sustain embankments, walls and flood gates around other areas	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The provision of setback embankments – Managed Realignment – west of Aylseford, east of Snodland, and west of Wouldham, would promote the conversion of terrestrial habitat to aquatic / estuarine, most likely either mudflat or saltmarsh, which would have a generally positive effect on the provision of such habitats in the study area.
				f) Construct new setback embankments at identified managed realignment sites and upgrade embankments, walls and flood gates around other areas	
3.5 Wouldham Marshes	Managed Realignment (all epochs)	No – alternative suggested: Managed Realignment with localised Hold the Line (all epochs)	This Benefit Unit is 6.56km south west of the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The distance from the nearest SPA and Ramsar, and the minimal physical change to the river and estuarine environment means that these options will not affect the SPA and Ramsar and the coastal dynamics in the wider Medway estuary.
				b) Maintain (capital) embankments and walls (Do minimum)	
				c) Construct new setback embankments at identified managed realignment sites and maintain (capital) embankments, walls and flood gates around other areas	This option will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The provision of setback embankments – Managed Realignment – at Wouldham Marshes would promote the conversion of terrestrial habitat to aquatic / estuarine, most likely either mudflat or saltmarsh, which would have a generally positive effect on the provision of such habitats in the study area.
4.1 The Strand to west Motney Hill	Hold the Line (epoch 1), then Managed Realignment (epochs 2 and 3)	No – alternatives suggested: Hold the Line (epoch 1) and then Hold the Line with localised Managed Realignment (epochs 2 and 3)	The existing defence line for this Benefit Unit is located adjacent to the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain (capital) embankments, walls and revetment (Do minimum)	
				c) Raise (sustain) embankments, walls and revetment	
				d) Construct new setback embankments at identified managed realignment sites and maintain (capital) embankments, walls and flood gates around other areas. Adaptation of Riverside Country Park	There may be potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and its constituent qualifying features due to coastal squeeze where Hold the Line is maintained. Countering this, the proposed localised Managed Realignment would take place outside the SPA and Ramsar, providing more areas of mudflat and / or saltmarsh. The combination of the effects of these two proposals, in combination with other options elsewhere, requires further consideration at appropriate assessment.
				e) Construct new setback embankments at identified managed realignment sites and sustain embankments, walls and flood gates around other areas. Adaptation of Riverside Country Park	
4.2a Motney Hill to Ham Green - Motney Hill	Managed Realignment with localised Hold the Line (all epochs)	Agree with SMP	The existing defence line for this Benefit Unit is located adjacent to or within the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain (capital) embankments, walls and revetment (Do minimum)	
				c) Raise (sustain) embankments, walls and revetment	
				d) Raise (upgrade) embankments, walls and revetment	

Benefit Unit	SMP Proposal	Compliance with SMP	Proximity to Natura 2000 sites	Description	Likely Significant Effects
to Ottersham Creek				e) Construct new setback embankments at identified managed realignment sites and maintain SOP (capital) of existing embankments, walls and revetments around other areas	There may be potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and its constituent qualifying features due to the intrusion of works into designated areas. The change from terrestrial (freshwater) to marine, or at least estuarine, habitat may alter the proportion of available habitats for the use of one or more of the qualifying features. Alternatively, it may be that the provision of additional coastal habitat, mudflat or saltmarsh, may serve to benefit one or more qualifying features by providing additional habitat.
				f) Construct new setback embankments at identified managed realignment sites and sustain SOP of existing embankments, walls and revetments around other areas	
				g) Construct new setback embankments at identified managed realignment sites and upgrade SOP of existing embankments, walls and revetments around other areas	
4.2b Motney Hill to Ham Green - Ottersham Creek to Ham Green	Managed Realignment with localised Hold the Line (all epochs)	Agree with SMP	The existing defence line for this Benefit Unit is located adjacent to and within the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain (capital) embankments, walls and revetment (Do minimum)	
				c) Raise (sustain) embankments, walls and revetment	
				d) Construct new setback embankments at identified managed realignment and maintain embankments, along the rest of the section	There may be potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and its constituent qualifying features due to the intrusion of works into designated areas. The change from terrestrial (freshwater) to marine, or at least estuarine, habitat may alter the proportion of available habitats for the use of one or more of the qualifying features. Alternatively, it may be that the provision of additional coastal habitat, mudflat or saltmarsh, may serve to benefit one or more qualifying features by providing additional habitat.
				e) Construct new setback embankments at identified managed realignment and sustain embankments, walls and revetment along the rest of the section	
4.3 Ham Green to east of Upchurch	No Active Intervention (all epochs)	Agree with SMP	The existing defence line for this Benefit Unit is located adjacent to the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	These options are not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features. This section of coastline is eroding naturally, so coastal squeeze is not known to be occurring. The rate of habitat loss due to sea level rise is loosely matched by the rate of erosion of the coastline here.
				b) Monitoring only	
4.4 - East of Upchurch to east of Lower Halstow	Managed Realignment with localised Hold the Line (all epochs)	Agree with SMP	The existing defence line for this Benefit Unit is located adjacent to the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain (capital) embankments, and walls (Do minimum)	
				c) Raise (sustain) embankments and walls	
				d) Construct new setback embankments at identified managed realignment sites and maintain (capital) embankments and walls around other areas	This option is not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features. The provision of setback embankments – Managed Realignment – at Lower Halstow would promote the conversion of terrestrial habitat to estuarine, most likely either mudflat or saltmarsh, which would have a generally positive effect on the provision of such habitats in the study area.
4.5 Barksore Marshes	Managed Realignment (epoch 1), No Active Intervention (epochs 2 and 3)	No – alternatives suggested: Managed Realignment with localised No Active Intervention (epoch 1) followed by No Active Intervention (epochs 2 and 3)	The existing defence line for this Benefit Unit is located adjacent to and within the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Adaptation- relocation of landfill	
				c) Maintain (capital) embankments	
				d) Raise (upgrade) embankments	
				e) Construct new setback embankments at identified managed realignment sites in first epoch. Tie the managed realignment site into high ground	There may be potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and its constituent qualifying features due to the intrusion of works into designated areas. The change from terrestrial (freshwater) to marine, or at least estuarine, habitat may alter the proportion of available habitats for the use of one or more of the qualifying features. Alternatively, it may be that the provision of additional coastal habitat, mudflat or saltmarsh, may serve to benefit one or more qualifying features by providing additional habitat.
4.6- Funton to Raspberry Hill	No Active Intervention	Agree with SMP	The existing defence line for this Benefit Unit is located adjacent to the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	These options are not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features. This section of coastline is eroding naturally, so coastal squeeze is not known to be occurring. The rate of habitat loss due to sea level rise is loosely matched by the rate of erosion of the coastline here.
				b) Adaptation - rollback of road	
				c) Monitoring only	
4.7 Chetney Marshes	Managed Realignment (all epochs)	Agree with SMP	The existing defence line for this Benefit Unit is located adjacent to and within the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain (capital) embankments, and walls (Do Minimum)	
				c) Raise (sustain) embankments and walls	
				d) Raise (upgrade) embankments and walls	
				e) Construct new setback embankments at identified managed realignment sites and maintain SOP (capital) of existing embankments and walls around other areas	There may be potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and its constituent qualifying features due to the intrusion of works into designated areas. The change from terrestrial (freshwater) to marine, or at least estuarine, habitat may alter the proportion of available habitats for the use of one or more of the qualifying features. This may be to their detriment. Alternatively, it may be that the provision of additional coastal habitat, mudflat or saltmarsh, may serve to benefit one or more qualifying features by providing additional habitat.
				f) Construct new setback embankments at identified managed realignment sites and sustain SOP of existing embankments and walls around other areas	

Benefit Unit	SMP Proposal	Compliance with SMP	Proximity to Natura 2000 sites	Description	Likely Significant Effects
				g) Construct new setback embankments at identified managed realignment sites and upgrade SOP of existing embankments and walls around other areas	
5.1 Kingsferry Bridge to Milton Creek	Hold the Line (all epochs)	Agree with SMP	The existing defence line for this Benefit Unit is located adjacent to and within The Swale SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Swale SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Conversely there may be beneficial effects associated with these options, and they each serve to protect a sizeable freshwater / terrestrial element of the Swale SPA (Ridham and Coldharbour Marshes). The interaction between these contradictory effects, and their interaction with effects elsewhere in the Medway and Swale SPAs, needs further consideration.
				b) Maintain (capital) embankments and walls	
				c) Raise (sustain) embankments and walls	
				d) Raise (upgrade) embankments and walls	
5.2 Milton Creek	Hold the Line (all epochs)	Agree with SMP	This Benefit Unit is 0.08km south west of The Swale SPA and Ramsar.	a) No Active Intervention	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The separation from the nearest SPA and Ramsar, and the minimal physical change to the river and estuarine environment means that these options will not affect the Swale SPA and Ramsar and the coastal dynamics in the wider Medway estuary.
				b) Maintain (capital) embankments and walls	
				c) Raise (sustain) embankments and walls	
				d) Raise (upgrade) embankments and walls	
				e) Construct new setback embankments at identified managed realignment sites. Sustain embankments and walls along the rest of the section	These options will not have adverse effects on the Swale SPA and Ramsar. It may be that the provision of additional coastal habitat, mudflat or saltmarsh, will serve to benefit one or more qualifying features of the nearby Swale SPA and Ramsar by providing additional habitat.
				f) Construct new setback embankments identified managed realignment sites. Upgrade embankments and walls along the rest of the section	
6.1 Murston Pits to Faversham	Hold the Line (epoch 1), then Managed Realignment (epochs 2 and 3)	No – alternatives suggested. Specific areas for Hold the Line recommended	The existing defence line for this Benefit Unit is located adjacent to and within The Swale SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Swale SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain (capital) embankments	
				c) Raise (sustain) embankments	
				d) Maintain embankments until year 20. Then construct new setback embankments at identified managed realignment sites. Maintain SOP of existing embankments around rest of frontage	There may be potential significant effects on the Swale SPA and Ramsar and its constituent qualifying features due to the intrusion of works into Designated areas. The change from terrestrial to marine, or at least estuarine, habitats is likely to alter the proportion of available habitats for the use of one or more of the qualifying features. This may be to their detriment. Alternatively, it may be that the provision of additional coastal habitat, mudflat or saltmarsh, may serve to benefit one or more qualifying features by providing additional habitat.
				e) Maintain embankments until year 20. Then construct new setback embankments at identified managed realignment sites. Raise (sustain SOP) existing embankments around rest of frontage	
6.2 Faversham Creek to The Sportsman Pub	Hold the Line (epoch 1), then Managed Realignment (epochs 2 and 3)	No – alternatives suggested: Timings of Managed Realignment may change	The existing defence line for this Benefit Unit is located adjacent to and within The Swale SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Swale SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Ongoing maintenance of embankments and walls	
				c) Raise (sustain) embankments and walls	
				d) Construct new setback embankments at identified managed realignment sites. Maintain embankments and walls at the Sportsman Pub	These options will not have adverse effects on the Swale SPA and Ramsar. It may be that the provision of additional coastal habitat, mudflat or saltmarsh, will serve to benefit one or more qualifying features of the nearby Swale SPA and Ramsar by providing additional habitat.
				e) Construct new setback embankments at identified managed realignment sites. Raise (sustain) embankments at the Sportsman Pub	
				f) Maintain embankments until year 20. Then construct new setback embankments at identified managed realignment sites. Maintain embankments and walls at the Sportsman Pub	There may be potential significant effects on the Swale SPA and Ramsar and its constituent qualifying features due to coastal squeeze in the first 20 years. From year 20, these options will not have adverse effects on the Swale SPA and Ramsar. It may be that the provision of additional coastal habitat, mudflat or saltmarsh, will serve to benefit one or more qualifying features of the nearby Swale SPA and Ramsar by providing additional habitat.
				g) Maintain embankments until year 20. Then construct new setback embankments at identified managed realignment sites. Raise (sustain) embankments at the Sportsman Pub	
7.1 Murston Pits to Faversham	Hold the Line (epoch 1), then Managed Realignment (epochs 2 and 3)	No – alternatives suggested: Specific areas of HTL recommended	The existing defence line for this Benefit Unit is located within the Swale SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Swale SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain (capital) embankments	
				c) Raise (sustain) embankments	
				d) Raise (upgrade) embankments	
				f) Construct new setback embankments at identified managed realignment sites. Raise (sustain SOP) existing embankments and walls along rest of creek (year 20)	There may be potential significant effects on the Swale SPA and Ramsar and its constituent qualifying features due to the intrusion of works into designated areas. The change from terrestrial to marine, or at least estuarine, habitats is likely to alter the proportion of available habitats for the use of one or more of the qualifying features. This may be to their detriment. Alternatively, it may be that the provision of additional coastal habitat, mudflat or saltmarsh, may serve to benefit one or more qualifying features by providing additional habitat.
				g) Construct new setback embankments at identified managed realignment sites. Raise (upgrade SOP) existing embankments and walls along rest of creek (year 20)	

Benefit Unit	SMP Proposal	Compliance with SMP	Proximity to Natura 2000 sites	Description	Likely Significant Effects
7.2a Faversham to Nagden (Front Brents and town)	Hold the Line (all epochs)	Agree with SMP	The eastern half of the existing defence line for this Benefit Unit, a length of coastline c. 0.5 km, is located within The Swale SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Swale SPA and Ramsar and constituent qualifying features due to coastal squeeze, although the very small proportion of the Swale SPA and Ramsar that would be affected by these options is acknowledged. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain (capital) embankments and walls	
				c) Raise (sustain) embankments and walls	
				d) Raise (upgrade) embankments and walls	
7.2b Faversham to Nagden (Abbey Fields)	Hold the Line (all epochs)	No – alternatives suggested: Hold The Line with localised Managed Realignment (no timings currently given)	The existing defence line for this Benefit Unit is located adjacent to and within the Swale SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Swale SPA and Ramsar and constituent qualifying features due to coastal squeeze, although the very small proportion of the Swale SPA and Ramsar that would be affected by these options is acknowledged. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain (capital) embankments and walls	
				c) Raise (sustain) embankments and walls	
				d) Construct new setback embankments at identified managed realignment sites (from year 20). Maintain embankments and walls along rest of creek	These options will not have adverse effects on the Swale SPA and Ramsar. It may be that the provision of additional coastal habitat, mudflat or saltmarsh, will serve to benefit one or more qualifying features of the nearby Swale SPA and Ramsar by providing additional habitat.
				e) Construct new setback embankments at identified managed realignment sites (from year 20). Raise (sustain) embankments and walls along rest of creek	
8.2 Leysdown to Shellness (from Park Avenue to Shellness only) Shellness to Sayes	Managed Realignment (all epochs)	No – alternatives suggested: Managed Realignment with localised Hold the Line around Shellness. (No timings currently given)	The existing defence line for this Benefit Unit is located adjacent to and within the Swale SPA and Ramsar. A portion, between Shell Ness and Leysdown, is 1km from the Outer Thames Estuary SPA.	a) No Active Intervention	There are potential significant effects on the Swale SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Ongoing maintenance of embankments	
				c) Raise (sustain) embankments	
				d) Raise (upgrade SOP) embankments	
				e) Maintain embankments and walls until year 50. Then construct new setback embankments at identified managed realignment sites. Raise (sustain SOP) existing embankments and walls along rest of frontage	There may be potential significant effects on the Swale SPA and Ramsar and its constituent qualifying features due to the intrusion of works into designated areas. The change from terrestrial to marine, or at least estuarine, habitats is likely to alter the proportion of available habitats for the use of one or more of the qualifying features. This may be to their detriment. Alternatively, it may be that the provision of additional coastal habitat, mudflat or saltmarsh, may serve to benefit one or more qualifying features by providing additional habitat.
8.3 - Sayes Court to Kingsferry Bridge (excluding Elmley Island)	Hold the line (first epoch) and Managed Realignment (second and third epochs)	No – alternatives suggested: Combination of Managed Realignment and No Active Intervention (all epochs)	The existing defence line for this Benefit Unit is located adjacent to and within the Swale SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Swale SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain SOP (capital) embankments and walls. NAI at Isle of Harty	
				c) Raise (sustain) embankments and walls. NAI at Isle of Harty	
				d) Construct new setback embankments at identified managed realignment sites. Maintain embankments along the rest of the section. NAI at Isle of Harty	There may be potential significant effects on the Swale SPA and Ramsar and its constituent qualifying features due to the intrusion of works into designated areas. The change from terrestrial to marine, or at least estuarine, habitats is likely to alter the proportion of available habitats for the use of one or more of the qualifying features. This may be to their detriment. Alternatively, it may be that the provision of additional coastal habitat, mudflat or saltmarsh, may serve to benefit one or more qualifying features by providing additional habitat. The large size (total, and as a proportion of the total size of the SPA) needs further consideration, as this area encompasses large inland areas of the Swale SPA, including Spitend Marshes, part of the Elmley Marshes, Stray Marshes and Minster Marshes.
				e) Construct new setback embankments at identified managed realignment sites. Raise (sustain) embankments along the rest of the section. NAI at Isle of Harty.	
8.4 - North Elmley Island	Managed Realignment (all epochs)	No – alternatives suggested: Combination of Managed Realignment and No Active Intervention (all epochs)	The existing defence line for this Benefit Unit is located adjacent to and within the Swale SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Swale SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain (capital) embankments	
				d) Construct new setback embankments	There may be potential significant effects on the Swale SPA and Ramsar and its constituent qualifying features due to the intrusion of works into designated areas. The change from terrestrial to marine, or at least estuarine, habitats is likely to alter the proportion of available habitats for the use of one or more of the qualifying features. This may be to their detriment. Alternatively, it may be that the provision of additional coastal habitat, mudflat or saltmarsh, may serve to benefit one or more qualifying features by providing additional habitat. The large size (total, and as a proportion of the total size of the SPA) needs further consideration, as this area encompasses large inland areas of the Swale SPA, predominantly the Elmley Marshes
8.5 Kingsferry Bridge to Rushenden	Hold the line (epoch 1) and Managed Realignment (epochs 2 and 3)	No – alternatives suggested. Combination of Managed Realignment and Hold the Line (epochs 2 and 3)	The existing defence line for this Benefit Unit is located adjacent to and within the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and constituent qualifying features due to coastal squeeze, although the limited size (total and proportion) of the SPA is noted. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat may be required.
				b) Maintain (capital) embankments	
				c) Raise (sustain) embankments	
				e) Maintain embankments until year 20. Then construct new setback embankments at identified managed realignment sites. Maintain SOP	

