Strategy Appraisal Report

Authority Scheme Reference	
Defra / WAG LDW Number	**CPW00970**
Promoting Authority	SEFTON COUNCIL
Strategy Name	Crosby Marine Lake to Formby Point

Hightown Section of Strategy Frontage at Risk of Flood and Coastal Erosion – March 2009

Date	December 2010
Version	Revised Final with amendments based on NRG comments

StAR for *Crosby Marine Lake to Formby Point*

Version	Status	Signed off by:	Date signed	Date issued
1	Draft	GRL		December 2009
2	Final Draft	GRL		January 2010
3	Final	GRL	26.8.10	August 2010
4	Final with amendments based on NRG comments	GRL	20.10.10	October 2010
5	Final with amendments based on second round of comments from NRG	GRL	20.12.10	December 2010

CONTENTS

TABLES

APPENDICES

Approval History Sheet

APPROVAL HISTORY SHEET (AHS)			
1. Review (to be completed by promoting Authority)			
Strategy Title Crosby Marine Park to Formby Point Strategy Study			
Authority Project Code:		**Date of PAR:**	
Lead Authority: Sefton Council			
Consultant: Coastal Engineering UK		**Version No:**	
Position	**Name**	**Signature**	**Date**
"I have reviewed this document and confirm that this project meets our quality assurance requirements, satisfies all the required environmental obligations and meets Defra investment appraisal criteria. I confirm that all internal approvals including member approval have been completed for this project and recommend submission to the Environment Agency for approval.			
Authority Project Executive	Graham Lymbery		26.8.10
"I have reviewed this document and confirm that it complies with the current StAR guidelines for Local Authority and IDB submissions"			
PAR Reviewer			
"I confirm that I have consulted with the Head of FCRM & Business Finance and that the project is ready for submission to NRG"			
Area Flood Risk Manager			
2. NRG – National Review Group			
Date of Meeting(s):		**Chairman:**	
Recommended for approval: In the capital grant eligible sum of £:		**Date:**	**Version No:**
3. Strategy approval Officers in accordance with the NFSoD: Specified Officer			
Version No:		**Date:**	
Capital Grant sum Approval	**By:** In the sum of: £ *(if different from above)*	**Date:**	
	Name	**Signature**	**Date**
Regional Director/Director Wales			
Director of Operations	David Jordan		
Breakdown of approved costs			
4. Defra approval			
Submitted to Defra or Not Applicable (as appropriate)		Date:	
Version No. (if different):			
Defra Approval: or Not applicable (as appropriate)		Date:	
Comments:			

NON FINANCIAL SCHEME OF DELEGATION (NFSoD) COVERSHEET FOR A FCRM COMPLEX CHANGE PROJECT / STRATEGIC PLAN

1.

Project name	**Crosby Marine Park to Formby Point Strategy Study**			**Start date**	
				End date	
Business unit	Sefton Council		**Programme**		
Project ref.		**Regional SoD ref.**		**Head Office SoD ref.**	-

2.

Role	**Name**	**Post Title**
Project Sponsor	Richard MacIlwaine	
Project Executive	Graham Lymbery	**Project Leader Coastal Defence – Sefton Council**
Project Manager	Graham Lymbery	

3.

Outline Risk Assessment (ORA) Category	**Low**	☒	**Medium**	☐	**High**	☐

4.

NFSoD value	**£k**
Whole Life Costs (WLC) of Complex Change Project / Strategic Plan	£5,096

5.

Required level of Environmental Impact Assessment (EIA)	**N/A** ☐	**Low** ☐	**Medium** ☒	**High** ☐

6.

NFSoD approver name	**Post title**	**Signature**	**Date**
Toby Wilson	**Director North West**		
David Jordan	**Director of Operations**		
NFSoD consultee name	**Post title**	**Signature**	**Date**
	NRG Chair		

Part 4: WLC should be consistent with eg Tables 1.1 and 6.2.

1 Executive Summary

1.1 Introduction and Background

- This report presents Sefton Council's Strategy for managing Flood and Coastal Erosion Risk between Crosby Marine Lake and Formby Point, for the next 100 years.

- The strategy frontage comprises approximately 12km of open coast shoreline (figure 1), from the north side of Seaforth Dock at the entrance to the River Mersey to the apex of the presently eroding Formby Sand dunes. The frontage can be split into three distinct areas for coastal management purposes (figures 2-5).