Benefit Unit	SMP Proposal	Compliance with SMP	Proximity to Natura 2000 sites	Description	Likely Significant Effects
				of existing embankments along the rest of the section. Maintenance of the rest of the defences	There may be potential significant effects on the Swale SPA and Ramsar and its constituent qualifying features due to the intrusion of works into designated areas. The change from terrestrial to marine, or at least estuarine, habitats is likely to alter the proportion of available habitats for the use of one or more of the qualifying features. This may be to their detriment. Alternatively, it may be that the provision of additional coastal habitat, mudflat or saltmarsh, may serve to benefit one or more qualifying features by providing additional habitat.
				f) Maintain embankments until year 20. Construct new setback embankments at identified managed realignment sites. Raise (sustain SOP) existing embankments along the rest of the section. Sustain the rest of the defences	
9.1 Leysdown to Shellness	Combination of Hold the Line and Managed Realignment (all epochs)	No – alternatives suggested. Area refined from SMP area, and now recommended for Hold the Line	The existing defence line for this Benefit Unit is 1km from the Swale SPA and Ramsar, and 0.8 km from the Outer Thames Estuary SPA.	a) No Active Intervention	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The separation from the Swale SPA and Ramsar means that these options will not affect the Swale SPA. Similarly, the distance from the Outer Thame Estuary SPA, the very small size (total and proportion) of potentially interfacing areas, and the nature of the single qualifying feature, means that significant adverse effects on the SPA will not be incurred.
				b) Maintain (capital) walls, groynes and beach (Do minimum)	
				c) Maintain defences and then adaptation from year 50	
9.2 - Warden Point to Leysdown	Combination of Hold the Line and Managed Realignment (all epochs)	Agree with SMP	The existing defence line for this Benefit Unit is 1.6km west the Swale SPA and Ramsar, and 0.8km from the Outer Thames Estuary SPA.	a) No Active Intervention	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. They are sufficient distance away, and of limited physical change, that no impacts are foreseen.
				b) Maintain (capital) embankments walls, groynes and beach and adaptation along Warden Cliffs (Do minimum)	
				c) Raise (sustain) embankments walls, groynes and beach and adaptation along Warden Cliffs	
				d) Construct new setback embankment at realignment site in 20 years, maintain walls along remaining frontage and adaptation along Warden Cliffs	These options are not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features. The proposed combination of Hold the Line and Managed Realignment in this Benefit Unit are not likely to have any significant adverse effects on either the Swale SPA or the Outer Thames Estuary SPA.
				e) Construct new setback embankment at realignment site in 20 years, raise (sustain) walls along remaining frontage and adaptation along Warden Cliffs	
10.1 Minster Slopes	No Active Intervention	Agree with SMP	The existing defence line for this Benefit Unit is 3.4km west of the Swale SPA and Ramsar, and 0.09 km from the Outer Thames Estuary SPA.	a) No Active Intervention (enforced no defences)	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The distance from the Outer Thame Estuary SPA, the very small size (total and proportion) of potentially interfacing areas, and the nature of its single qualifying feature, means that significant adverse effects on the SPA will not be incurred.
				b) Monitoring only	
				c) Adaptation - roll back of property and short term erosion management	
11.1 Minster Town to Royal Oak	Hold the Line (all epochs)	Agree with SMP	The existing defence line for this Benefit Unit is 0.37 km from the Outer Thames Estuary SPA.	a) No Active Intervention	These options will not have significant effects on any Natura 2000 sites and their constituent qualifying features. The distance from the Outer Thame Estuary SPA, the very small size (total and proportion) of potentially interfacing areas, and the nature of its single qualifying feature, means that significant adverse effects on the SPA will not be incurred.
				b) Ongoing maintenance of embankments, walls, flood gates, groynes and beach (Do Minimum)	
				c) Maintain SOP embankments, walls, flood gates, groynes and beach.	
11.2 - Sheerness to Minster and Rushenden to Sheerness	Hold the Line (all epochs)	Agree with SMP	The easternmost 2.0 km of the existing defence line for this Benefit Unit is adjacent to the Outer Thames Estuary SPA. The southernmost 2.2 km of the existing defence line is adjacent to the Medway Estuary and Marshes SPA and Ramsar.	a) No Active Intervention	There are potential significant effects on the Medway Estuary and Marshes SPA and Ramsar and constituent qualifying features due to coastal squeeze. Each of these options on the short list involves the retention of the existing coastal defence for the medium to long term. Compensatory habitat is likely to be required.
				b) Maintain (capital) embankments, walls, flood gates, groynes and beach	
				c) Raise (sustain) embankments, walls, flood gates, groynes and beach	
				d) Raise (upgrade) embankments, walls, flood gates, groynes and beach	

4.7.2 Magnitude of Effects when Considered in Combination with other Environment Agency permissions and/or other plans or projects

It is likely that the TE2100 project may have potential effects on the Medway Estuary and Marshes SPA and Ramsar site, and The Swale SPA and Ramsar Site, in combination with the options in the Short List. However, at this stage it is not considered likely that the magnitudes of potential effects options in the Short List would differ from those magnitudes already presented in Table 3. above.

No other Environment Agency projects are known that would combine with the options on the Short List to create significant effects on Natura 2000 sites.

4.7.3 Magnitude of Effects when Considered in Combination with permissions and/or plans/projects of other Competent Authorities

At this stage, it is not considered likely that the magnitudes of potential effects options in the Short List would differ from those magnitudes already presented in Table 3. above.

Further consideration will be given to In-Combination effects of other projects, plans and policies as the Short List is refined and distilled down to the Preferred Option. This is at least in part due to the difficulty in assessing magnitudes of potential effects on individual, stand-alone Benefit Areas; the assessment of In-Combination effects is more appropriately carried out at the Appropriate Assessment stage, when the Preferred Option for management of the Medway Estuary and Swale is presented.

It is felt that the assessment of the magnitude of potential effects in Section 4.7.1 has been carried out with sufficient degree of caution and breadth that no options have been excluded from further consideration at Appropriate Assessment that would have been included had a way of considering In-Combination effects been identified.

4.8 Conclusion of the Screening Process

Is the proposal likely to have a significant effect 'alone and/or in combination' on a European site?

The above Screening has demonstrated that a number of options in the Short List are likely to have significant effects on the European sites listed below. No likely significant effects are predicted on the Outer Thames Estuary SPA, so this site is screened out of further assessment. The remaining six sites are screened in due to potential for Likely Significant Effects:

- Medway Estuary and Marshes SPA and Ramsar Site
- The Swale SPA and Ramsar Site
- Thames Estuary and Marshes SPA and Ramsar Site

Generally, the sites above are impacted by options, either wholly or partly within European sites, that involve retention of the existing coastal defence line, as coastal squeeze will result in the loss of valuable protected habitat seaward side of the defences as sea level rises, and also effects due to overtopping of defences. They include those Hold the Line options (those that propose to maintain, sustain or enhance the existing defence), and No Active Intervention options at the following Benefit Units:

- 1.2 Kingsnorth Power Station
- 1.3 Kingsnorth Power Station to Cockham Wood
- 2.3 St Mary's Island to the Strand

- 4.1 The Strand to west Motney Hill
- 4.2a Motney Hill to Ham Green - Motney Hill to Ottersham Creek
- 4.2b Motney Hill to Ham Green - Ottersham Creek to Ham Green
- 4.4 East of Upchurch to east of Lower Halstow
- 4.5 Barksore Marshes
- 4.7 Chetney Marshes
- 5.1 Kingsferry Bridge to Milton Creek
- 6.1 Murston Pits to Faversham
- 6.2 Faversham Creek to The Sportsman Pub
- 7.1 Murston Pits to Faversham
- 7.2a Faversham to Nagden (Front Brents and town)
- 7.2b Faversham to Nagden (Abbey Fields)
- 8.2 Leysdown to Shellness (from Park Avenue to Shellness only) Shellness to Sayes
- 8.3 Sayes Court to Kingsferry Bridge (excluding Elmley Island)
- 8.4 North Elmley Island
- 8.5 Kingsferry Bridge to Rushenden
- 11.2 Sheerness to Minster and Rushenden to Sheerness

Further, the Screening process has demonstrated that there are some options in the Short List where the potential for significant effects on European sites is less than Hold the Line, but consideration is required to look at potential level of impacts. In general, they include those options where Managed Realignment would take place in or very close to SPAs, resulting in the loss of terrestrial habitat and the gradual creation of estuarine habitats. These include Managed Realignment and No Active Intervention proposals as the following Benefit Units:

- 1.3 Kingsnorth Power Station to Cockham Wood
- 4.1 The Strand to west Motney Hill
- 4.2a Motney Hill to Ham Green - Motney Hill to Ottersham Creek
- 4.2b Motney Hill to Ham Green - Ottersham Creek to Ham Green
- 4.5 Barksore Marshes
- 4.7 Chetney Marshes
- 6.1 Murston Pits to Faversham
- 6.2 Faversham Creek to The Sportsman Pub
- 7.1 Murston Pits to Faversham
- 8.2 Leysdown to Shellness (from Park Avenue to Shellness only) Shellness to Sayes
- 8.3 Sayes Court to Kingsferry Bridge (excluding Elmley Island)
- 8.4 North Elmley Island
- 8.5 Kingsferry Bridge to Rushenden

5 Stage 2 – Appropriate Assessment (HR02)

5.1 Introduction

The Appropriate Assessment (AA) has been carried out on the Preferred Options for each of the relevant designated sites, using an adaptation of the HR02 tabular format (which is the Environment Agency template for undertaking Appropriate Assessments).

The Assessment is based on the Strategy-wide combination of Preferred Options as a single entity, rather than on individual Benefit Areas, as was carried out at Screening. This is appropriate as the individual components will be subject to their own, individual AA at a project level, as they come forward. The modelling that has been completed throughout the project has been done at a Strategy level, modelling the whole of the two estuaries as one system, rather than individual Benefit Areas, so the impacts of, for example coastal squeeze, flooding events or sediment transfer, are known at this level. The AA uses this information, so it is appropriate that it is carried out at this level rather than by Benefit Area. The terminology 'Strategy' and 'Preferred Option' are therefore used interchangeably.

This AA considers the qualifying features and their conservation objectives when assessing the likely impacts on the European site from the preferred Strategy option. In particular, it focuses on the assessment of coastal squeeze of the intertidal habitat, and impacts from increased flooding of freshwater habitat due to overtopping or managed realignment.

The plans in Appendix C show the existing coastal flood regime, and the modelled flood extents for Epoch 1, and for Epoch 3. The flood extents for Epoch 1 are based on the impacts on the Preferred Options for a 1 in 200 year storm event using existing sea level, whereas the Epoch 3 extents have been modelled on the Epoch 3 Preferred Options using a 1 in 200 year storm event, based on the sea level at 100 years hence. These show the predicted extents of flooding behind defences.

The preferred options for the Strategy (identified prior to this AA) are summarised below in Table 4.

Table 4: Initial preferred Strategy options identified prior to Appropriate Assessment.

Benefit Area	Preferred Option	1st Epoch (0-20 years)	2nd Epoch (21-50 years)	3rd Epoch (51-100 years)
1.2	Maintain defences until year 8. Then raise (sustain) the embankment, seawall and rock revetment in year 8.	HTL maintain until year 8 and then HTL Sustain	HTL Sustain	HTL Sustain
1.3	Ongoing maintenance until year 25, followed by No Active Intervention (NAI).	HTL Maintain	NAI	NAI
1.4	No Active Intervention (NAI).	NAI	NAI	NAI
2.1	Raise (sustain) embankments, walls, flood gates and revetments.	HTL Sustain	HTL Sustain	HTL Sustain
2.2	Raise (sustain) embankments, walls, flood gates and revetments in localised areas.	HTL Sustain with localised NAI	HTL Sustain with localised NAI	HTL Sustain with localised NAI

Benefit Area	Preferred Option	1st Epoch (0-20 years)	2nd Epoch (21-50 years)	3rd Epoch (51-100 years)
2.3	Raise (sustain) embankments, walls, flood gates and revetments.	HTL Sustain	HTL Sustain	HTL Sustain
3.1	No Active Intervention (NAI).	NAI	NAI	NAI
3.2	Construct new setback embankments at Halling Marshes. Raise (sustain) embankments, walls and flood gates in localised areas.	HTL Sustain and MR with localised NAI	HTL Sustain and MR with localised NAI	HTL Sustain and MR with localised NAI
3.3	Raise (sustain) embankments, walls and flood gates from year 20.	HTL Maintain	HTL Sustain	HTL Sustain
3.4	Raise (sustain) embankments, walls and flood gates in localised areas.	HTL Sustain with localised NAI	HTL Sustain with localised NAI	HTL Sustain with localised NAI
3.5	No Active Intervention (NAI)	NAI	NAI	NAI
4.1	Raise (sustain) embankments, walls and flood gates around other areas.	HTL Sustain	HTL Sustain	HTL Sustain
4.2a	No Active Intervention (NAI),	NAI	NAI	NAI
4.2b	Ongoing maintenance until year 15, followed by No Active Intervention (NAI).	HTL Maintain until year 15 followed by NAI	NAI	NAI
4.3	No Active Intervention (NAI).	NAI	NAI	NAI
4.4	Raise (sustain) embankment and revetment in localised areas.	HTL Sustain with localised NAI	HTL Sustain with localised NAI	HTL Sustain with localised NAI
4.5	No Active Intervention (NAI).	NAI	NAI	NAI
4.6	No Active Intervention (NAI).	NAI	NAI	NAI
4.7	Ongoing maintenance until year 15, followed No Active Intervention.	HTL Maintain until year 15 followed by NAI	NAI	NAI
5.1	Maintain defences until year 20. Raise (sustain) embankments and walls from year 20.	HTL Maintain	HTL Sustain	HTL Sustain
5.2	Raise (sustain) embankments and walls.	HTL Sustain	HTL Sustain	HTL Sustain
6.1	No Active Intervention (NAI).	NAI	NAI	NAI
6.2	Ongoing maintenance until year 20, followed by No Active Intervention.	HTL Maintain	NAI	NAI
7.1	Ongoing maintenance until year 30, followed by No Active Intervention (NAI).	HTL Maintain	HTL Maintain until year 30, followed by NAI	NAI
7.2a	Raise (sustain) embankments and walls.	HTL Sustain	HTL Sustain	HTL Sustain
7.2b	Maintain defences until year 20. Raise (sustain) embankments and walls from year 20.	HTL Maintain	HTL Sustain	HTL Sustain
8.2	No Active Intervention (NAI).	NAI	NAI	NAI
8.3	No Active Intervention (NAI).	NAI	NAI	NAI
8.4	No Active Intervention (NAI).	NAI	NAI	NAI
8.5	No Active Intervention (NAI).	NAI	NAI	NAI
9.1	Maintain (with capital works) walls, groynes and beach.	HTL Maintain	HTL Maintain	HTL Maintain

Benefit Area	Preferred Option	1st Epoch (0-20 years)	2nd Epoch (21-50 years)	3rd Epoch (51-100 years)
9.2	Maintain (with capital works) embankments walls, groynes and beach. No Active Intervention (NAI) and localised property adaptation along Warden Cliffs.	HTL Maintain, and NAI on the cliffs	HTL Maintain, and NAI on the cliffs	HTL Maintain, and NAI on the cliffs
10.1	No Active Intervention (NAI) with localised property adaptation (potentially not GiA funded).	NAI, with localised property adaptation	NAI, with localised property adaptation	NAI, with localised property adaptation
11.1	Maintain embankments, walls, flood gates, groynes and beach.	HTL Maintain	HTL Maintain	HTL Maintain
11.2	Raise (sustain) embankments, walls, flood gates, groynes and beach.	HTL Sustain	HTL Sustain	HTL Sustain

5.2 Features List

Table 5 below highlights the relevant European sites and their interest features, which are potentially sensitive and exposed to hazards arising from the Strategy. These were determined following an initial screening of all European sites and their features with respect to Likely Significant Effects in Chapter 4 HR01, which focussed the assessment process only on those features where there is likely to be a significant effect. The precautionary principle was applied so if there was any uncertainty as to if there are likely significant effects on a feature, then it was included.

Table 5: Features of the Natura 2000 Sites for Consideration

ID	Qualifying Features	Application has associated hazards to which features are sensitive?	Details of Hazard/s
Medway Estuary & Marshes SPA			
3.04 Birds of lowland wet grasslands 3.05 Birds of lowland dry grassland 3.06 Birds of lowland freshwaters and their margins 3.09 Birds of estuarine habitats	Article 4.1: During the breeding season: Avocet, Little Tern, Common Tern Over winter: Avocet, Bewick's Swan Article 4.2: On passage: Ringed Plover Over winter: Black-tailed Godwit, Common Greenshank, Dark-bellied Brent Goose, Dunlin, Eurasian Teal, Eurasian Wigeon, Grey Plover, Northern Plover, Pintail, Red Knot, Redshank, Ruddy turnstone, Ringed Plover, Shelduck Assemblage qualification: Over-winter waterfowl assemblage: Red throated diver, Great Crested Grebe, Cormorant, Bewick's Swan, Dark-bellied Brent Goose a, Shelduck, Eurasian wigeon, Eurasian Teal, Mallard, Pintail, Northern Plover, Common Pochard, Oystercatcher, Avocet, Ringed Plover, Grey Plover, Lapwing, Red Knot, Dunlin, Black-tailed Godwit, Ruddy Turnstone.	Yes	Habitat loss Physical damage Changes to physical regime Changes in water table / level Changes to surface water flooding Turbidity Changes to water chemistry / salinity Habitat / community simplification Disturbance Changes to flow and velocity regime
Medway Estuary and Marshes Ramsar Site			
1.12 Estuarine and intertidal habitats 3.04 Birds of lowland wet grasslands 3.05 Birds of lowland dry grassland. 3.06 Birds of lowland freshwaters and their margins 3.09 Birds of estuarine habitats	Ramsar criterion 2 The site supports several nationally scarce plants, a total of at least twelve British Red Data Book species of wetland invertebrates, and a significant number of non-wetland British Red Data Book invertebrate species also occur Ramsar criterion 5 Species with peak counts in winter: Waterfowl Ramsar criterion 6 Species with peak counts in spring/autumn: Grey plover, Common redshank, Species with peak counts in winter: Dark-bellied Brent Goose, Common shelduck, Northern pintail, Ringed Plover, Red Knot, Dunlin	Yes	Habitat loss Physical damage Changes to physical regime Changes in water table / level Changes to surface water flooding Turbidity Changes to water chemistry / salinity Habitat / community simplification Disturbance Changes to flow and velocity regime

ID	Qualifying Features	Application has associated hazards to which features are sensitive?	Details of Hazard/s
	Species/populations identified after designation for possible future consideration under criterion 6 Species with peak counts in spring/autumn: Black-tailed godwit		
The Swale SPA			
3.06 Birds of lowland freshwaters and their margins 3.07 Birds of farmland 3.08 Birds of Coastal Habitats 3.09 Birds of estuarine habitats	Article 4.2 Over winter: Dark Bellied Brent Goose, Dunlin, Redshank Assemblage qualification: Over-winter waterfowl assemblage: Dark Bellied Brent Goose, Gadwall, Teal, Oystercatcher, Ringed Plover, Grey Plover, Dunlin alpina, Curlew, Redshank	Yes	Habitat loss Physical damage Changes to physical regime Changes in water table / level Changes to surface water flooding Turbidity Changes to water chemistry / salinity Habitat / community simplification Disturbance Changes to flow and velocity regime
The Swale Ramsar Site			
1.12 Estuarine and intertidal habitats 3.06 Birds of lowland freshwaters and their margins 3.07 Birds of farmland 3.08 Birds of coastal habitats 3.09 Birds of estuarine habitats	Ramsar criterion 2 The site supports nationally scarce plants and at least seven British Red data book invertebrates Ramsar criterion 5 Species with peak counts in winter: Waterfowl Ramsar criterion 6 Species with peak counts in spring/autumn: Common redshank Species with peak counts in winter: Dark-bellied Brent Goose, Grey Plover Species/populations identified subsequent to designation for possible future consideration under criterion 6 Species with peak counts in spring/autumn: Ringed Plover Species with peak counts in winter: Eurasian Wigeon, Northern Pintail, Northern Shoveler, Black-tailed Godwit	Yes	Habitat loss Physical damage Changes to physical regime Changes in water table / level Changes to surface water flooding Turbidity Changes to water chemistry / salinity Habitat / community simplification Disturbance Changes to flow and velocity regime
Thames Estuary and Marshes SPA			
3.04 Birds of lowland wet grasslands	Article 4.1: Over winter: Avocet, Hen Harrier	Yes	Habitat loss Habitat/community simplification

ID	Qualifying Features	Application has associated hazards to which features are sensitive?	Details of Hazard/s
3.06 Birds of lowland freshwater and their margins 3.08 Birds of coastal habitats 3.09 Birds of estuarine habitats	Article 4.2: Over winter: Black Tailed Godwit, Dunlin, Grey Plover, Red Knot, Redshank Assemblage qualification: Over-winter waterfowl assemblage: Black-tailed Godwit, Dunlin, Grey Plover, Avocet, Red Knot, Redshank		Changes to physical regime
Thames Estuary & Marshes Ramsar Site			
1.12 Estuarine and intertidal habitats 3.04 Birds of lowland wet grasslands 3.06 Birds of lowland freshwaters and their margins 3.08 Birds of coastal habitats 3.09 Birds of estuarine habitats	Ramsar criterion 2: The site supports one endangered plant species and at least 14 nationally scarce plants of wetland habitats. The site also supports more than 20 British Red Data Book invertebrates. Ramsar criterion 5: Species with peak counts in winter: Waterfowl. Ramsar criterion 6: Species with peak counts in spring/autumn: Ringed Plover, Black-tailed Godwit Species with peak counts in winter: Grey Plover, Red Knot, Dunlin, Common Redshank	Yes	Habitat loss Habitat / community simplification Changes to physical regime

5.3 Appropriate Assessment Introduction

5.3.1 Designated Sites, Interest Features and Attributes for Appropriate Assessment

In the following section, potential adverse effects are assessed for the Medway Estuary and Marshes SPA and Ramsar site, the Swale SPA and Ramsar site, and the Thames Estuary and Marshes SPA and Ramsar site. These are assessed in relation to each of the predicted hazards and potential effects on Interest Features, and the related Attributes and Conservation Objectives.

Impacts are assessed, both on those European Sites within the Strategy areas, and those beyond its boundary but with the potential to be affected.

The assessment has been carried out using the structure of the Environment Agency's HR02 pro forma, but converted to a report-based format, to allow for the volumes of information to be more easily presented and interpreted. This mirrors the approach taken at Screening.

5.3.2 Policies, Plans and Programmes for Assessment of In-Combination Effects

The in-combination assessments were carried out in relation to the following policies and plans:

- SMP9: Medway Estuary and Swale SMP (2008)
- SMP10: Isle of Grain to South Foreland SMP (2008)
- North Kent Rivers Catchment Flood Management Plans
- North Kent Coastal Habitat Management Plan (2002)
- Rochester Riverside Masterplan and Development Brief SPD (2014)
- Medway Local Plan (2003)
- Medway Strategic Flood Risk Assessment (2006)
- The Interface Land, Chatham SPD (2010)
- Gun Wharf Masterplan SPD (2010)
- Kent Local Flood Risk Management Strategy (2013)
- Kent Biodiversity Action Plan
- Swale Surface Water Management Plan (2012)
- Swale Borough Local Plan (2008)
- Swale Borough Emerging Local Plan (2014)
- Swale Borough SFRA for LDF (2009)
- Greater Thames Coastal Habitat Management Plan (2008)

5.4 Medway Estuary and Marshes SPA and Ramsar

5.4.1 Interest Features

It is to be noted that further surveys will be undertaken as a key part of the Strategy implementation to build upon the understanding of the key interest features and potential impacts on them. These surveys are being carried out by the Environment Agency's Kent and South London Area Team.

5.4.1.1 Habitats and Species:

- 1.12 Estuarine and intertidal habitats
- 3.04 Birds of lowland wet grasslands
- 3.05 Birds of lowland dry grassland
- 3.06 Birds of lowland freshwaters and their margins
- 3.09 Birds of estuarine habitats

5.4.1.2 Qualifying Features:

Individual Species:

Avocet, Little Tern, Common Tern, Bewick's Swan, Black-tailed Godwit, Common Greenshank, Dark-bellied Brent Goose, Dunlin, Eurasian Teal, Eurasian Wigeon, Grey Plover, Northern Plover, Pintail, Red Knot, Redshank, Ruddy turnstone, Ringed Plover, Shelduck

Over-winter waterfowl assemblage:

Red throated diver, Great Crested Grebe, Cormorant, Bewick's Swan, Dark-bellied Brent Goose a, Shelduck, Eurasian wigeon, Eurasian Teal, Mallard, Pintail, Northern Plover, Common Pochard, Oystercatcher, Avocet, Ringed Plover, Grey Plover, Lapwing, Red Knot, Dunlin, Black-tailed Godwit, Ruddy Turnstone

5.4.1.3 Other species:

Wetland and non-wetland invertebrates.

5.4.2 Favourable Condition Target for Relevant Attribute (Including Range of Natural Variation) based on Conservation Objectives

Relevant Attributes:

- Saltmarsh
- Intertidal sandflats and mudflats
- Freshwater grazing marsh and associated freshwater habitats

Attribute Targets:

- No decrease in extent and distribution of the habitats of the qualifying features
- Maintain the structure and function of the habitats of the qualifying features
- Maintain the supporting processes on which the habitats of the qualifying features rely
- Maintain the population and distribution of each of the qualifying features

5.4.3 Contribution of Attribute to Ecological Structure and Function of Site

The Medway Estuary and Marshes SSSI, that is almost entirely coincident with the SPA, is comprised of 29 units, covering 4748.8ha.

The Medway SSSI is functionally linked to the wider South Thames Estuary and Marshes SSSI, and the Swale SSSI, providing important roosting and feeding grounds for significant numbers of migratory waterbirds.

The Medway estuary forms a single tidal system with the Swale and joins the Thames Estuary between the Isle of Grain and Sheerness. It has a complex arrangement of tidal channels, which drain around large islands of saltmarsh and peninsulas of grazing marsh.

The mud-flats are rich in invertebrates and also support beds of *Enteromorpha* and some Eelgrass *Zostera* spp. Small shell beaches occur, particularly in the outer part of the estuary. Grazing marshes are present inside the sea walls around the estuary.

The complex and diverse mixes of coastal habitats support important numbers of waterbirds throughout the year. In summer, the estuary supports breeding waders and terns, whilst in winter it holds important numbers of geese, ducks, grebes and waders. The site is also of importance during spring and autumn migration periods, especially for waders.

The saltmarsh of Stoke Saltings is well used by breeding redshank and oystercatcher, with roost sites used by redshank, dunlin, knot and oystercatcher. Overwintering dunlin and grey plover use the saltmarshes, and ringed plover use the high saltings.

The reedbed of Damhead creek, to the western end of Stoke Saltings, provides a nesting location for a pair of breeding marsh harriers. The arable land within the SPA, behind the defences adjacent to Kingsnorth Power Station, is generally used by swans and geese, with warblers, reed bunting, skylark and meadow pipits using the marginal ditch vegetation.

Nor Marsh is known to be used by Mediterranean gulls. Motney Hill includes large blocks of reedbed, used by breeding and wintering marsh harriers. Horsham Marsh is known for its use by breeding avocet, with lapwing and redshank also present in notable numbers in its southern half.

Barksore Marshes includes numerous high quality ditches, and breeding wader habitat. Overwintering wader numbers are high too, with brent goose and grey plover also favouring this area for overwintering.

Chetney Marshes also offer habitat for many interest features. Deadmans Island, at the northern end, has a notable population of little terns, with a small number of overwintering black-tailed godwit. The western portion of Chetney is good for breeding avocet, and is productive for many other breeding wader species. Chetney's eastern edge is good for overwintering brent goose and grey plover. Pintail use the pools in this area too.

The entire SPA/Ramsar site is included within the Strategy area, so all interest features and relevant attributes would be affected by the Strategy's proposals.

5.4.4 Contribution of Management or Other Unauthorised Sources to Attribute and/or Feature Condition

Within the Medway Estuary and Marshes SSSI, there is a roughly equal split in the proportion of units (be area) that are recovering, and those that are declining or exhibiting no change.

53.72% of the SSSI (by area) is classified as Unfavourable - Recovering, 0.24% as Unfavourable - No change, 45.56% as Unfavourable – Declining, and 0.47% as Destroyed.

Of the 29 SSSI units just three are estuarine in nature (Littoral sediment), and of these, just one is proportion classified as Unfavourable – Declining. This includes 2163ha of saltmarsh and mudflats, and includes the upstream and western parts of the estuary, for example the Hoo Saltmarsh and Flats, Slede Ooze, and Stoke Saltings.

Those estuarine areas that are classified as Unfavourable – Recovering are concentrated on the eastern part of the estuary, bordering the Swale SSSI, which is known to have a far higher proportion of units classified as Favourable. Recovering areas of saltmarsh/mudflat include Hooe Island Horsham Marsh, Burntwick Island, Greenborough Marshes and the associated flats, Barksore Marshes, Bedlam's Bottom, Deadman's Island, Chetney Marshes and Ferry Marshes.

Note that the above assessments of condition have been based solely on bird numbers, and not on wider assessment of habitat condition, coastal squeeze or other factors.

All other units/areas within the SSSI are terrestrial/freshwater in nature, and almost entirely Unfavourable – Recovering. This effectively demonstrates the level of control/influence that land managers and conservation bodies have over the terrestrial habitats, compared to estuarine habitats, where the tidal nature, and the documented effects of coastal squeeze due to sea level rise are clearly having an effect.

Those interest features that are currently subject to WeBS Alerts include:

High Alerts: (since classification unless otherwise noted)

Dark-bellied brent goose (-60%), shelduck (-64%), great crested grebe (-69% long term), cormorant (-75% long term), ringed plover (-83%), grey plover (-71%), dunlin (-68%), curlew (-65%) and redshank (-74%).

Medium Alerts: (since classification unless otherwise noted)

Wigeon (-33%), pintail (-30%) and oystercatcher (-32% medium term).

Note that a number of other wader and waterfowl species are also subject to high and medium alerts, but are not Interest Features within this assessment process.

Both saltmarsh and intertidal sandflats are known to be disappearing due to coastal squeeze, whereas terrestrial/freshwater habitats continue to be defended, with little or no habitat loss and improving management in many cases.

Negative impacts on the conditions within the SPA, as recorded in the Standard Data Form (2015) include a change in biotic conditions, problematic native species, changes in abiotic conditions and outdoor sports and leisure activities, recreational activities. All of these threats/pressures are considered to be of high ranking.

Positive impacts are recorded as improved access to site, modification of cultivation practices and annual and perennial non-timber crops. As with the threats above, these are also considered to be of High ranking.

There is Natural England Site Improvement Plan for the Greater Thames Complex, produced as part of the Improvement Programme for England's Natura 2000 sites (IPENS). The plan provides a high-level overview of the issues (both current and predicted) affecting the condition

of the Natura 2000 features on the site(s) and outlines the priority measures required to improve the condition of the features.

In addressing coastal squeeze, the plan recommends a habitat creation and restoration strategy, ideally through the Kent and South London Habitat Creation Programme which is now operated at the Area Team level within the Environment Agency. In terms of public access and disturbance, it recommends investigating sources of disturbance within the SPAs. To address changes in species distributions it advocates investigation to identify cause of the decline in SPA birds. In terms of invasive species, it recommends investigating the impact of freshwater invasive species on SPA birds and investigating the impact of *Spartina anglica* on native saltmarsh and birds.

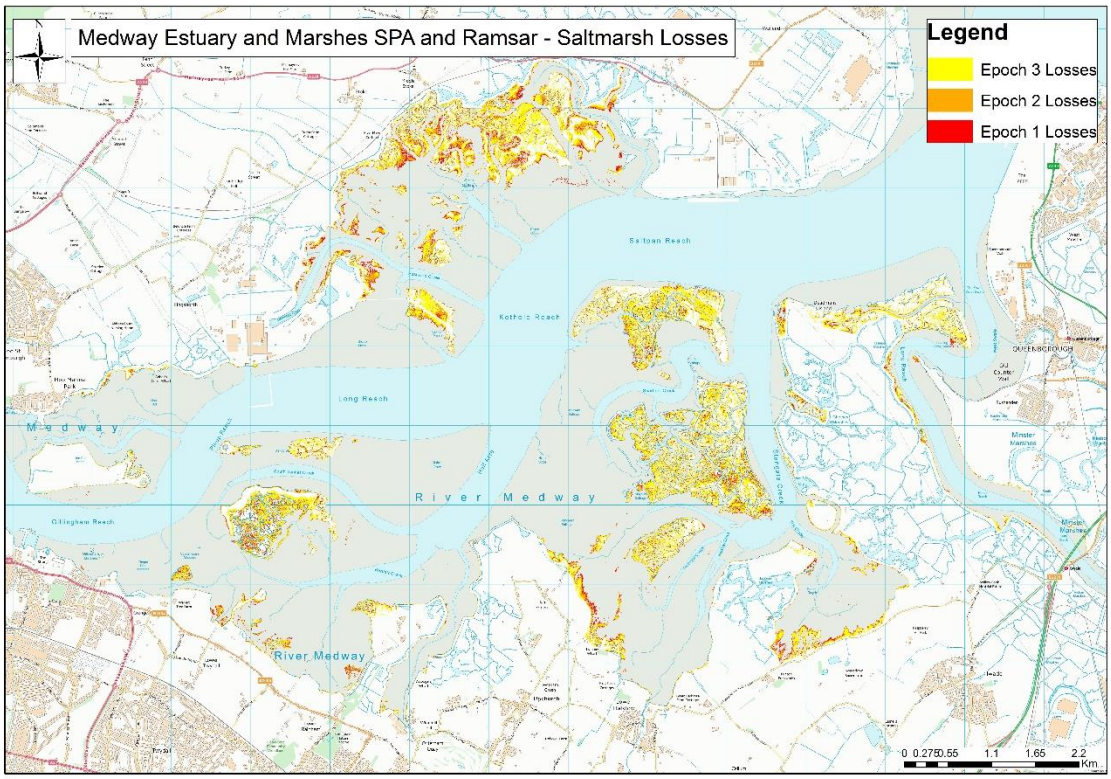
5.4.5 Adverse Effect of Proposal Alone and In-Combination on Attribute and/or Feature

5.4.5.1 Habitat loss

Alone:

The overarching strategy is predicted to impact designated saltmarsh as coastal squeeze manifests itself, reducing the area of these habitats available to the interest features listed. The potential loss of saltmarsh habitat has been calculated within the Mott MacDonald Coastal Processes Study (see Appendix E). This study has concluded a potential loss of 395ha over the next 100 years due to Hold the Line policies within the Medway Estuary and Marshes SPA and Ramsar Site. These areas are presented in Figure 5. Furthermore, since the Shoreline Management Policy, there has been an estimated 35ha of loss between then and present day (using figures from CHaMP). A total loss of saltmarsh habitat from the Strategy is therefore 430ha for the Medway Estuary and Marshes SPA and Ramsar Site. The Strategy looks to address all of the potential loss in epochs 1 and 2, and the majority of loss in epoch 3. However potential outstanding loss of compensation will be picked up as part of a Strategy review by the KSL Area Team during Strategy implementation. There is a projected growth of mudflat habitat expected as saltmarsh areas within the estuary become mudflats due to coastal squeeze. However this will need to be monitored throughout the Strategy implementation and compensation identified if loss of mudflat habitat is observed.