- The southern part of the frontage from Seaforth to Blundellsands is a heavily modified frontage which was reinforced by the tipping of rubble to prevent erosion from the 1920s to the 1950s, supplemented by the construction of more robust artificial coastal defences from 1950 to1980. The hinterland across this section comprises primarily residential properties, although these are generally setback from the shoreline; utility infrastructure (MEPAS – Mersey Estuary Pollution Alleviation Scheme); the Crosby Marine Lake amenity and HM Coastguard Station at Blundellsands.

- The central section of frontage from Blundellsands to the River Alt at Hightown is a natural dune shoreline the southern half of which was reinforced by the tipping of rubble between 1940 and 1980, which slowed the erosion that was occurring across this section. Across the northern half the remains of the dunes prevail. The channel of the River Alt meanders along the shoreline across much of the length before being turned seaward by an artificial training bank, built in the 1930s. The hinterland across the frontage comprises largely open space land (golf course and local amenity), apart from at the northern end where a 1970s housing development is set back approximately 50-100 metres from the shoreline. MEPAS infrastructure is located immediately behind the shoreline over the southern most kilometre and there is a risk of future erosion, disrupting operation to this and also leading to flooding and disruption to the Liverpool to Southport railway

- The northern section of the frontage, from the Mouth of the River Alt at Hightown to Formby Point, comprises a natural sand dune belt which is in a state of natural flux. There are no residential or commercial properties at immediate risk of flooding or erosion across this section, although the section immediately north of the River Alt comprises the TAVRA (Territorial Army Volunteer Reserve Association) Altcar Firing Range.

- The frontage was split into three management units, within the Liverpool Bay (Sub Cell 11a) SMP1 (1999), which accord with the areas described above and which were used in Strategy development. The northern boundary of the Strategy being the boundary between the sub cell 11a and sub cell 11b SMPs. The SMP1 identified the frontage as appropriate for a Strategy, which was produced prior to the SMP2 review commencing.

- Prior to the review of the SMP, which is currently in progress, the SMP boundary at Formby Point was moved northerly to Southport Pier. The draft SMP2 divides the strategy frontage into 5 Policy Units, compared with the three management units. The two additional units comprise the tidal banks of the River Alt at Hightown.

- In the first ten years, the strategy requires £890,000 of FDGiA funding for capital maintenance works but no funding for capital works. £700,000 of non FDGiA funded capital works will be carried out during this period.