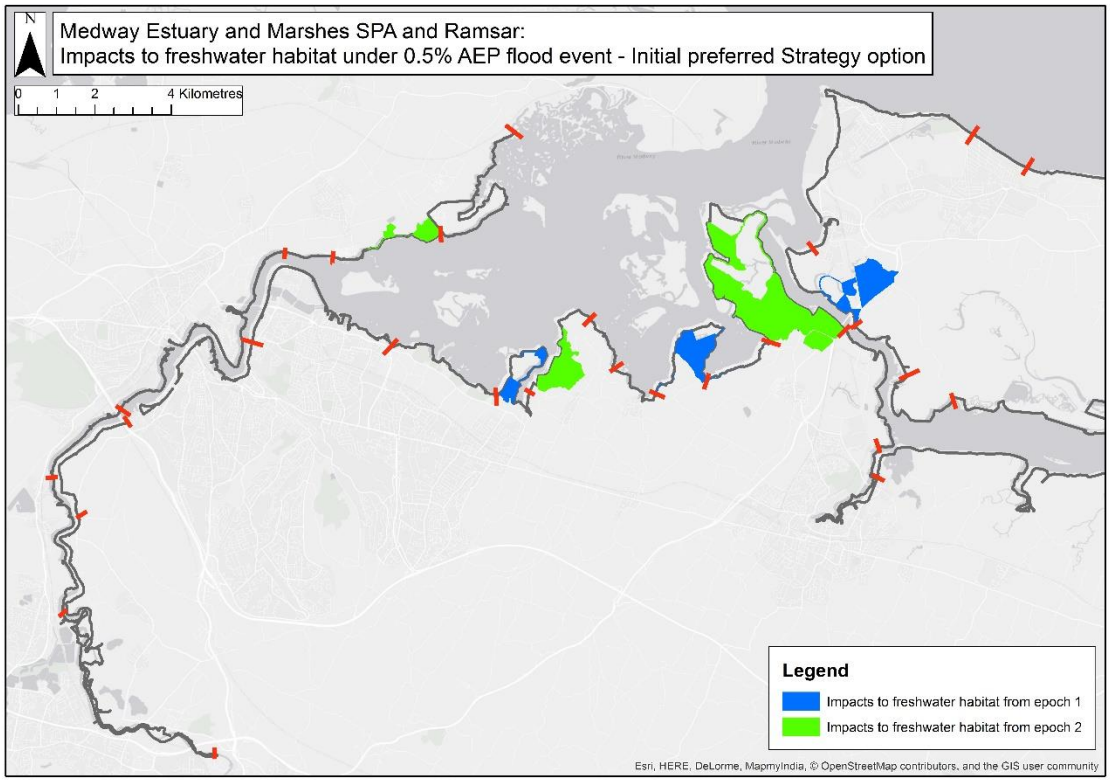
Figure 5: Coastal squeeze of saltmarsh in Medway Estuary and Marshes SPA and Ramsar Site over the next 100 years.



Source: Coastal Processes Study, Mott MacDonald (Appendix E).

It is also predicted that the Strategy will impact areas of designated freshwater habitat due to the inclusion of Managed Realignment sites, and in areas of No Active Intervention, by permitting overtopping of existing defences that currently offer a degree of protection. The degree of protection against storms decreases as sea level rise occurs in 6 sites (3 in epoch 1 and 3 in epoch 2). The areas of predicted impacts are summarised in Figure 6.

Figure 6: Impacts on Medway Estuary and Marshes SPA freshwater habitat in the Strategy.



Benefit Area 1 – (Northern part of the estuary)

The defences to the north and northeast of Kingsnorth power station on the Hoo peninsula will be subject to HTL (Sustain) throughout the life of the Strategy, primarily to protect the power stations and industry in the area. Further upstream, the defences at Hoo St Werbergh will HTL (Maintain) during Epoch 1. From Epoch 2 the HTL (Maintain) will revert to NAI. This means that the designated freshwater habitat to the west of Kingsnorth Power station would be adversely affected due to overtopping events of increasing frequency. There would be adverse effects on habitats, invertebrates and bird species that feed and roost here. It is worth noting however that this NAI policy will provide overall benefits to the estuary in terms of slowly reintroducing coastal processes and encouraging the development of transitional habitats.

Coastal squeeze would mean that large expanses of saltmarsh habitats will retract markedly at Stoke Saltings and Hoo Island. These attributes would therefore be adversely affected, as would the bird species that feed, roost and breed on them.

Benefit Area 4 – (Southern part of the estuary)

On the southern part of the estuary, the defences between Gillingham and Motney Hill would be subject to HTL (Sustain) throughout the life of the Strategy. There would be adverse effects on the mudflats either side of Bartlett Creek and South Yantlet Creek, as they would be lost to coastal squeeze over the life of the Strategy, as would much of the saltmarsh of Nor Marsh. Impacts there would also be adverse effects on relevant attributes and interest features would be as above that use these habitats.

The defences of Motney Hill and Barksore Marshes would be subject to NAI from Epoch 1, with Horsham and the majority of Chetney Marshes initially benefitting from HTL (Maintain). In Epoch 2, Horsham Marshes would revert to NAI, as well as Chetney Marshes (except Tailness Marsh). Designated freshwater habitat at Motney Hill, Horsham Marshes, Barksore Marshes and Chetney Marshes would all be subject to overtopping of the defences, with inundation possible along all these lengths of defence. This would adversely affect designated freshwater habitat.

Coastal squeeze is predicted to take place from Ham Ooze all the way to Halsow Creeks, and around Sharfleet Creek to the east of Chetney, eased slightly in the area in front of Tailness Marsh. Areas of saltmarshes are predicted to be lost at Burntwick Island and Greenborouigh Marshes. Again, these are adverse effects on attributes, with consequential impacts on interest features using these extensive areas for feeding, roosting and breeding.

In-Combination Effects:

It is predicted that currently there are no effects when considered in combination with plans and policies such as the Greater Thames CHaMP and similar plans, that aim to improve the condition of intertidal habitats in and around the Medway estuary.

Can Adverse Effects be Avoided?

No

Adverse Effect on Integrity; Long Term, Short Term. Yes, No or Uncertain?

Yes – Long term.

5.4.5.2 Physical damage

Alone:

The impacts associated with physical damage associated with construction of defences, particularly where large capital works and excavation is required, is more appropriately assessed at the project stage when more definitive designs are available.

It should be possible, through careful design the use of appropriate construction methodologies, and mitigation where necessary, to effectively eliminate adverse effects on attributes and interest features.

In-Combination Effects:

No plans, policies or projects are predicted to have in-combination adverse effects on the Attributes or Interest Features of this Site.

This should be confirmed at a project stage, once details of the level and type of disturbance are fully understood.

Can Adverse Effects be Avoided?

Yes, through careful mitigation, allowing adverse effects to be avoided (subject to confirmation at project stage).

Adverse Effect on Integrity; Long Term, Short Term. Yes, No or Uncertain?

No.

5.4.5.3 Changes to physical regime, Changes in water table/level, Changes to surface water flooding, Turbidity, Changes to water chemistry/salinity, Habitat / community simplification, and Disturbance

Alone:

As already described in the habitat loss section above, the overtopping of retained defences is likely to result in the occasional inundation of freshwater habitats with seawater. Inundation events are likely to increase in frequency through the lifetime of the Strategy – a result of both sea level rise and the eventual failure of defences subject to NAI. Similar effects are predicted behind areas of HTL (Maintain), although over longer timescales, and to a lesser geographical extent. The inundations are predicted to cause a change in physical regime, surface water flooding, turbidity and water chemistry within the habitat.

These changes are predicted to result in a change in plant and invertebrate communities. The change is likely to result in the initial simplification of freshwater habitats and communities as conditions change, with a drop in the number of species present and an overall loss of biodiversity. Following this, it is predicted that diversity would slowly increase, with the newly forming estuarine habitats becoming sufficiently established to provide suitable conditions for new invertebrate communities, and hence provide food sources for many of the interest features. However, the change in community may cause the loss of some rare species.

In-Combination Effects:

There is the potential for adverse effects in combination with those plans and policies that would increase indirect pressures on the sites. Increased disturbance through a rise in recreational use, associated with an increase in population through continued development, would have adverse effects on the sites.

Similarly, plans that affect the flooding regime in the estuary, with potential knock-on effects on changes in the water table, water chemistry and other changes to physical regime, would have potential adverse effects on the Sites. Those aspects of the Medway Local Plan, the Swale Borough Local Plan and the Swale Borough Emerging Local Plan, that each include areas of development that will require additional drainage capacity, are likely to cause these effects. Additional areas of development, also affecting drainage capacity and behaviours in the Strategy area, would have combine to create adverse effects.

The North Kent Rivers Catchment Flood Management Plans, the Medway Strategic Flood Risk Assessment and the Swale Surface Water Management Plan should aid in these effects being minimised, but it is not likely that in-combination effects would be completely removed. For example, algal blooms due to water quality, addressed by the above plans, are still likely to occur, which would act in combination with the Strategy to adversely affect the integrity of the site.

Can Adverse Effects be Avoided?

No.

Adverse Effect on Integrity; Long Term, Short Term. Yes, No or Uncertain?

Yes – long term.

5.4.5.4 Changes to Flow and Velocity Regime

Alone:

The nature of the strategy is such that changes to flow and velocity regime on the Medway Estuary are considered likely to adversely affect attributes or interest features. This process is interlinked with the above habitat loss and other hazards, as NAI policies and the rising sea level would affect how the water behaves in the estuaries, with associated adverse effects on habitats and birds and other species using them.

In-Combination Effects:

It is predicted that there are no other plans, policies or projects that would act in combination to adversely affect attributes of interest features within this European Site.

Can Adverse Effects be Avoided?

No.

Adverse Effect on Integrity; Long Term, Short Term. Yes, No or Uncertain?

Yes – long term.

5.5 Swale SPA and Ramsar

5.5.1 Interest Features

It is to be noted that further surveys will be undertaken as a key part of the Strategy implementation to build upon the understanding of the key interest features and potential impacts on them. These surveys are being carried out by the Environment Agency's Kent and South London Area Team.

5.5.1.1 Habitats and Species:

- 1.12 Estuarine and intertidal habitats
- 3.06 Birds of lowland freshwaters and their margins
- 3.07 Birds of farmland
- 3.08 Birds of coastal habitats
- 3.09 Birds of estuarine habitat

5.5.1.2 Qualifying Features:

Individual Species:

Dark Bellied Brent Goose, Dunlin, Redshank, Grey Plover, Ringed Plover, Wigeon., Pintail, Northern Shoveler, Black-tailed Godwit

Over-winter waterfowl assemblage:

Dark Bellied Brent Goose, Gadwall, Teal, Oystercatcher, Ringed Plover, Grey Plover, Dunlin, Curlew, Redshank

5.5.1.3 Other species:

Wetland and non-wetland invertebrates.

5.5.2 Favourable Condition Target for Relevant Attribute (Including Range of Natural Variation) based on Conservation Objectives

Relevant Attributes:

- Saltmarsh
- Intertidal sandflats and mudflats
- Freshwater grazing marsh and associated freshwater habitats

Attribute Targets:

- No decrease in extent and distribution of the habitats of the qualifying features
- Maintain the structure and function of the habitats of the qualifying features
- Maintain the supporting processes on which the habitats of the qualifying features rely
- Maintain the population and distribution of each of the qualifying features

5.5.3 Contribution of Attribute to Ecological Structure and Function of Site

The Swale SSSI, that is almost entirely coincident with the SPA, is comprised of 60 units, covering 6509.3ha.

The Swale SSSI is functionally linked to the wider South Thames Estuary and Marshes SSSI, and the Medway estuary and Marshes SSSI, providing important roosting and feeding grounds for significant numbers of migratory waterbirds.

The Swale is an estuarine area that separates the Isle of Sheppey from the Kent mainland. To the west it adjoins the Medway Estuary.

It is a complex of brackish and freshwater, floodplain grazing marsh with ditches, and intertidal saltmarshes and mud-flats. The intertidal flats are extensive, especially in the east of the site, and support a dense invertebrate fauna. These invertebrates, together with beds of algae and Eelgrass *Zostera* spp., are important food sources for waterbirds. Locally there are large Mussel *Mytilus edulis* beds formed on harder areas of substrate.

The SPA contains the largest extent of grazing marsh in Kent (although much reduced from its former extent). There is much diversity both in the salinity of the dykes (which range from fresh to strongly brackish) and in the topography of the fields.

The wide diversity of coastal habitats found on the Swale combine to support important numbers of waterbirds throughout the year. In summer, the site is of importance for Marsh Harrier *Circus aeruginosus*, breeding waders and Mediterranean Gull *Larus melanocephalus*. In spring and autumn migration periods, as well as during winter, the Swale supports very large numbers of geese, ducks and waders.

Minster Marshes and Stray Marshes, both freshwater grazing marsh to the east of the Kingsferry Bridge, are managed for breeding waders. Elmley and Spitend Marshes, along the south of Sheppey, offer habitat for a large number of waders, including notable breeding Avocet and Lapwing. Avocet also overwinter here, as do Bar-Tailed Godwits. Spitend Point offers excellent habitat for many species of breeding waders. Overwintering populations of ducks, especially Wigeon, and other species like Lapwing and Golden Plover are known to use this area.

Mocketts, on the Isle of Harty, is well known for Ringed Plover on passage. Marsh Harrier are known to breed and overwinter in the reedbeds of Capel Fleet here, and Hen Harrier also use this feature for overwintering.

Further east, the eastern parts of Harty Marshes include large areas of arable land, used heavily by goose and swans. The saltmarshes here are in excellent condition, and provide habitat for overwintering Bar-Tailed and Black-Tailed Godwit. Grey Plover and Knot also feed here, roosting in the arable and freshwater habitats behind.

On the other side of the Swale, the saltmarsh fringe again provide habitat for feeding Grey Plover and Knot. A colony of Little Tern uses a small island in front of Graveney Marshes, which themselves provide good roosting sites for large numbers of waders, particularly Golden Plovers, for example.

The Oare Marshes provide good overwintering habitat for Avocet, Bar-Tailed and Black-Tailed Godwit, Pintail and Shoveler.

Luddenham Marshes and Teynham Level offer a number of habitat types, with freshwater marshes to the north, used for roosting, and more terrestrial habitats like orchards to the south. This area is of lesser value for waders and wildfowl. A narrow strip of saltmarsh is located in front of the defences along this stretch.

The areas to the west of Conyer Creek is also of limited value, with a narrow saltmarsh strip in front of sometimes over-grazed freshwater grazing marsh. Little Murston Nature Reserve is of higher value. Habitats around Milton Creek, close to Sittingbourne, offer some foraging habitat but roosting is limited here due to disturbance. Species using this area for foraging are known to use Elmley, the other side of the Swale, for roosting.

The entire SPA/Ramsar site is included within the Strategy area, so all interest features and relevant attributes would be affected by the strategy proposals.

5.5.4 Contribution of Management or Other Unauthorised Sources to Attribute and/or Feature Condition

Within the Swale SSSI, the majority of the units (by area) are in a favourable condition, with a very small proportion unfavourable but exhibiting no change. 97.83% of the SSSI (by area) is classified as Favourable, and just 2.17% as Unfavourable – No Change.

Those units classified as Unfavourable – No Change are both neutral lowland grassland, of 62, 59 and 20ha respectively. Reasons for their unfavourable condition have been described in the NE condition report as overgrazing and/or undergrazing, inappropriate ditch management and a lack of corrective works, inappropriate scrub management, public disturbance due to people and vehicles. Each of these units is within Graveney Marshes.

Those interest features that are currently subject to WeBS Alerts include:

High Alerts: (since classification unless otherwise noted)

White-fronted Goose (-75%), Little Grebe (-74% medium term), Cormorant (-72% long term).

Medium Alerts: (since classification unless otherwise noted)

Shelduck (-26% medium term), Shoveler (-25% medium term), Grey Plover (-44% medium term), Lapwing (-42% medium term), Dunlin (-30% long term), Redshank (-43% long term).

Note that a number of other wader and waterfowl species are also subject to high and medium alerts, but are not Interest Features within this assessment process.

Both saltmarsh and intertidal sandflats are known to be disappearing due to coastal squeeze, although this is at a lesser rate than in the Medway Estuary and Marshes SSSI.

Terrestrial/freshwater habitats continue to be defended, with little or no habitat loss and improving management in many cases.

Negative Impacts on the conditions within the SPA, as recorded in the Standard Data Form (2015) include changes in biotic conditions, changes in abiotic conditions, outdoor sports and leisure activities, recreational activities, fishing and harvesting aquatic resources, and invasive non-native species. All of these threats/pressures are considered to be of High ranking.

Positive impacts are recorded as Annual and perennial non-timber crops, Modification of cultivation practices, Improved access to site, and Grazing. As with the threats above, these are also considered to be of High ranking.

There is a Natural England Site Improvement Plan for the Greater Thames Complex, produced as part of the Improvement Programme for England's Natura 2000 sites (IPENS). The plan provides a high level overview of the issues (both current and predicted) affecting the condition of the Natura 2000 features on the site(s) and outlines the priority measures required to improve the condition of the features.

In addressing Coastal squeeze, the plan recommends a habitat creation and restoration strategy, ideally through the Kent and South London Habitat Creation Programme which is now operated at the Area Team level within the Environment Agency. In terms of public access and disturbance, it recommends investigating sources of disturbance within the SPAs. To address changes in species distributions it advocates investigation to identify cause of the decline in SPA birds. In terms of invasive species, it recommends investigating the impact of freshwater invasives on SPA birds and investigating the impact of *Spartina anglica* on native saltmarsh and birds.

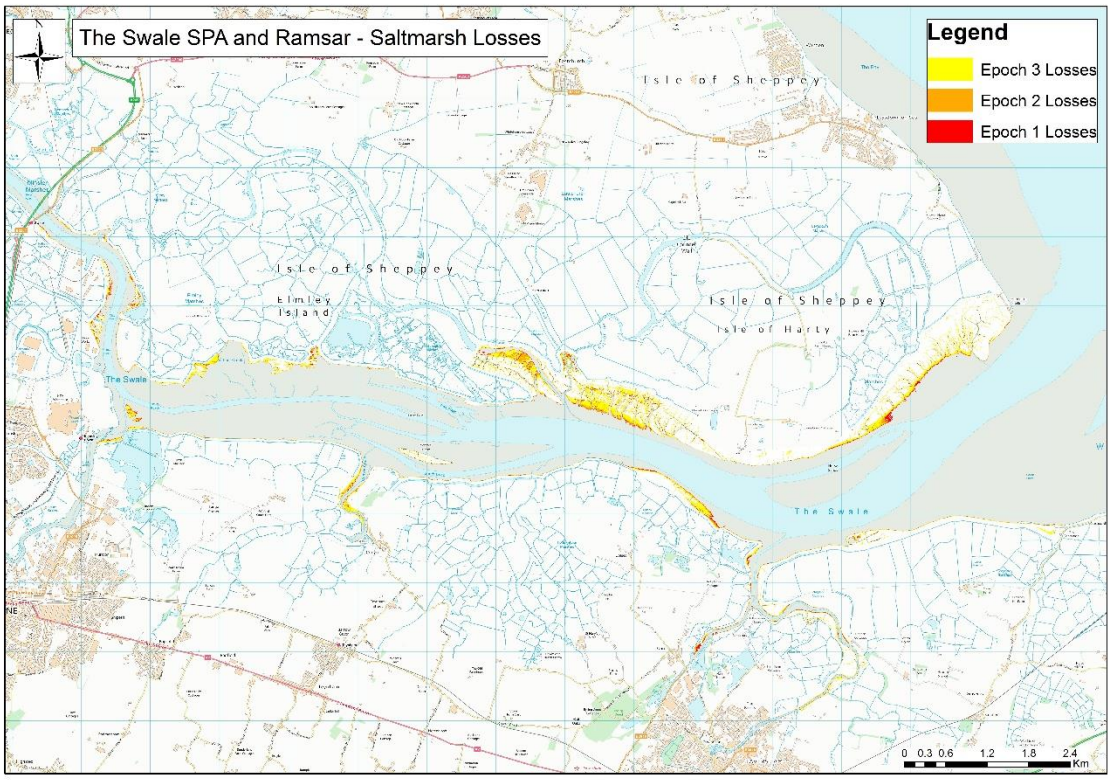
5.5.5 Adverse Effect of Proposal Alone and In-Combination on Attribute and/or Feature

5.5.5.1 Habitat loss

Alone:

The overarching strategy is predicted to impact designated saltmarsh as coastal squeeze manifests itself, reducing the area of these habitats available to the interest features listed. The potential loss of saltmarsh habitat has been calculated within the Mott MacDonald Coastal Processes Study (see Appendix E). This study has concluded a potential loss of 106ha over the next 100 years due to Hold the Line policies and high ground areas within the Medway Estuary and Marshes SPA and Ramsar. These areas are presented in Figure 5. There is a projected growth of mudflat habitat expected as saltmarsh areas within the estuary become mudflats due to coastal squeeze.

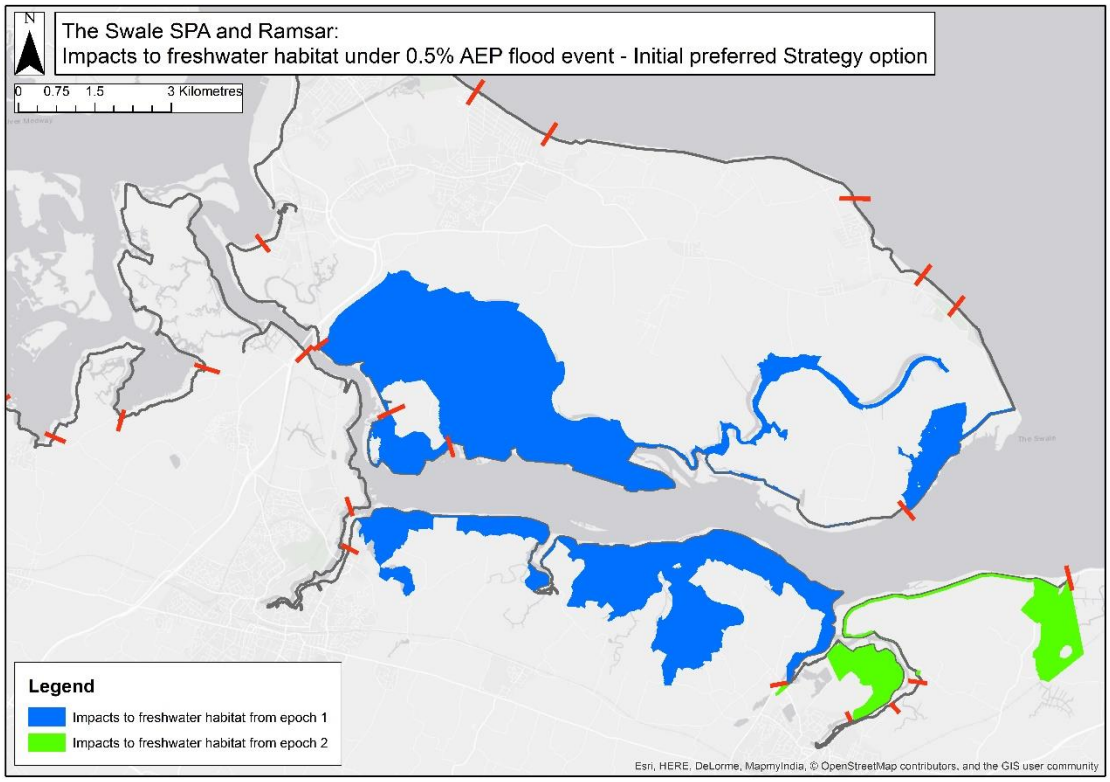
Figure 7: Coastal squeeze of saltmarsh in Medway Estuary and Marshes SPA and Ramsar over the next 100 years.



Source: Coastal Processes Study, Mott MacDonald (Appendix E).

It is also predicted that the Strategy will impact areas of designated freshwater habitat due to adoption of Managed Realignment and No Active Intervention in 6 sites (4 from epoch 1 and an additional 2 from epoch 2). The areas of predicted impacts are summarised in Figure 8.

Figure 8: Impacts on Medway Estuary and Marshes SPA freshwater habitat in the Strategy.



The majority of the defences along the Swale are to be subject to NAI, with the exception of the defences along Milton Creek, Sittingbourne, and Faversham Creek, where HTL (Sustain) will be used.

Over these extensive lengths, the designated freshwater habitat of Elmley and Spitend Marshes, Harty Island and Marshes, Little Murston Marshes, Teynham Level and Luddenham Marshes could all potentially be adversely affected by overtopping events, impacting on the habitats and invertebrates here, with consequential, widespread impacts on the interested features that feed and roost here.

In-Combination:

It is predicted that currently there are no adverse effects when considered in combination with plans and policies such as the Greater Thames CHaMP in addition to similar plans, that aim to improve the condition of intertidal habitats in and around the Swale Estuary.

Can Adverse Effects be Avoided?

No.

Adverse Effect on Integrity; Long Term, Short Term. Yes, No or Uncertain?

Yes – long term.

5.5.5.2 Physical damage

Alone:

The impacts associated with physical damage associated with construction of defences, particularly where large capital works and excavation is required, is more appropriately assessed at the project stage when more definitive designs are available.

It should be possible, through careful design the use of appropriate construction methodologies, and mitigation where necessary, to effectively eliminate adverse effects on attributes and interest features.

In-Combination:

No plans, policies or projects are predicted to have in-combination adverse effects on the Attributes or Interest Features of this Site.

This should be confirmed at a project stage, once details of the level and type of disturbance are fully understood.

Can Adverse Effects be Avoided?

Yes (subject to confirmation at project stage).

Adverse Effect on Integrity; Long Term, Short Term. Yes, No or Uncertain?

No.

5.5.5.3 Changes to physical regime, Changes in water table/level, Changes to surface water flooding, Turbidity, Changes to water chemistry/salinity, Habitat / community simplification, and Disturbance

Alone:

As already described in the Habitat Loss section of this table, the overtopping of defences could result in the occasional inundation of freshwater habitats with seawater. This would depend on the frequency and severity of overtopping events.

In areas of NAI, inundation events are likely to increase in frequency through the lifetime of the Strategy – a result of both sea level rise and the eventual failure of defences. Similar effects are predicted behind areas of HTL (Maintain), although over longer timescales, and to a lesser geographical extent. The inundations are predicted to cause a change in physical regime, surface water flooding, turbidity and water chemistry within the habitat.

These changes are predicted to result in a change in plant and invertebrate communities. The change is likely to result in the initial simplification of freshwater habitats and communities as conditions change, with a drop in the number of species present and an overall loss of biodiversity. Following this, it is predicted that diversity would slowly increase, with the newly forming estuarine habitats becoming sufficiently established to provide suitable conditions for new invertebrate communities, and hence provide food sources for many of the interest features. There is potential for loss of some rare freshwater species or reduction in usage by birds at high tide.

In-Combination:

There is the potential for adverse effects in combination with those plans and policies that would increase indirect pressures on the sites. Increased disturbance through a rise in recreational use, associated with an increase in population through continued development, would have adverse effects on the sites.

Similarly, plans that affect the flooding regime in the estuary, with potential knock-on effects on changes in the water table, water chemistry and other changes to physical regime, would have potential adverse effects on the Sites. Those aspects of the Medway Local Plan, the Swale Borough Local Plan and the Swale Borough Emerging Local Plan, that each include areas of development that will require additional drainage capacity, are likely to cause these effects. Additional areas of development, also affecting drainage capacity and behaviours in the Strategy area, would have combine to create adverse effects.

The North Kent Rivers Catchment Flood Management Plans, the Medway Strategic Flood Risk Assessment and the Swale Surface Water Management Plan should aid in these effects being minimised, but it is not likely that in-combination effects would be completely removed.

Can Adverse Effects be Avoided?

No.

Adverse Effect on Integrity; Long Term, Short Term. Yes, No or Uncertain?

Yes – Long term.

5.5.5.4 Changes to Flow and Velocity Regime

Alone:

The nature of the strategy is such that changes to flow and velocity regime on the Swale Estuary are considered likely to adversely affect attributes or interest features. This process is interlinked with the above habitat loss and other hazards, as the NAI policies and the rising sea level would affect how the water behaves in the estuaries, with associated adverse effects on habitats and birds and other species using them.

It will be necessary to model changes in flow and velocity regimes as projects are developed to ensure that effects are minimised as far as possible.

In-Combination:

It is predicted that there are no other plans, policies or projects that would act in combination to adversely affect attributes of interest features within the Designated Site.

Can Adverse Effects be Avoided?

No.

Adverse Effect on Integrity; Long Term, Short Term. Yes, No or Uncertain?

Yes – Long term.

5.6 Thames Estuary and Marshes SPA and Ramsar

It is to be noted that further surveys will be undertaken as a key part of the Strategy implementation to build upon the understanding of the key interest features and potential impacts on them. These surveys are being carried out by the Environment Agency's Kent and South London Area Team.

5.6.1 Interest Feature

5.6.1.1 Habitats and Species:

- 1.12 Estuarine and intertidal habitats
- 3.04 Birds of lowland wet grasslands

- 3.06 Birds of lowland freshwaters and their margins
- 3.08 Birds of coastal habitats
- 3.09 Birds of estuarine habitats

5.6.1.2 Qualifying Features:

Individual Species:

Avocet, Hen Harrier, Black-tailed Godwit, Dunlin, Grey Plover, Red Knot, Redshank, Ringed Plover

Over-winter waterfowl assemblage:

Black-tailed Godwit, Dunlin, Grey Plover, Avocet, Red Knot, Redshank

5.6.1.3 Other Species:

Invertebrates.

5.6.2 Favourable Condition Target for Relevant Attribute (Including Range of Natural Variation) based on Conservation Objectives

Relevant Attributes:

- Saltmarsh
- Intertidal sandflats and mudflats
- Freshwater grazing marsh and associated freshwater habitats

Attribute Targets:

- No decrease in extent and distribution of the habitats of the qualifying features
- Maintain the structure and function of the habitats of the qualifying features
- Maintain the supporting processes on which the habitats of the qualifying features rely
- Maintain the population and distribution of each of the qualifying features

5.6.3 Contribution of Attribute to Ecological Structure and Function of Site

The South Thames Estuary and Marshes SSSI, that is almost entirely coincident with the Thames Estuary and Marshes SPA, is comprised of 58 units, covering 5982.5ha.

The SSSI is functionally linked to the wider Medway Estuary and Marshes SSSI and the Swale SSSI to the south of the Thames Estuary, and to a lesser extent the Benfleet and Southend Marshes SSSI to the north of the Thames estuary. It provides important roosting and feeding grounds for significant numbers of migratory waterbirds.

The marshes extend for about 15 km along the south side of the estuary and also include intertidal areas on the north side of the estuary. To the south of the river, much of the area is brackish grazing marsh, although some of this has been converted to arable use. At Cliffe, there are flooded clay and chalk pits, some of which have been infilled with dredgings.

Outside the sea wall, there is a small extent of saltmarsh and broad intertidal mud-flats. The estuary and adjacent grazing marsh areas support an important assemblage of wintering waterbirds including grebes, geese, ducks and waders. The site is also important in spring and autumn migration periods.

The Thames Estuary and Marshes SPA/Ramsar site is not located within the Strategy area, but is adjacent to it. It therefore has the potential to be affected by changes to flood regime, salinity, turbidity and sediment supply, and by wider impacts on the population sizes and distributions of the interest features and qualifying features.

5.6.4 Contribution of Management or Other Unauthorised Sources to Attribute and/or Feature Condition

Within the South Thames Estuary and Marshes SSSI, the majority of the units (by area) are in a favourable condition.

95.28% of the SSSI (by area) is classified as Favourable, 2.35% as Unfavourable - Recovering, 0.59% as Unfavourable - No change, and 1.79% as Unfavourable – Declining.

Of the 58 SSSI units just eight are estuarine in nature, four being littoral sediment and four inshore sublittoral sediment, totalling 2763.49ha. Of the inshore sublittoral sediment units, three of the four (175.14ha) are in Favourable condition, with the remaining unit (64.63ha) classified as Unfavourable – Recovering. Of the littoral sediment units, two units (2443.29ha) are in Favourable condition, with the other two (94.5ha) classified as Unfavourable – Declining.

Almost all the other units, comprised mostly of lowland neutral grassland, with small areas of boundary and linear features, and standing open water and canals are in Favourable condition.

Note that in assigning these classifications, units have been assessed for value as breeding and over wintering bird habitat.

Those interest features that are currently subject to WeBS Alerts include:

High Alerts: (since classification unless otherwise noted)

White-fronted Goose (-63%), Grey Plover (-50%).

Medium Alerts: (since classification unless otherwise noted)

Shoveller (-33%), Ringed Plover (-36% short term), Lapwing (-35%), Dunlin (-28% short term).

Note that a number of other wader and waterfowl species are also subject to high and medium alerts, but are not Interest Features within this assessment process.

Both Saltmarsh and intertidal sandflats are known to be disappearing due to coastal squeeze, whereas terrestrial/freshwater habitats continue to be defended, with little or no habitat loss and improving management in many cases.

Negative Impacts on the conditions within the SPA, as recorded in the Standard Data Form (2015) include shipping lanes, ports, marine constructions (of medium ranking), renewable abiotic energy use, and marine water pollution (both of high ranking), and fishing and harvesting aquatic resources (of low ranking). These threats/pressures are considered to be of high ranking.

No positive impacts are recorded.

There is a Natural England Site Improvement Plan for the Greater Thames Complex, produced as part of the Improvement Programme for England's Natura 2000 sites (IPENS). The plan provides a high level overview of the issues (both current and predicted) affecting the condition of the Natura 2000 features on the site(s) and outlines the priority measures required to improve the condition of the features.

In addressing Coastal squeeze, the plan recommends a habitat creation and restoration strategy, ideally through the Kent and South London Habitat Creation Programme. In terms of public access and disturbance, it recommends investigating sources of disturbance within the SPAs. To address changes in species distributions it advocates investigation to identify cause of the decline in SPA birds. In terms of invasive species, it recommends investigating the impact of freshwater invasives on SPA birds and investigating the impact of *Spartina anglica* on native saltmarsh and birds.

5.6.5 Adverse Effect of Proposal Alone and In-Combination on Attribute and/or Feature

5.6.5.1 Habitat Loss, Habitat Simplification, Changes to Physical Regime

Alone:

The Strategy is likely to adversely affect the physical regime of the site by altering the sediment supply from the Medway and Swale Estuary. This is likely to alter the rate at which sediment moves between the two sites, and the nature of the sediment being transferred, with potential adverse effects on the accretion/erosion regime. This has the potential to cause habitat loss and/or habitat simplification at the site.

In-Combination:

No adverse effects are predicted, that would be caused or exacerbated in combination with other plans, policies or projects.

Can Adverse Effects be Avoided?

No.

Adverse Effect on Integrity; Long Term, Short Term. Yes, No or Uncertain?

Yes – Long term.

5.7 Summary of the Appropriate Assessment

5.7.1 Medway Estuary and Marshes SPA and Ramsar Site

In the Medway Estuary, 430has of saltmarsh habitats are predicted to be lost to coastal squeeze over the life of the Strategy. During Epoch 1 it is recommended in the Strategy that the existing coastal defences are managed using combination of HTL (Maintain and Sustain) and NAI.

From Epoch 2 (and inclusive for Epoch 3) the Strategy alters, with all those areas previously HTL (Maintain) becoming NAI. Those areas of HTL (Sustain) remain unchanged, in order to protect the assets behind.

Adverse effects are predicted in relation to both the loss of saltmarsh to coastal squeeze, and to the loss of freshwater habitats to areas of NAI. Habitat loss is likely to be linked to other aspects of change, including alterations in the physical regime, the water chemistry, alterations in surface water drainage, and changes to flow and velocity regime.

5.7.2 The Swale SPA and Ramsar Site

In Epoch 1, large lengths of defence on both side of the Swale will be subject to NAI, with HTL (Sustain) in front of more built-up areas like Sittingbourne and Faversham.

In Epoch 2, most lengths of NAI will remain in place, with the defence to the north of Sittingbourne/Kemsley upgraded to HTL (Sustain) to provide better ongoing protection against storm events and sea level rise. The defences in front of Ham Marshes will change from HTL (Maintain) to NAI.

No changes to defence policies are proposed between Epoch 2 and Epoch 3.

As with above, Adverse Effects are predicted in relation to both the loss of 106ha of saltmarsh to coastal squeeze, and to the loss of freshwater habitats to areas of NAI. As with the Medway estuary, habitat loss is linked to other aspects of change, including alterations in the physical regime, the water chemistry, alterations in surface water drainage, and changes to flow and velocity regime.