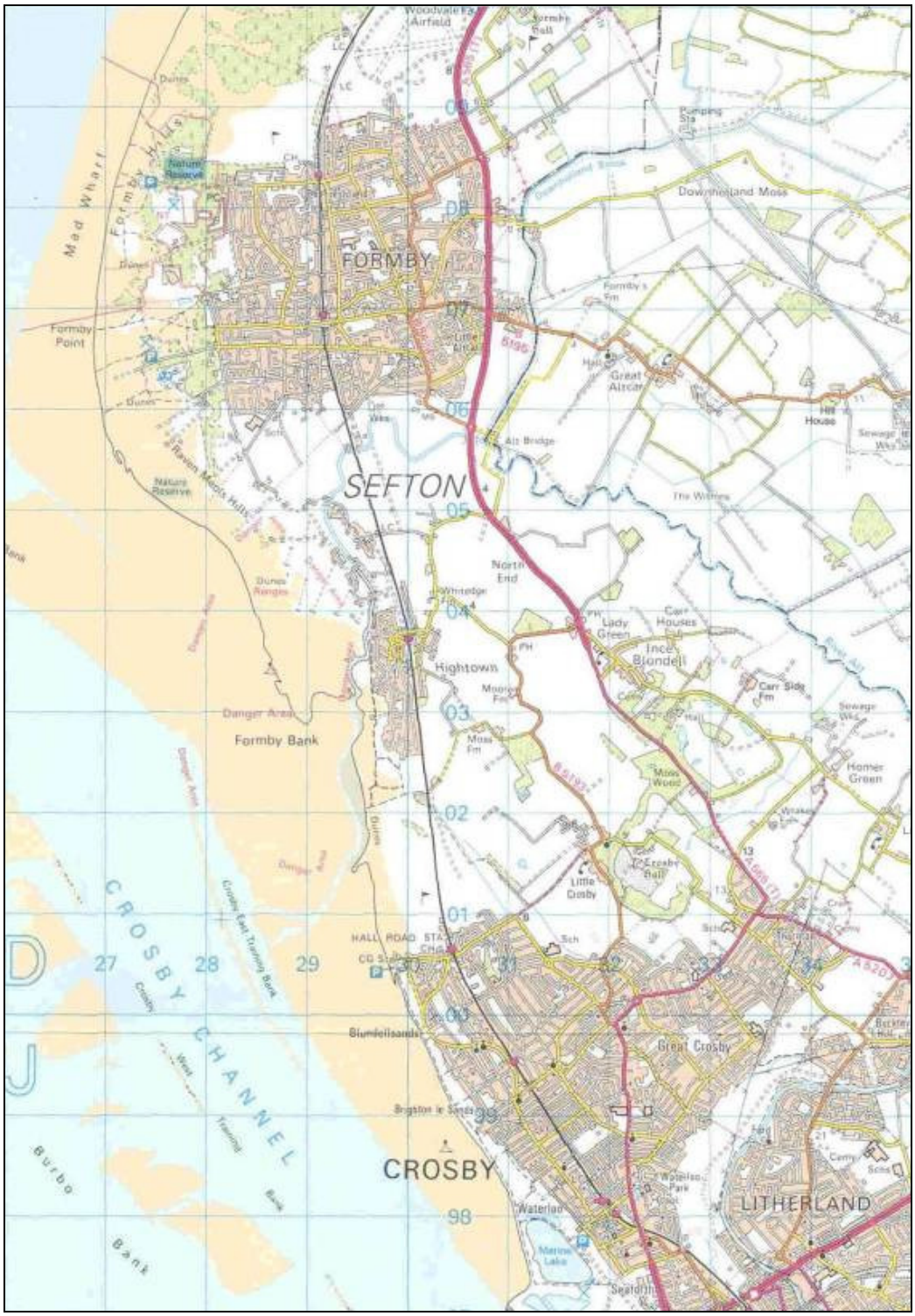

Figure 1– Strategy Frontage

Figure 2 – Strategy Management Unit SMU 8/2: Key Features Plan

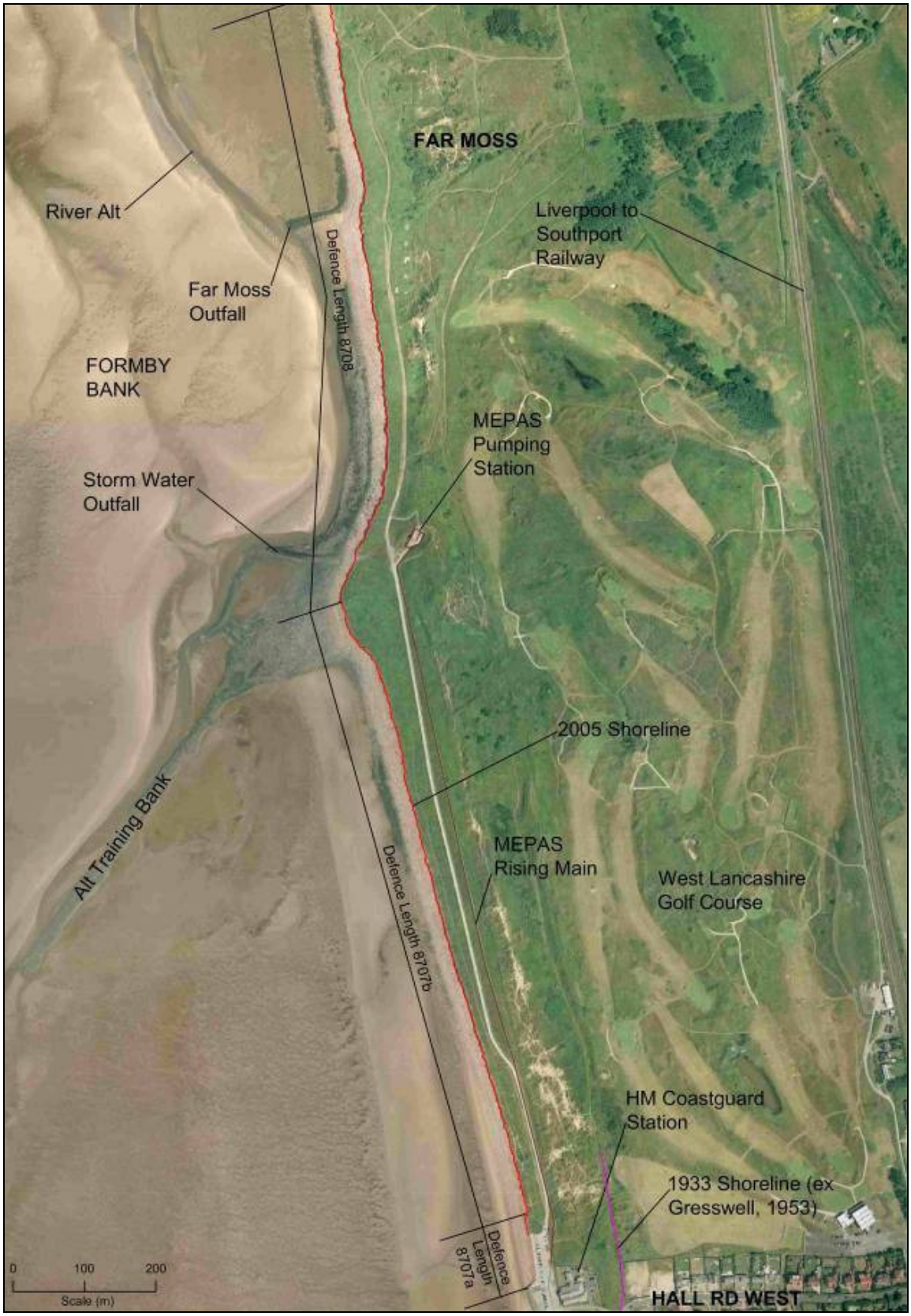

Figure 3 – Strategy Management Unit SMU 8/3/1: Key Features Plan

Figure 4 – Strategy Management Unit SMU 8/3/2: Key Features Plan

Figure 5 – Strategy Management Unit SMU 8/4: Key Features Plan

1.2 Problem

- The principal risk to the Crosby to Formby Point frontage arises from combinations of wave conditions and/or water levels and the impact the changes in the frequency and magnitude of these parameters has on the shoreline in terms of overtopping of existing defences, breaching and failure of defences or erosion of undefended sections of shoreline.

- Where there are existing coastal defences they have been assessed as having estimated residual lives, without further maintenance, of between 5 and 20 years. With appropriate maintenance this would be increased to 10-35 years.

- Where there are undefended shorelines, some sections are currently eroding whilst others are accreting.

- Without further intervention and actions to manage coastal defence across the Strategy frontage, based on available evidence, the following is predicted to occur:

- Across the southern section of the frontage there will be will be gradual deterioration in the structural fabric of the existing hard defences that will lead to failure which is estimated to spread across the whole frontage in the next twenty years. Gradual erosion of the shoreline will ensue over the remaining Strategy period.

- Across the central section of the frontage erosion of soft/reinforced shorelines will occur throughout the strategy period.

- Across the northern section the majority of the frontage will accrete advancing the shoreline, with only the northern most (2km) length continuing to erode.

- The timescale for damages, in the absence of further intervention, is as follows:

- In the short term the only damages will be the loss of open space land, including internationally designated conservation areas, and the clubhouse of the Blundellsands Sailing Club.
- In the medium term there will be further loss of amenity land, including further internationally designated conservation areas, operation of MEPAS infrastructure will be disrupted and HM Coastguard station will be lost. Approximately 20 residential properties are identified as being at risk of erosion during this epoch.
- In the longer term there will be on-going loss of amenity land, including further internationally designated conservation areas, further MEPAS infrastructure and residential properties. In addition towards the end of the Strategy period railway infrastructure and agricultural land will be disrupted by flooding and the Marine Lake at Crosby would be inundated. A further 250 residential properties are identified as being at risk of erosion during this epoch.

- The overall objectives for the Strategy are to:

- To reduce risks to people and the developed and natural environment from flooding and coastal erosion
- To protect assets of environmental importance and to adopt and mitigate the effects of climate change

- To identify an optimal approach to coastal management based on a synthesis of economic constraints, engineering and environmental issues
- To establish the preferred option for each stretch of coastline and to make decisions on the most appropriate management of the coastal defences
- To develop a phased programme of sustainable works and maintenance for the shoreline
- To develop an appropriate understanding of the environmental sensitivities and likely extent of erosion in the future
- To achieve appropriate and sustainable coastal defence given the complex processes and known risks along this stretch of the coast
- To meet the needs of the local community and wider social and economic services compatible with the environmental status of the Coast.