5.7.3 Thames Estuary and Marshes SPA

The alteration of the hydrological regime in the Strategy area is likely to affect the sediment supply to this site. This would potentially have adverse effects, by altering the extents of the habitats here.

5.7.4 Summary for the Strategy

Table 6 and Table 7 summarise the impacts from the preferred Strategy on intertidal SPA/Ramsar habitat and freshwater SPA/Ramsar habitat.

Table 6: Summary of Strategy impacts on intertidal saltmarsh habitat due to coastal squeeze

Strategy epoch	Projected loss of intertidal saltmarsh SPA/Ramsar habitat (ha)
Epoch 1 (0-20 years)*	110.3 ha
Epoch 2 (21-50 years)	134.8 ha
Epoch 3 (51-100 years)	290 ha

*Includes 35ha historic loss since SMP

Table 7: Summary of Strategy impacts on freshwater SPA/Ramsar habitat due to increased flooding

Strategy epoch	Projected loss of freshwater SPA/Ramsar habitat (ha)
Epoch 1 (0-20 years)	2,531 ha
Epoch 2 (21-50 years)	656 ha
Epoch 3 (51-100 years)	0*

*Although increased loss would be expected with sea level rise, the figures for Epochs 1 and 2 have been calculated using modelling which has already accounted for rise in sea level.

6 Stage 3: Consideration of Alternatives

6.1 Description of the Derogation Tests

The Habitats Directive provides a derogation under article 6(4) which allows plans or projects to be approved provided three sequential tests are met. These are:

- There are no feasible alternative solutions to the plan or project which are less damaging.
- There are “imperative reasons of overriding public interest” (IROPI) for the plan or project to proceed.
- Compensatory measures are secured to ensure that the overall coherence of the network of European sites is maintained.

These tests must be interpreted strictly and in a step-wise process and developments which may result in an adverse effect on the integrity of a European Site can only be authorised once the above tests have been met.

6.2 Consideration of Alternatives

It has been identified that there will be adverse effects on the Attributes (freshwater habitats and saltmarsh) and Interest Features (the many Qualifying Feature bird species and assemblages breeding, overwintering and using habitats on passage) of the Natura 2000 sites. It is therefore necessary to consider feasible alternative solutions to the plan or project which are less damaging.

Following the assessment of the impacts on habitats associated with the qualifying features and management of the European sites (Section 5), the options were assessed to see whether there was an alternative approach in different frontages. Formulation of the Strategy has involved extensive consideration of a range of environmental aspects, carried out with regular input from Stakeholders – members of the various teams within the Environment Agency, Natural England, Kent Wildlife Trust and the RSPB for example. This has allowed the various options and their relative implications to be understood. This consultation, allied with the extensive environmental input from the project team throughout the project, means that the Strategy recommendations have therefore been formed by ensuring that the least damaging, most appropriate options.

Information on the extent and content of the Stakeholder Engagement process can be found in the Stakeholder Report (Technical Appendix L of the Strategy), and is also summarised in the Strategic Environmental Assessment.

The process to identify alternative options that has been followed during the formulation of the Strategy has ensured an approach where impacts were firstly directed towards areas that were not likely to adversely impact on habitats associated with the qualifying features and management of the European sites. However, within the consideration of alternatives, the same approach that was applied within the SMPs has been applied within the Strategy where there are potential impacts on both intertidal and freshwater habitat. As outlined in Section 3.5.4, the SMP determined:

“Hold the Line: Based on the best available information recently produced under the Greater Thames CHaMP project, Hold the Line is now considered a damaging policy within all epochs due to its predicted loss of intertidal habitat through coastal squeeze. Natural England do not

consider Hold the Line to be the least damaging alternative for any epoch of the plan based on this information.

Managed Realignment with a Controlled Extent: Following a review of the SMP policies within and outside the designated areas plus their respective timing, Managed Realignment with a Controlled Extent (to minimise ecological impact) is the least damaging alternative for all Managed Realignment Policies affecting the designated sites. This would allow the creation of a more natural coastline. This is therefore the approach that the SMP has adopted subject to the following conditions that define the actions and controls required to implement the plan in the least damaging way."

Therefore, within the consideration of alternatives, if Managed Realignment could be undertaken as opposed to Hold the Line or No Active Intervention (which could be taken forward by the Landowners as Hold the Line), Managed Realignment has been taken forward.

When specifically developing the options for the Managed Realignment sites, a number of constraints were considered to compare the large number of Managed Realignment sites identified within the Shoreline Management Plans, and present the most suitable to take forward. Key constraints were considered which were identified as issues which could identify an area as not suitable for Managed Realignment. Assessment of secondary constraints was then undertaken to allow prioritisation of the most suitable Managed Realignment sites. These constraints include:

- Key constraints: topography, impact on adjacent coastlines and wider estuary morphology, adverse impact on flood risk, location of landfill sites, and potential functionality of created habitat (i.e. whether it could provide SPA/Ramsar habitat compensation).
- Secondary constraints: Impact on freshwater habitat (with the consideration of the quality and value of that freshwater habitat), land use, grade/quality of agricultural land, infrastructure present, landowner and stakeholder feedback.

Table 8 presents the summary of the consideration of alternatives. However, it should be noted that whilst the table below considers each Benefit Area individually there was a higher level assessment also considered. The modelling of Managed Realignment sites showed that if all short listed sites were taken forward, the impacts on water levels within the estuaries would be a significant increase, which would put more pressure on the Hold the Line areas of defences. Furthermore, this increase in water coming into the estuaries would increase current speeds and scour and could have an adverse impact on the existing areas of saltmarsh and mudflat. Therefore, whilst Managed Realignment sites were preferred on an individual BA assessment, an overall Strategy view was also undertaken as part of the option assessment process. Modelling of the whole Strategy frontage was used to inform where Managed Realignment sites could have adverse impacts on the overall estuary. Modelling of the final Strategy preferred option after alternatives were proposed was also undertaken to ensure the sustainable future evolution of the estuaries.

Table 8: Consideration of Alternatives

Benefit Area	Initial Strategy Option	Alternative Option Available?	Justification
1.2	Maintain defences until year 8. Then raise (sustain) the embankment, seawall and rock revetment in year 8.	No	There is major infrastructure located within this area which needs to be protected from overtopping and flooding.

Benefit Area	Initial Strategy Option	Alternative Option Available?	Justification
1.3	Ongoing maintenance until year 25, followed by No Active Intervention (NAI).	Yes – a managed realignment site at Abbotts Court	There are areas of key infrastructure (pipelines) and also Hoo Marina in the area, however the Managed Realignment site at Abbotts Court will provide compensatory habitat for coastal squeeze.
1.4	No Active Intervention (NAI).	No	This is a cliffed area and designated as under SSSI designation and therefore not suitable for Managed Realignment.
2.1	Raise (sustain) embankments, walls, flood gates and revetments.	No	Defences protect important industry, heritage and residential and commercial properties in the area.
2.2	Raise (sustain) embankments, walls, flood gates and revetments in localised areas.	No	Defences protect important industry, heritage and residential and commercial properties in the area.
2.3	Raise (sustain) embankments, walls, flood gates and revetments.	No	Defences protect important industry, heritage and residential and commercial properties in the area.
3.1	No Active Intervention (NAI).	No	The topography is not advantageous for Managed Realignment, and the modelling undertaken showed that too many managed realignment sites increased water levels and current speeds in the estuary. The location of this area is located a further distance away from the SPA/Ramsar site so would not be suitable compensation habitat.
3.2	Construct new setback embankments at Halling Marshes. Raise (sustain) embankments, walls and flood gates in localised areas.	No	Already located a Managed Realignment site here and the village of Halling needs to be continued to be protected.
3.3	Raise (sustain) embankments, walls and flood gates from year 20.	No	Defences protect a number of residential properties, commercial areas, and industries as well as valuable arable land.
3.4	Raise (sustain) embankments, walls and flood gates in localised areas.	No	Defences protect a number of residential properties, commercial areas, and industries as well as valuable arable land.
3.5	No Active Intervention (NAI)	No	The topography is not advantageous for Managed Realignment, and the modelling undertaken showed that too many managed realignment sites increased water levels and current speeds in the estuary. The location of this area is located a further distance away from the SPA/Ramsar site so would not be suitable compensation habitat.
4.1	Raise (sustain) embankments, walls and flood gates around other areas.	Yes – Managed Realignment site at Danes Hill	Construct Managed Realignment site at Danes Hill to provide compensatory habitat for coastal squeeze. The rest of the frontage requires Hold the Line policy to protect the road and the Riverside Country Park which is important recreational space as well as residential properties.
4.2a	No Active Intervention (NAI),	No	Southern Water assets and high ground in this area make this frontage unsuitable for Managed Realignment.
4.2b	Ongoing maintenance until year 15, followed by No Active Intervention (NAI).	No	There is important agricultural land here and the freshwater habitat is of very high quality and

Benefit Area	Initial Strategy Option	Alternative Option Available?	Justification
			important for the overall integrity of the SPA/Ramsar.
4.3	No Active Intervention (NAI).	No	Site ties into high ground and is therefore not suitable for Manged Realignment.
4.4	Raise (sustain) embankment and revetment in localised areas.	No	The village of Lower Halstow needs to continue to be protected due to the number of residential properties at risk. The rest of the area is used as important recreation and mooring sites, or ties into high ground.
4.5	No Active Intervention (NAI).	No	This area is a historic landfill site and therefore there would be concerns around potential contamination if Managed Realignment was undertaken here. Further, the current management of the freshwater designated sites is undertaken very well by the landowner.
4.6	No Active Intervention (NAI).	No	The topography here moves very quickly to high ground and is therefore not suitable for Managed Realignment, however the high ground does reduce the need for defences here.
4.7	Ongoing maintenance until year 15, followed No Active Intervention.	Yes – Managed Realignment at Tailness and Managed Realignment Habitat Adaptation for rest of the site	A Managed Realignment site is not feasible on the whole site due to a number of reasons including very low topography, risks of increasing scour and current speeds by Queenborough, large requirements for freshwater habitat compensation in the short term, and impacts to nationally important infrastructure. However, a more adaptive approach to reduce impacts on coastal squeeze is proposed as well as MR at Tailness in the short term.
5.1	Maintain defences until year 20. Raise (sustain) embankments and walls from year 20.	No	A large number of industry and commercial properties to be protected.
5.2	Raise (sustain) embankments and walls.	No	Residential properties at Sittingbourne to be protected from flood risk. Very limited space available for Managed Realignment.
6.1	No Active Intervention (NAI).	Yes – Hold the Line and increase crest levels with sea level rise	Due to the very large area that would be flooded under NAI, there would be technical difficulties in identifying enough area further inland for compensation of the freshwater impacts. Furthermore, the additional water this large area would bring in to the estuary would adversely affect the estuary through increased current speeds and water levels.
6.2	Ongoing maintenance until year 20, followed by No Active Intervention.	Yes – Managed Realignment in second epoch	Change to Managed Realignment to reduce impacts on coastal squeeze and provide compensatory saltmarsh habitat. There is a large area which provides opportunity for a large Managed Realignment site. Due to risks around interaction with important infrastructure near the site, this is not planned till year 20.
7.1	Ongoing maintenance until year 30, followed by No Active Intervention (NAI).	No	Although this goes to NAI after year 30, there are a number of industries in the area which are likely to privately defend their areas. Furthermore, there modelling suggested concerns around impacts on Faversham Creek.
7.2a	Raise (sustain) embankments and walls.	No	HTL required to protect properties and residential areas in Faversham Creek.
7.2b	Maintain defences until year 20. Raise (sustain)	No	HTL required to protect properties and residential areas in Faversham Creek.

Benefit Area	Initial Strategy Option	Alternative Option Available?	Justification
	embankments and walls from year 20.		
8.2	No Active Intervention (NAI).	Yes – Hold the Line and increase crest levels with sea level rise	Due to the very large area that would be flooded under NAI, there would be technical difficulties in identifying enough area further inland for compensation of the freshwater impacts (and there would not be space on the Isle of Sheppey for this). Furthermore, the additional water this large area would bring in to the estuary would adversely affect the estuary through increased current speeds and water levels.
8.3	No Active Intervention (NAI).	Yes – Hold the Line and increase crest levels with sea level rise. Managed Realignment at Spitend	Due to the very large area that would be flooded under NAI, there would be technical difficulties in identifying enough area further inland for compensation of the freshwater impacts (and there would not be space on the Isle of Sheppey for this). Furthermore, the additional water this large area would bring in to the estuary would adversely affect the estuary through increased current speeds and water levels. A Managed Realignment site can be undertaken for just part of the frontage and Spitend has been proposed as is adjacent to existing good quality saltmarsh and has preferable topography for the Managed Realignment site.
8.4	No Active Intervention (NAI).	Yes – Managed Realignment	Change to Managed Realignment to reduce impacts on coastal squeeze and provide compensatory saltmarsh habitat. Ties into high ground so reduces need for setback embankments and has existing creeks and low topography.
8.5	No Active Intervention (NAI).	No	Much of the frontage ties back into high ground.
9.1	Maintain (with capital works) walls, groynes and beach.	No	Cliffed frontage and therefore not suitable for Managed Realignment.
9.2	Maintain (with capital works) embankments walls, groynes and beach. No Active Intervention (NAI) and localised property adaptation along Warden Cliffs.	No	Eastern part is important tourist town and beach, and the western part of the frontage is a cliffed frontage and therefore not suitable for Managed Realignment.
10.1	No Active Intervention (NAI) with localised property adaptation (potentially not GiA funded).	No	Cliffed frontage and therefore not suitable for Managed Realignment.
11.1	Maintain embankments, walls, flood gates, groynes and beach.	No	Erosional frontage and therefore not suitable for Managed Realignment.
11.2	Raise (sustain) embankments, walls, flood gates, groynes and beach.	No	Defences required to protect a large number of residential and commercial properties, industry and heritage assets.

6.3 Supporting Assessments

In ensuring that the Strategy presents the least damaging alternative, a number of initiatives and programmes have been used in the development of the Strategy, and have helped to inform the type and location of the various types of approaches for managing defences in the future. The most important of these are described below including Healthy Estuaries, Improvement Programme for England's Natura 2000 Sites and North Kent and Greater Thames Habitat Management Programmes.

6.3.1 Healthy Estuaries

The Coastal Processes Study (Appendix E) has demonstrated how the Strategy area is predicted to change over the three Epochs. It has modelled sea level rise, sediment movement and topography changes in the estuary to quantify the relative extents of habitat loss.

The effects of coastal squeeze will take hold throughout the Strategy area, although there is variability in the extents and severity of the loss of mudflat and saltmarsh. As can be seen in the modelling outputs of the Coastal Processes Study, loss of saltmarsh is predicted to be far more marked in the Medway estuary than it is in the Swale. Whilst large proportions of the saltmarshes on the south-eastern coastline of Sheppey, from Shellness to Spitend Marshes are predicted to remain in situ in the future, the saltmarshes of the Medway estuary – Stoke Saltings, Hoo Flats, Nor Marsh, Burntwick Island and Greenborough Marshes – are all predicted to contract markedly.

The Healthy Estuaries initiative addresses concerns at a number of other estuaries around the English coastline, but can be applied to this Strategy too. The Healthy Estuaries can be used as a tool in developing an approach of looking at the geomorphological health and relating this to a "favourable" condition status being developed within an estuary. It focusses on the morphological condition of estuaries and looks to apply a scientific method to relate this to the amount of intertidal habitat that can be sustained. Using this information, it aims to understand the requirements that will move the intertidal habitat and estuary features towards favourable condition within their Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) and their underpinning SSSIs in order to meet national and international obligations for biodiversity. This is currently still work in progress and the potential link between the geomorphology and the ecology within the estuary not yet understood in enough detail. However, overall it looks to allow the estuary to perform under its natural processes with as few constraints as possible.

The purpose of incorporating a Heathy Estuaries-style approach was to ensure that saltmarsh and mudflat habitats remain available within the Strategy area into the future, providing feeding, breeding and roosting habitats to the Natura 2000 qualifying features, and that their location and extents are such that the Strategy area retains is ecological functioning, both as a discrete entity and as part of the wider, regional network of estuaries in Kent, the Thames area, and East Anglia.

A key example of these measures is the MR Habitat Adaption approach for Chetney Marshes, included to provide large areas of habitat for wildfowl and waders that would otherwise be displaced and subject to habitat loss and fragmentation in the Medway estuary due to coastal squeeze (see Section 7.3.1 for further details).

The above aspects of the Strategy have been included as a result of frequent consultation with biodiversity experts from both Natural England and the Environment Agency. This has ensured that adverse effects have been balanced with maximising likely success of the creation of compensatory habitat, and that, at a Strategy-wide level, habitat creation (both in terms of MR to

compensate for coastal squeeze, and to best mitigate for ongoing and increasing pressures on Attributes and Interest Features within the SPA/Ramsar sites) takes place in the most effective locations and in the most effective way.

6.3.2 Improvement Programme for England's Natura 2000 sites (IPENS)

Parallel to the above, the guidance and recommendations in the Improvement Programme for England's Natura 2000 sites (IPENS) programme have been carefully considered. As part of this programme, Natural England have published a wealth of guidance and evidence relating to the successful management of Natura 2000 sites, including the production of a variety of Theme Plans, strategic plans that explain how it is intended to deal with priority issues which affect multiple Natura 2000 sites.

Relevant Theme Plans include the following:

- Coastal Management
- Habitat Fragmentation
- Climate Change

6.3.2.1 Coastal Management Theme Plan

This document examines the importance of adaptive coastal management to the achievement of objectives set by the EC Habitats & Birds Directive and presents an overview of Natural England's recommended approach to address challenges faced by coastal Natura 2000 sites. It acknowledges that coastal management within Natura 2000 sites is very complex and requires partnership working with other statutory bodies, key involved organisations, land owners and stakeholders.

It recommends the adoption of a holistic approach to habitat creation, looking beyond managed realignment to more innovative approaches, and embedding the need to allow for natural and managed coastal change into planning and strategic land use plans. It also identifies the benefits of adopting No Active Intervention' approaches in specific locations, together with greater emphasis on working with natural processes and adapting to climate change, creating replacement intertidal habitats, and consequently moving freshwater sites further inland.