1.3 Options Considered

- The SMP policy options for the Crosby to Formby frontage encompass the full range of potential policies, apart from advancing the line i.e. Do-Nothing, Hold the Line, Managed Re-alignment, with different policies applying in each of the three strategy units.

- Options inappropriate for the conditions applying across the frontage e.g. offshore breakwaters, beach wide groyne fields etc, were rejected prior to detailed Strategic assessment.

- For the southern strategy unit (8/2) the policy is “Hold the Line”. The key aspects in examination of the options for this strategy unit relate to the relative merits of maintaining existing structures compared to re-building them and the level of protection they provide. In this unit options considered were:

- Maintaining the existing defences (not sustainable for 100 years, without significant damages)
- Sustaining the existing defences (maintenance in the short term to extend the residual life, followed by re-building to present standards when individual lengths became life expired).
- Improving the existing defences (Replacing the existing defences to an improved standard. Consideration was given to like for like replacement of linear defences and an alternative beach recharge option).
- For the central strategy unit (8/3), the SMP Policy is “Do Nothing with Selective Hold the Line” in the short term and “Do Nothing with Selective Managed Retreat in the medium term. The key aspects in examination of the options for this strategy unit relate to the general presumption of no intervention allied with the need to provide protection at key locations where significant numbers of properties and infrastructure are at risk. Due to the variable nature of the shoreline across this section and the disparate hinterland receptors this unit was divided into two halves for option appraisal. For the southern half of the unit (8/3/1) the options considered were:

- Maintaining the shoreline (not sustainable for 100 years, without significant damages,)
- Combined maintenance with intermittent linear defences (maintenance in the short term to extend the residual life of existing defences, followed by re-building plus the provision of new defences to protect key points, whilst the shoreline is allowed to function naturally in between).
- Sustaining the existing shoreline (as above but sustaining existing rubble defences in their current position by toping up and regular management)

- Improving existing defences by construction of a new linear defence along the entire section of frontage)

For the northern section of the unit (8/3/2) the options considered were:

- Maintaining the shoreline (not sustainable for 100 years, without significant damages)
- Managed re-alignment (allowing the shoreline to naturally retreat until flood and erosion risk to residential property was unacceptable and then build a retired line defence).
- Sustaining the existing shoreline (by fixing it on its present alignment, either by provision of linear defence along the toe of the dunes or by recharging the beach so that the dunes would not be impacted by tide and wave activity.
- Sustaining the existing shoreline (by recycling dune sand from elsewhere on the Sefton Coast and advancing the dune line to seaward and then letting it recede over time before repeating the exercise.

- For the northern strategy unit (8/4) the policy is "Do-nothing" but with non coastal defence management of the natural sand dunes undertaken. The key aspects in examination of the options for this strategy unit relate to the general presumption of working with rather than against natural processes, no intervention other than that required to manage external pressures e.g. public access, wind blown sand etc, the largely natural character of the foreshore, shoreline and hinterland and the dearth of tangible assets at risk. In this unit "Maintain" and "Hold the Line" were appropriate to put the policy in context.

- The provision of defences in all the strategy frontages will have environmental impacts but these can be managed in most cases, apart from options that consider defences along sections where currently no defences exist.

1.4 Preferred Option

- The general low level of benefits available across the strategy frontage, principally by virtue of the location of the shoreline relative to the infrastructure and property at risk, provides for a future strategy of coastal defence management that is, in the short term, based on management and maintenance of existing assets with minimum capital investment to protect key areas where infrastructure is at risk or where existing defences become life expired.

- Preferred approaches have been defined for each of the strategy lengths or sub lengths identified , with the following applying:

- For the Seaforth to Blundellsands frontage (Strategy unit 8/2) maintaining existing structures and replacing parts of those structures most in need of reinstatement, when necessary, provides an equitable approach to coastal defence at the present for minimum public investment. Such an approach provides in the short term an adequate standard of defence set against the risks applying, safeguards the environment and social fabric of the area and allows for time to reconsider (20-30 years) what actions are appropriate for the long term management of the frontage.

- For the Blundellsands to Far Moss frontage (Strategy unit 8/3/1) providing defences to protect key property (Coastguard Station) and infrastructure (MEPAS pipelines, outfalls and pumping stations) meets the objectives for the frontage and provided the capital expenditure is deferred into the future (estimated to be no later than year 20) then it meets the necessary economic criteria for investment.