It contains two useful case studies in the document, that have been considered during the production of this Strategy. The first was the coastline at Cley and Salthouse, Norfolk, where the long-standing means of managing the single ridge, which protected valuable freshwater habitats, was altered. Decreases in sediment volume and a series of storm events led to a review of the approach, which included a number of specific interventions to improve the recovery time of the habitat after inundation, and the creation of compensatory reedbed elsewhere.

The second case study was Medmerry, West Sussex, where a Managed Realignment scheme was constructed to provide over 180ha of intertidal habitat as compensation for losses of intertidal habitat in The Solent SAC, as identified in the SMP and its supporting studies. The realignment project provided effective compensation for coastal squeeze, addressed an existing problem of coastal management impacting on nationally designated features and also provided a more sustainable approach to flood and erosion risk management.

6.3.2.2 Habitat Fragmentation Theme Plan

This plan addresses the widespread impact on many interest features and supporting habitats of Natura 2000 sites.

It aims to address the issues of the subdivision of species' habitat into smaller patches, the isolation of habitat patches and reduction of successful species immigration and emigration, edge effects and impaired function of some ecosystem processes that affect the stability and viability of the ecosystems.

It mainly concludes that a strategic approach is needed at a national level, but recommends that fragmentation and connectivity are considered both within and between habitats.

6.3.2.3 Climate Change Theme Plan

This wide-ranging theme plan includes commentary and recommendations relating to latitudinal shifts in climatic conditions, and the ability (or otherwise) of species and habitats to adapt to these anthropogenic changes.

More pertinent to this Strategy is its consideration of subjects like the risk to wetlands from hotter and potentially drier summers, and the increased coastal erosion with sea level rise and increased storminess. As such it ties in closely with the Coastal Management Theme Plan.

The recommendations of these Theme Plans have been considered in the production of this FCERM Strategy. The adoption of their key recommendations, aimed at minimising impacts on Natura 2000 sites and where possible providing beneficial impacts, all contribute to the assertion that this Strategy is indeed in the public interest, reduce flood and erosion risk to all properties and infrastructure at significant or very significant risk in light of coastal change over the next 100 years.

6.3.3 North Kent and Greater Thames Estuary Coastal Habitat Management Plans

The North Kent Coastal Habitat Management Plan (CHaMP) was produced in 2002, to quantify habitat change and to recommend measures to prevent future losses.

It was superseded by the Greater Thames Estuary CHaMP, produced as part of the TE2100 strategy. It included the Medway estuary and the Swale, as well as the Thames Estuary and Marshes SPA and Ramsar site, the Benfleet and Southend Marshes SPA and Ramsar site, and also now includes the Foulness (Mid Essex Coast Phase 5) SPA.

These documents have been used when considering the extents of habitat to be lost to coastal squeeze, as a starting point for discussions on the amount of compensatory habitat required etc. In some cases, the results of the CHaMPS have been superseded, with modelling undertaken to inform the Strategy sometimes contradicting their content, particularly in terms of habitat to be lost cumulatively over the epochs.

7 Stage 4: IROPI and Compensation

7.1 Summary of impacts following consideration of alternatives

Through a consideration of alternatives, Managed Realignment was preferred over Hold the Line or No Active Intervention where possible (further details on this is provided in Section 6.2). This has meant that compensation can be provided for coastal squeeze impacts, and there is a reduced impact on freshwater designated habitat due to the HTL policy within BAs 6.1, 8.2 and 8.3. Table 9 provides the updated figures of Strategy impacts on freshwater habitat. Figure 9 presents an updated map showing where and when the potential impacts are expected.

Table 9: Summary of final Strategy impacts on freshwater SPA/Ramsar habitat due to increased flooding. Note that these are reduced figures compared with Table 7 due to the assessment of alternatives undertaken and the updated Strategy policies.

Strategy epoch	Projected loss of freshwater SPA/Ramsar habitat (ha)
Epoch 1 (0-20 years)	289 ha
Epoch 2 (21-50 years)	584 ha
Epoch 3 (51-100 years)	0*
Total	**873 ha**

*Although increased loss would be expected with sea level rise, the figures for Epochs 1 and 2 have been calculated using modelling which has already accounted for rise in sea level and therefore all compensation will be captured by year 50. There could be a requirement for additional Managed Realignment sites in the third epoch. If these are undertaken on sites with designated freshwater habitat, additional compensation would need to be sought as part of these schemes.

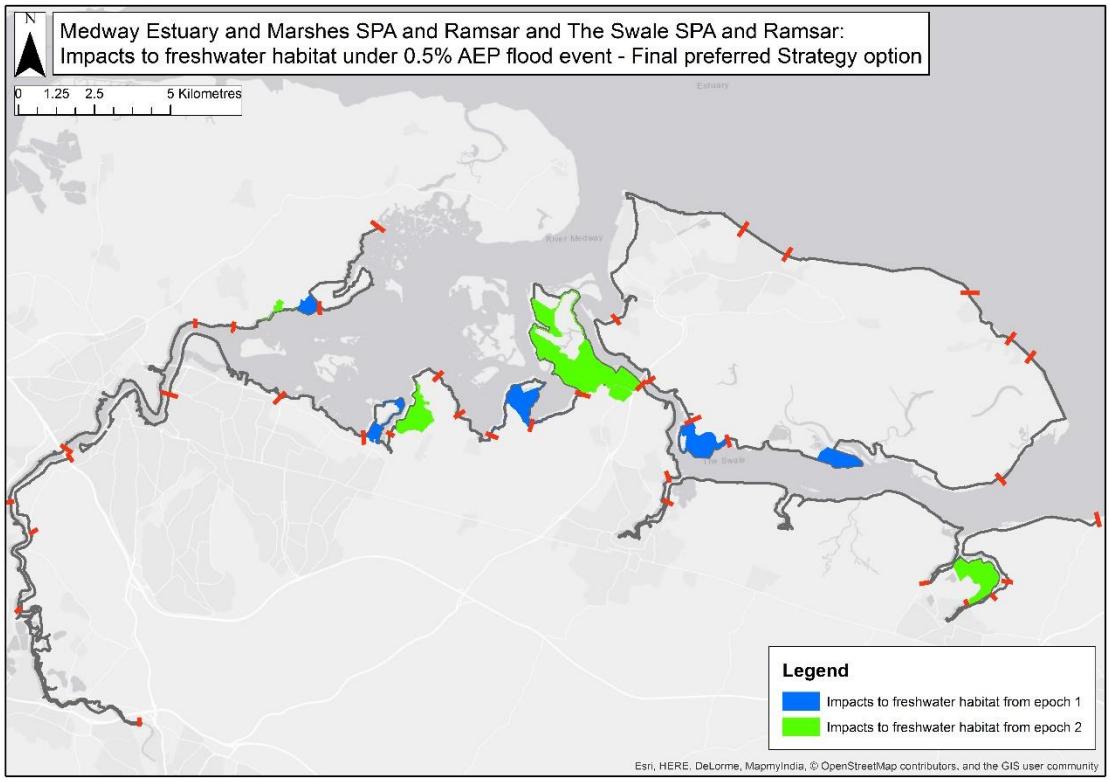
The overall impacts on coastal squeeze are presented in Table 10 and have been calculated from the Strategy wide modelling. The compensation being provided is discussed in Chapter 7.3 in more detail. Table 10 provides the figures of Strategy impacts on intertidal habitat. It should be noted that monitoring is set out in the Strategy Implementation Plan and will be undertaken by the KSL Area Team throughout the Strategy lifetime to ensure that the habitat projection figures are realistic and to identify changes required if the resulting changes seen are different.

Table 10: Summary of Strategy impacts on intertidal saltmarsh habitat due to coastal squeeze

Strategy epoch	Projected loss of intertidal saltmarsh SPA/Ramsar habitat (ha)
Epoch 1 (0-20 years)*	110.3 ha
Epoch 2 (21-50 years)	134.8 ha
Epoch 3 (51-100 years)	290 ha
Total	**535.1 ha**

*Includes historic loss since SMP of 35ha

Figure 9: An updated map showing where and when the potential impacts are expected on SPA and Ramsar freshwater habitats from the preferred Strategy option



7.2 Imperative Reasons of Overriding Public Interest (IROPI)

It has been determined that the Strategy will, in continuing to protect towns, settlements and maintaining essential infrastructure assets, result in adverse impacts to Natura 2000 Sites through coastal squeeze. In addition, active managed realignment or allowing certain lengths of coastal defence line to naturally deteriorate will, while restoring more natural processes to the estuary, adversely impact on freshwater components of the European sites. It is therefore necessary to consider the IROPI in taking the Strategy forward.

The Strategy is of overriding public interest, as it will focus defences where they will benefit and protect local populations, whilst allowing/promoting the ingress of seawater into other areas. If the Strategy were not adopted, coastal flood and erosion risk within the Medway estuary and the Swale would not be managed in a coordinated, sustainable manner, with a number of risks likely to be realised.

Major flooding events would likely be uncontrolled and uncoordinated, with adverse effects on private properties, residential areas and infrastructure (the road and rail network, water supplies and sewerage, power etc). As such, uncontrolled flooding events would likely present serious risk to human health and public safety as well as designated sites. Alongside this, the size of the Strategy area, and the population sizes and densities within it, mean that large flooding events would present notable adverse economic and social consequences.

Currently, across the Strategy area, the standard of protection offered by the defences is low, with some rural areas having only a standard of protection to a 50% AEP. Aging defences, rising sea levels and climate change mean that coastal flood and erosion risk to people, properties, habitats, and agricultural land will significantly increase in the coming years. Over the next 100 years it is predicted that 17,226 properties will be at an increased risk of tidal flooding (up to a 0.1%AEP event) within the MEASS area. A further 979 properties are at risk of erosion over the next 100 years. The Hold the Line sections within MEASS are required to protect these properties which includes total estimated economic savings of £1,324 million over 100 years. The breakdown of these benefits across different assets is provided in Table 11.

Table 11: Summary of the strategy wide present value (PV) damages should the Strategy not be implemented.

Assets assessed	Total Present Value Damages (£k)
Residential Properties	£720,000k
Commercial Properties	£501,000k
Vehicle and Health Damages	£12,000k
Emergency services	£13,000k
Agricultural Land	£17,000k
Roads and Railways	£10,000k
Recreation	£11,000k
Erosion	£41,000k
TOTAL	**£1,324,000k**

The Strategy is therefore of overriding public interest, to provide a systematic, sustainable approach to managing flood and erosion risk, and the consequent associated risk to the safety and health of the public. Its adoption will ensure that the likely economic costs associated with loss of, or damage to, assets and infrastructure are minimised as far as possible. It represents the most appropriate, least damaging, most coordinated and sustainable means of protecting the area from flood and erosion risk, whilst also acting to minimise the effects on the Designated Sites and their Qualifying Features.

Whilst adverse effects on the integrity of Natura 2000 sites are predicted, the Strategy presents the most appropriate way to manage the defences in the Strategy area in an integrated and sustainable manner, given the constraints and pressures that inevitably affect them. It addresses the ongoing and unavoidable impacts of coastal squeeze (caused by HTL policies in the estuary), and serves to best manage this, such that its ecological functioning, and the effects on Qualifying Features are minimised. It identifies, alongside the SMP, that the overall approach of Managed Realignment where possible, to reduce coastal squeeze impacts, and relocate freshwater habitat further inland, is a sustainable approach to managing the designated sites within the estuaries. As such, given the pressures in the Strategy area, it could be considered to be of primary importance to the environment.

7.3 Compensation

7.3.1 Compensation for the Loss of Intertidal Habitats due to Coastal Squeeze

The loss of saltmarsh habitat in both estuaries due to coastal squeeze is ongoing and unavoidable. One of the two main objectives of the project is to maintain the integrity of European sites, and the proposed MR sites will help to achieve this, by providing an equivalent area of compensatory intertidal habitats.

Several different pieces of work have been undertaken to assess coastal squeeze caused by HTL policies in the estuaries and update the MEASS objectives. Appendix E of this HRA presents the Coastal Processes Study which explains how Mott MacDonald has calculated coastal squeeze figures and provides a comparison between different studies.

To calculate the impacts on coastal squeeze throughout the HRA, LiDAR data and bathymetry data was used to identify potential mudflat and saltmarsh habitat according to the location within the tidal range (detailed methodology can be found in Chapter 3 of the Report in Appendix E). Google Earth images were then used to validate the baseline model.

A number of scenarios were assessed:

- sea level rise impacts only,
- an accretion scenario,
- an erosional scenario.

These are described in Sections 3.1.3, 3.1.4 and 3.1.5 of the Report (Appendix E). All scenarios assume that the coastline is fixed with defences in all places. In practice, parts of the coastline will be left to naturally roll back and therefore the coastal squeeze figures are a slight overestimate, providing landowners do not defend these sections. If landowners do defend the No Active Intervention areas within the Strategy, the figures will therefore still be representative of potential coastal squeeze.

The final figures from the HRA and Coastal Process Study that have been used to define the required intertidal compensatory habitat are provided in Table 10.

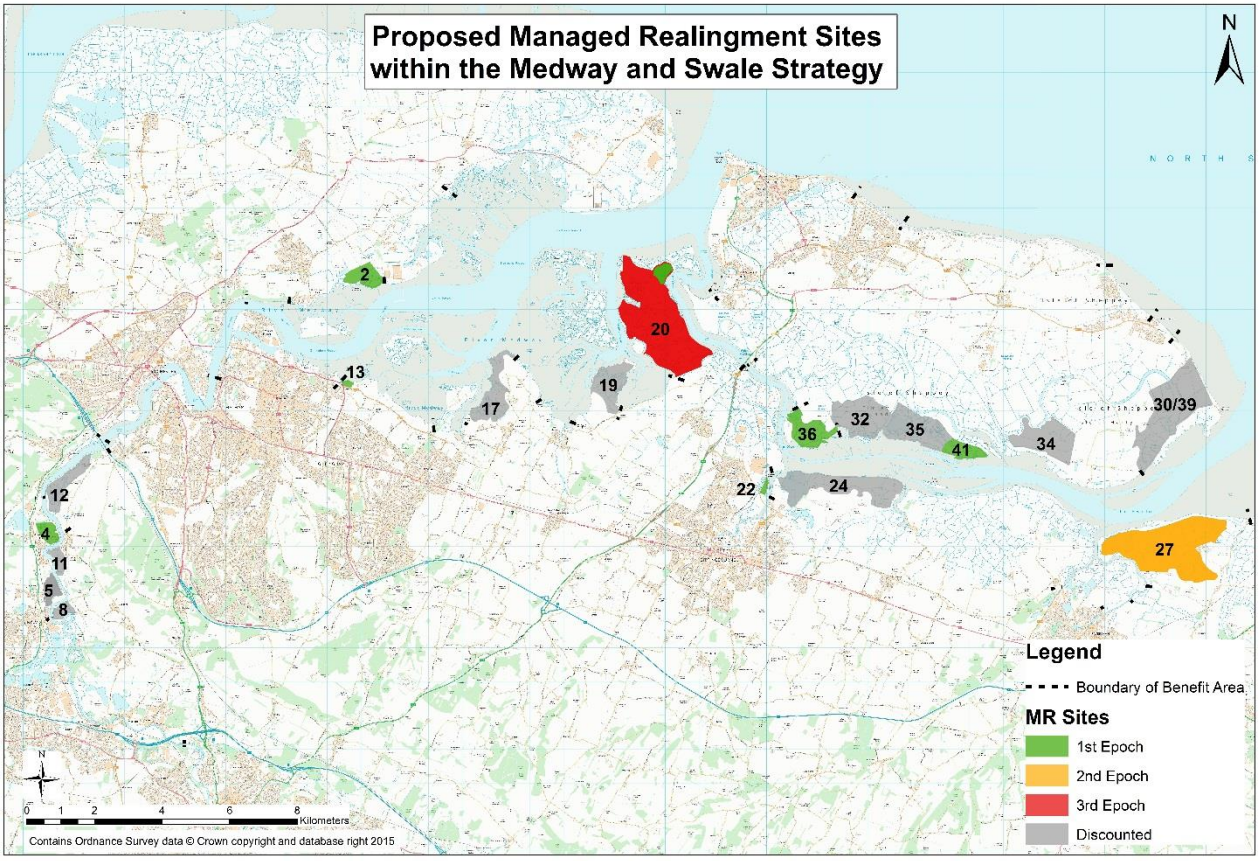
The proposed compensation of saltmarsh for the Strategy will be realised over three epochs, with the majority of the number MR sites being required for compensation within the first epoch. Table 12 and Figure 10 outline in which epoch the proposed managed realignment sites for the Strategy will be realised. Figure 11 demonstrates the fluctuations in the amount of saltmarsh habitat over the Strategy lifetime as the MR sites are achieved. A monitoring plan is set out in the Strategy Implementation Plan and will be undertaken by the KSL Area Team throughout the Strategy lifetime to understand actual changes in habitat and compare these back to the projected changes.