- For the Far Moss to Hightown frontage (Strategy unit 8/3/2) the preferred option for public investment would be to allow the shoreline to retreat before reconstructing retired line defences in the future (year 20+). However Sefton Council has section 106 monies, deposited by the developer of the property at risk in this area, available to fund coastal defence improvements. Accordingly a scheme of dune restoration which has broad community and statutory body support and which can be implemented without the use of any public funds, has been identified as the preferred approach.

- For the Hightown to Formby Point frontage (Strategy unit 8/4) there is no justification for expenditure other than that carried out by TAVRA (Territorial Army Volunteer Reserve Association) on the west bank of the River Alt and elsewhere, for purposes other than coastal defence, by e.g. Sefton Council, TAVRA, Natural England, National Trust etc to manage the shoreline as it naturally evolves (both erosion and accretion).

- The strategy for much of the frontage will require on-going review and update as future conditions dictate but will be supported by strategic and local monitoring to determine more precisely the future intervention requirements. A summary of key criteria applying is provided in the table below:

	SMU8/2	SMU 8/3/1	SMU 8/3/2	SMU8/4	Total
Standard of Protection	NA	NA	NA	NA	
Climate Change Response	Managed	Managed	Managed	Natural	
Defence Type	Linear	Intermittent Linear	Natural	Natural	
Houses moved to lower risk category	>100	NA	125	NA	
OM Score	NA	NA	NA (non FDGiA funds)	NA	
PV Costs (£k)					
Capital (year 1-10)	0.00	0.00	894.40	0.00	894.40
Capital (year 11-100)	1007.08	587.89	620.48	0.00	2215.45
Non-capital	1654.18	115.69	216.72	0.00	1986.59
Total PV Costs (£k)	2661.26	703.58	1731.60	0.00	5096.44
PV Benefits (£k)	2938.57	734.85	1900.98	26.87	5601.27
Average Benefit/Cost Ratio	1.10	1.04	1.10	NA	

1.5 Implementation

- Funding for all capital and capital maintenance elements of the strategy will be through FDGiA, apart from the works designated to be carried out in strategy unit 8/3/2, which will be funded through Section 106 monies which have been deposited with Sefton Council, expressly and only for use in the construction and maintenance of coastal defence measures to be carried out at Hightown. These works will be carried out in the first five years.

- The following applies with regard to works to be carried out in the first ten years under the strategy:

- Frontage 8/2: Works to be carried out in accordance with agreed structure maintenance plan, to be updated and amended annually, based on details and results from on-going defence and shoreline monitoring. Capital maintenance works to life expired section required towards end of period, unless monitoring identifies that this can be deferred.
- Frontage 8/3/1: Action plan for intervention, including predicted future recession contours to be devised utilising results from actual cliff edge and structure monitoring, which will be used to update predictions and identify optimum timing for intervention (year 10+).
- Frontage 8/3/2: Relevant approvals and design of the works will be sought during the next financial year with implementation during late spring and summer of 2011. Following on from completion of the works on-going monitoring of scheme performance and dune management will be carried out with the results being utilised to inform timing of future interventions as necessary.
- Frontage 8/4: On going non coastal defence management of dune frontages (by Sefton Council, Natural England, National Trust etc) will be informed by results of Coastal Adaptation study (www.defra.gov.uk/environment/flooding/manage/pathfinder/index.htm).
- There will be a continuation of non-structural management work that is delivered via the Council's staff, this will include the use of planning policy to prevent inappropriate development, engagement with the public, provision of technical advice to Partners on the coast and the completion of a Coastal Change Adaptation Study.

1.6 Risks

- The principle risks associated with implementation of the strategy arise from the following:

- Obtaining necessary approvals under Environmental and FEPA legislation
- Availability of Revenue funding
- Earlier timing of future intervention requirements

- The strategy includes specific appropriate mitigation measures in order to reduce these risks and minimize their impact on strategy implementation, including:

- Early involvement of Statutory Conservation bodies in strategy development and implementation process
- Early screening, under Habitats Regulations, to identify risks and identify potential issues that require resolution.
- Regular defence condition assessments to be carried out to provide for prioritisation of revenue works within available budgets
- Comprehensive local and strategic monitoring and management regime in place to provide early warning of changes in coastal evolution that may impact on strategy implementation

- There are other technical, political and environmental risks, however the amount of investigation and consultation carried out suggests that these risks can be appropriately managed, through on-going liaison and consultation.