Table 12: The MR sites proposed to be taken forwards based on a Strategy Wide assessment

Epochs	MR Site	Area of saltmarsh habitat (ha)	Total Ha provided	Cumulative compensation (ha)
1	22 – Kemsley	4.8	115.4	115.4
	13 – Danes Hill	1.9		
	41 – Spitend	7.3		
	36 – Elmley	66.2		
	# Tailness Marsh	5.6		
	2 – Abbotts Court	29.6		
2	27 - Cleve Hill	202.7	202.7	318.1
3	20 - Chetney Marsh	175	175	493.1

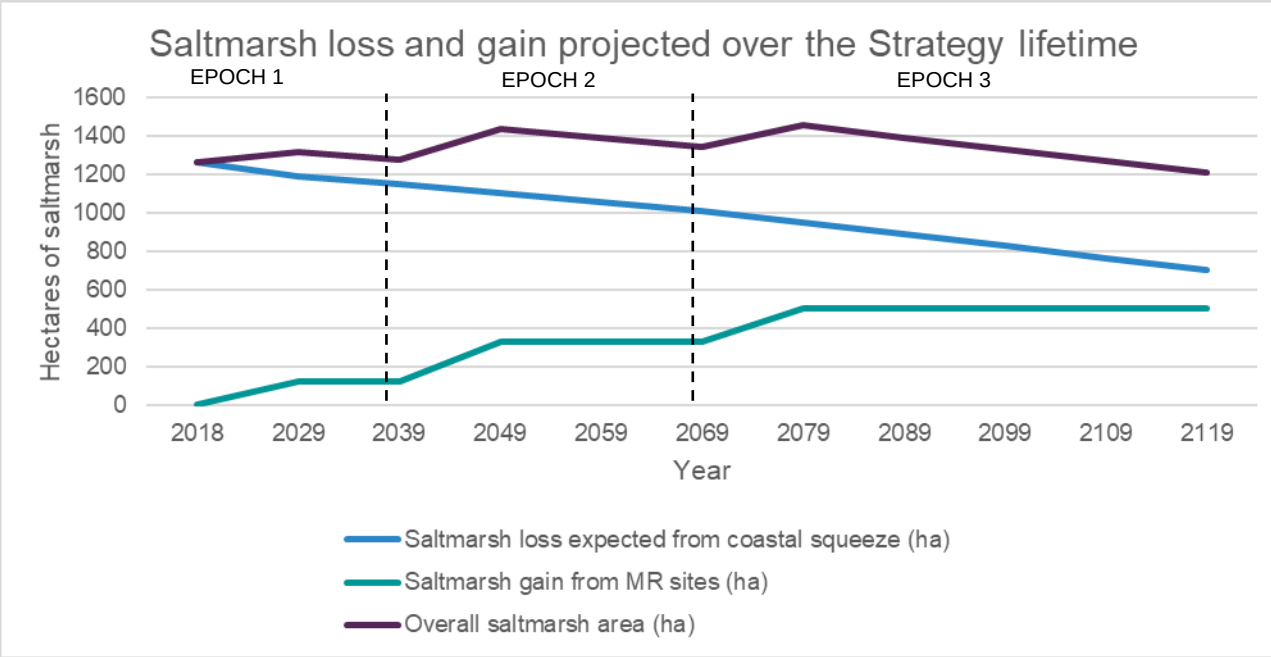
Source: Mott MacDonald, 2017

Figure 10: Map of the proposed MR sites across the Strategy area.



Source: Mott MacDonald, 2018

Figure 11: Graph showing the loss and gain of saltmarsh habitat over the Strategy lifetime



Within the first epoch of the Strategy, six Managed Realignment sites are proposed to provide compensatory habitat for SPA and Ramsar saltmarsh losses. The Strategy Implementation Plan has set out requirements for surveys within the first two years of the Strategy to determine functionality of losses, understand the impact on interest features (in particular on invertebrates)and influence the design of these Managed Realignment sites. It is to be noted that the Strategy further identifies a Managed Realignment site at Halling marshes (Site 4) which will contribute to non-designated coastal squeeze compensation as well as flood protection.

MR site 27 (Cleve Hill) has the potential to provide a large amount of the required compensation. However, the Project team are aware of a proposed solar park at Cleve Hill. There remains uncertainty about the future of the site which we have allowed for within the strategy. If the solar park does not go ahead the whole site can be used as a managed realignment site or if the solar farm is only in operation until year 40 then it could be utilised by the Strategy following decommission. Therefore, managed realignment of this site is delayed until the 2nd epoch until it is clear how the site is to be used in the long-term. If the site becomes unsuitable, Chetney Marshes adaptation policy (see paragraph below) could be accelerated with additional management/breaches to create the required intertidal habitat earlier. This would require slightly earlier compensation for impacts on freshwater habitat at Chetney, however as the plans have a conservative approach implementation of the freshwater compensation would only be bought forward by 4 years.

In the third epoch Chetney Marsh will be realised as a managed realignment site, under a Habitat Adaption approach. Modelling of this site has shown that the current topography has the potential to provide an area for saltmarsh habitat to “rollback”, which reduces an immediate adverse impacts on the freshwater designated sites. This indicates that this option may allow adaptation of the habitat rather than immediate loss of all the freshwater habitat. However, it is less certain when the saltmarsh habitat in this area will develop, so although the option will be

implemented within the first epoch, the intertidal habitat which develops will only be considered for compensatory habitat in the third epoch. Built into this option is the requirement to compensate for impacts on the freshwater habitat which is programmed for early on in the option (year 25).

7.3.1.1 Risk associated with the delivery of the intertidal compensation habitat

It should be noted that due to the uncertainties in the future implementation of the Strategy, this HRA and the Strategy has focussed on setting out the compensation requirements for the first 50 years of the Strategy. Table 12 demonstrates that currently there is a shortfall of 41.9ha of saltmarsh compensation for the third epoch. Studies and review of the potential to provide this through currently identified Managed Realignment sites, or additional ones, will be undertaken as part of the Implementation Plan in Year 10 following the initial development of Managed Realignment Sites and additional surveys. This will be the responsibility of the Kent and South London Habitat Creation Programme.

To identify appropriate Managed Realignment sites, MEASS has considered preliminary desk studies, information from landowner consultation and the Strategic Environmental Assessment. Managed Realignment sites were selected by considering key and secondary constraints.

However, it is acknowledged that there are residual risks in taking Managed Realignment sites through detailed design and to construction; due to unknown infrastructure, ground conditions, and specific site concerns. Within MEASS, if one or two of the Managed Realignment sites cannot be taken forward, there are limited alternative options for meeting our obligation to compensate for loss of saltmarsh habitat due to coastal squeeze.

The Project Team have therefore identified potential opportunities to provide compensation from outside of the Strategy area, should this risk be realised. If compensation is required from outside of the Strategy area, the Kent & South London Area Habitat Creation Programme will assess alternative sites. This has been detailed within Appendix H: Implementation Plan.

7.3.2 Compensation for loss of Freshwater Habitat due to Managed Realignment Sites and Areas of No Active Intervention

It will be necessary to compensate for the loss of designated freshwater grazing marsh and associated habitats due to Managed Realignment and NAI policies. Table 13 below shows the amount of freshwater habitat that will be required through the life of the Strategy, to compensate for that lost to Managed Realignment and NAI locations. It is to be noted that there are no areas with a HTL Maintain policy which are also located next to freshwater designated habitat, and therefore there are no impacts from increased overtopping from sea level rise in HTL areas.

Table 13: Hectares of freshwater habitat compensation required (as defined in Table 9). A total of 873ha is required over the Strategy lifetime. Please note that this total currently assumes a 1:1 compensation ratio is required. Following freshwater surveys, the required compensation for specific features and interests will be determined and the overall compensation required could be increased

Year	Policies causing freshwater impacts	Hectares of freshwater compensation required
EPOCH 1		**289**
5	MR site at BA1.3, BA8.3, and BA8.4	143
9	NAI policy at BA4.2a – estimated will become at risk by year 9 due to deterioration of defence condition.	32
11	MR site at BA1.3	37

Year	Policies causing freshwater impacts	Hectares of freshwater compensation required
20	NAI policy at BA4.5 - estimated will become at risk by year 20 due to deterioration of defence condition.	77
EPOCH 2		**584**
21	NAI policy at BA4.2b - estimated will become at risk by year 21 due to deterioration of defence condition.	88
25	BA4.7 Managed Realignment – Habitat Adaptation Policy.	385
30	NAI policy at BA7.1 - estimated will become at risk by year 30 due to deterioration of defence condition.	111

160.4 ha of compensatory freshwater habitat has already been procured to compensate for the loss of freshwater habitat at Elmley and Spitend Marshes (a total of 143ha is needed), through the Kent & South London Area Habitat Creation Programme. This is located at Great Bells Farm on the Isle of Sheppey, a location that means this new habitat will be contiguous with the extensive existing freshwater habitats already in this area. Great Bells Farm is planned to provide compensatory habitat for MR sites at BA8.3 and 8.4, and part compensation for the NAI policy at BA4.2a, subject to surveys planned over the next couple of years to see what is establishing at the site.

Compensatory habitat for the loss of freshwater grazing marsh at Abbott's Court would need to be secured in the first five years of the Strategy implementation. A total of 52 ha is required for freshwater compensation (for BA1.3 and 15ha for BA4.2a) by year 9. Provisional areas at Stoke Marshes on the Isle of Grain has been identified through discussions with Natural England, and the Kent and South London Area Team will be assessing these in more detail following the completion of the freshwater habitat surveys in 2020. Over 100ha have potential to be developed here which would habitat compensation for BAs 1.3 and 4.2a.

Longer term, freshwater habitat needs to be planned and developed to implement by year 20. This action is set out for the Kent and South London Area Team to develop a freshwater habitat plan in the first ten years of the Strategy within the Implementation Plan for the Strategy. Provisionally, potential suitable areas have already been discussed with Natural England and land within BA6.1 (the area between Sittingbourne and Conyer) is likely to be one of the first areas investigated further. There is potential for around 150 ha in this area.

Longer term, around 250 to 300 ha will potentially be identified on the Isle of Sheppey with an addition 100 ha within the Medway Marshes area and 100ha within the upper Medway Estuary.

It is acknowledged that time is required to develop freshwater designated sites and that surveys are required to identify exact compensation requirements and ratios. To provide confidence that the Strategy can be implemented the following risk mitigation measures have been built into the Strategy:

- The habitat required earlier on in the Strategy is located in an area close to Great Bells Farm compensatory site. More habitat is available at Great Bells Farm than required in the first 5 years of the Strategy in case a ratio more than 1:1 is required.
- Overall it has been assumed that more habitat may be required than a 1:1 ratio and part of the risk budget associated with the freshwater sites cost provides flexibility for this.
- Potential areas for freshwater compensation identified in the SMP have been taken forward in the Strategy and discussed further with Natural England. Natural England have identified areas that are currently being managed under agro-environmental practices. Focusing on

these areas are likely to reduce the time frame required to develop the habitat and reduce costs.

- Within the Implementation Plan, the timeframes for developing the freshwater habitats have been identified to happen as early on as possible and at a minimum 5 years prior to when they are required to allow the habitat to develop.

7.3.3 Compensation for the Impacts on Qualifying Species, not addressed by the Habitat Creation through Managed Realignment

The process followed during the formulation of the Strategy ensured an approach where impacts were firstly directed towards areas that were not likely to adversely impact the European sites. It has therefore been necessary to consider in parallel the impacts on Qualifying Feature species, to ensure that the strategy maintains the integrity of Natura 2000 sites.

This means it has been necessary to consider the Qualifying Feature species, and the impacts that would remain due to coastal squeeze. This requirement is most notable in the Medway estuary, where modelling of coastal squeeze is predicted to result in the loss of a large proportion of intertidal habitat, with adverse impacts on the wildfowl and wader species that use these habitats for feeding, roosting and breeding.

To compensate for these impacts, the areas of NAI and MR Habitat Adaptation (see 7.3.1) in this estuary have been included to provide habitat for these species, as close to the existing habitat as possible. This will reduce the impacts of habitat loss and fragmentation that would otherwise occur, and act to maintain the estuary's ecological functioning and connectivity, and hence contribute to maintaining the integrity of the European site.

7.3.4 The Approach in Assessing the value of new Saltmarsh Habitats.

This Appropriate Assessment takes a slightly different approach to the comparative assessments of habitat loss and habitat creation that was given in the preceding SMP HRA. Whilst the SMP's assessment indicated that Managed Realignment would have adverse effects on freshwater habitat, but beneficial effects for intertidal habitats, this document adopts a more precautionary approach, indicating adverse effects on freshwater habitat and a lag/delay on the beneficial effects for intertidal habitats. This has affected the implementation years for the Managed Realignment sites which are due to be established at the start of each epoch to ensure compensation in advance of the impacts.

This is based on the premise that newly created habitat takes time to establish. The time taken depends on a variety of factors, including the size of area, the condition of the existing habitat and its viability for conversion, the frequency and severity of overtopping/inundation, and the type of new habitat being considered.

Managed Realignment, with the creation of a breach in the existing defences and the regular inundation of habitat with the tidal cycle after this, would result in a swift rate of change in comparison with other, more hands-off approaches.

Inundation behind areas of NAI would be far more variable and less predictable, with far more influence due to the residual life of the defences and the standard of protection. Lower existing defences would be overtopped more frequently than higher defences, and those with a shorter residual life would function for a lesser amount of time than those with a longer residual life. The time taken for habitats to establish could potentially be decreased through preparation of the land in advance of the defence failing, creating specific landforms or altering the existing landforms where modelling indicates that this would be beneficial.

The rate of establishment of the numerous aspects of a functioning habitat are also likely to vary. Whilst plant communities may establish comparatively quickly, the diversity and size of invertebrate communities both above ground and in the substrate may lag further behind. This then may in turn affect that rate of uptake of wildfowl and waders that feed on these invertebrates. Their use of the site for breeding and roosting may also vary.

Whilst Manged Realignment is widely accepted at the most appropriate means of compensating for loss of intertidal habitat, it is acknowledged that, whilst it will potentially provide habitat for Qualifying Features and other bird species, the quality of the communities even after 100 years may not be of similar quality to established saltmarsh habitats.

With this, and the need to vary the start and rate of change from freshwater to intertidal habitat, to minimise the degree of impact on freshwater habitats throughout the Strategy area, the various approaches included in the Preferred Options provide a heterogeneity in approach to coastal management and habitat creation. This allows the known variability in the success of the various methods to be accounted for, and incorporates a range of approaches and rates of change of habitats, as brackish and/or seawater inundates freshwater habitats at different rates, over different extents associated with the condition of existing defences, and at different frequencies. This will be clarified through surveys that will be undertaken by the EA KSL Area Team as part of the Strategy implementation.

Inundation in MR sites will be sudden, associated with the creation of a breach in existing defences, and will rapidly (in comparative terms) affect areas of freshwater habitat. NAI will include variation in the time at which overtopping and inundation occur, depending on the residual life and standard of protection of the individual defences through the Strategy area, both of which vary markedly. Where residual life and standard of protection are low, then inundation will be early in the Strategy life, meaning the alteration of habitat from freshwater to estuarine would begin early. Alternatively, where the residual life and/or standard of protection are high, then inundation would likely be later in the Strategy life. This means that the loss of freshwater habitat is effectively deferred until later in the Strategy life, allowing more time for Qualifying Feature bird species to adapt to the changing conditions. This will be assessed in more detail as part of site specific HRAs for each MR site following freshwater surveys.

7.4 Summary of Stage 4: Approval or Refusal of Plan

It is considered that, by virtue of the continued assessment of environmental effects during the strategy process, and the method of assessing alternatives and identifying Managed Realignment sites where possible, that there are no feasible alternatives to the Strategy that are less damaging.

There are a number of imperative reasons of overriding public interest for the Strategy to proceed, relating to effective flood and erosion protection of assets, the preventions of risk to public health and safety, and the consideration of impacts on Natura 2000 sites. Over 17,266 properties will be better protected from coastal flooding and erosion over the next 100 years due to the implementation of the Strategy.

Compensatory measures have been considered throughout the project, currently on a 1:1 ratio basis, although this may need to be reassessed and updated following surveys which will be completed by 2020. 160.4ha of compensatory freshwater habitat for that predicted to be lost to MR sites and NAI areas during Epoch 1 has been secured through the Kent and South London Habitat Creation Programme, at Great Bells Farm on the Isle of Sheppey. This will be contiguous with existing freshwater habitat, maximising the scope for successful establishment and use by Natura 2000 Qualifying Features, and other protected (and unprotected) species.

Other sites will be developed within the first five years of the Strategy by the Kent and South London Habitat Creation Programme following completion of the freshwater surveys which are currently being planned to be carried out by the KSL Area Team over 2018 and 2019. These will be to compensate for the other 52 ha required by year 11 of the Strategy. Between years 20 and 30, a further 661ha will be required.

A number of Managed Realignment sites have been identified within Chapter 7.3 which will also be implemented by the Kent and South London Habitat Creation Programme. The majority of Managed Realignment sites are proposed to be developed for construction by 2024/2025. A review of the Strategy in 2039 by the KSL Area Team will identify the success of the initial first epoch MR sites, confirm or update the potential shortfall in compensation the Strategy is providing in the third epoch, and provide alternative compensation sites outside of the Strategy area, but still linked to the overall functionality of the designated areas.

8 Conclusions

The Strategy is predicted to have adverse effects on intertidal habitats due to coastal squeeze. Modelling predicts that 110ha of saltmarsh would be lost in Epoch 1 (including 35ha of historic loss) and a further 135ha in Epoch 2; this will be compensated for by the provision of replacement saltmarsh by the creation of Managed Realignment sites. There is a shortfall of 41.9ha of compensation for the third epoch. Studies and review of the potential to provide this through currently identified Managed Realignment sites, or additional ones, will be undertaken by the Kent and South London Habitat Creation Programme within the first 10 years of Strategy implementation. All compensation has been calculated using a 1:1 ratio.

Compensatory freshwater habitat will be required, to compensate for the loss of designated freshwater habitats and impacts on the SPA and Ramsar interest features, which are lost to Managed Realignment and behind areas of NAI. Compensatory freshwater habitat, for the loss of freshwater habitat at Elmley and Spitend Marshes due to Managed Realignment, and BA4.2a due to a NAI policy, all required in the first 10 years of the Strategy implementation, has already been secured at Great Bells Farm on the Isle of Sheppey subject to freshwater habitat surveys planned for 2018-2020. Currently this has been calculated on a 1:1 ratio basis however this may need to be reassessed subject to the outcomes of the surveys.

Further areas of compensatory freshwater habitat will need to be secured to account for the loss of existing freshwater habitat at Abbott's Court in Epoch 1 and all other sites in Epoch 2. Further assessment of the effects of these proposals will be carried out at a project level as each individual aspect comes forward. Compensatory habitat will be taken forward by the Kent and South London Habitat Creation Programme.

Overall, the future monitoring will be important for all of these areas and detailed monitoring requirements would be captured as part of the individual scheme stage Appropriate Assessments. This may influence the amount of habitat required, and also provide more detail on interest features predicted to be impacted, especially for the Ramsar sites.

Assessment of the potential impacts on not implementing the Strategy shows that this Strategy is in the public interest; it will reduce flood and erosion risk to 17,266 properties and significant infrastructure in light of coastal change over the next 100 years, whilst at the same time maintaining the integrity of Natura 2000 sites.

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Appendices

A. The Study Area

A.1 The Study Area and Benefit Areas

A.2 The Study Area and Natura 2000 Sites

A.3 Natura 2000 and Ramsar Site Citations

B. Preferred Option Drawings

C. Flood Extents Maps

D. Potential Sites of Compensatory Freshwater Habitat for Epoch 2

E. Coastal Processes Study