2 Introduction and Background

2.1 Purpose of this Report

- This Strategy Appraisal Report presents a programme of work to manage flood and coastal erosion risk. Its purpose of is to seek technical approval to the recommendations arising from the Crosby Marine Lake to Formby Point Strategy Study in order that the Local Authority can proceed with them and to seek financial approval of the elements of the strategy that require funding from GiA during the first ten years (in order to take it up to and include the period for the review). The appraisal outlined in this (StAR) report is founded on:

- Technical and economic evaluation described in the HR Wallingford draft Strategy
- The results of public engagement on the draft Strategy
- Subsequent refinement of the economic business case from draft PARs for Hightown Dunes and Hall Road to Far Moss.
- Environmental screening and SEA undertaken following completion of the draft Strategy
- The actions that are recommended during the first ten years of the strategy are:

<u>Revenue Maintenance (Years 1-10)</u>
- Maintenance of existing rock armour structures
- Maintenance of existing concrete sea walls and associated crest works (promenades)
- Monitoring & management of existing tipped rubble defences
- Wind Blown Sand Recycling
- Dune Management (Hightown)

<u>Capital Maintenance (Years 1-5)</u>
- No works proposed

<u>Capital Maintenance (Years 6-10)</u>
- Replacement of life expired timber breastwork defences, if required

<u>Capital Works FDGiA funded (Years 1-10)</u>
- No works proposed

<u>Capital Works Non-FDGiA funded (Years 1-5)</u>
- Hightown Dune Restoration Works.

<u>Capital Works Non-FDGiA funded (Years 5-10)</u>
- No works proposed

Non-structural Measures
- Continued engagement with the Planning Authority to control development
- Community engagement to improve understanding of coastal processees
- Development of Coastal Change Adaptation Study
- Liaison and investigation to secure, if possible, contributions to future coastal defence expenditure from parties whose interests are afforded coastal defence protection

- The appraisal provided has been carried out in accordance with the DEFRA Flood and Coastal Defence Project Appraisal Guidance (FCDPAG) and associated Environment Agency policies and procedures.

- The amount of FDGiA funding requested for capital maintenance works in the first ten years is £890,000 to replace the timber breastwork in SU 8/2, unless on-going monitoring determines that on-going maintenance is appropriate.

- The amount of FDGiA funding requested for capital works in the first ten years is zero.

2.2 Background

Strategic and Legislative Framework

- The strategy frontage is located within coastal cell 11 (HR Wallingford, 1993). The Shoreline Management Plan (SMP) for Sub cell 11a (Great Orme, Llandudno to Formby Point) was completed in 1999 and subsequently adopted by the Sefton Council in 2000.

- Review and production of the SMP2s in cell 11 commenced in April 2008 and is due for completion in 2010. Revised draft policy proposals are available from the North West And North Wales Coastal Group website (http://mycoastline.org/). These are reproduced in section 2.2.15 below.

- The strategy frontage abuts the area covered by the Alt and Crossens Catchment Management Flood Management Plan at the pumping station on the River Alt at Hightown.

- The strategy is to be implemented by Sefton Council utilising its powers under the Coast Protection Act 1949 and/or the Land Drainage Act, 1991.

- Implementation of the strategy requires approvals under all or some of the following legislation :

  - Conservation Regulations (Natural Habitats, etc.) 1994.
  - Food and Environmental Protection Act (1985)
  - Coast Protection Act 1949, Sections 5 and 34.
  - Town and Country Planning Act, 1988

Previous Studies

- The basis for the business case for investment is provided in the Crosby Marine Lake to Formby Point strategy study documents, updated by subsequent work carried out for the production of (unpublished) draft PAR reports for two specific sub sections of the strategy frontage, defined below (included in Appendix M).

  - Hightown Dunes
  - Hall Rd West to Far Moss

- The main draft Strategy Document is underpinned by a series of technical reports, a SEA and a Habitats Regulations Screening Report of the Options examined, as listed in Appendix B.

- All the documents identified have been use, where appropriate, to inform the StAR.

- Development of the Strategy and the associated assessments have been the subject of consultation exercises with relevant bodies and stakeholders, as necessary, the views and outcomes from which have guided the development of the proposals as presented in the StAR.

Social and Political Background

- Sefton Council has on deposit Section 106 agreement monies deposited with the Council by developers since the 1970s to be used to provide improved coastal defences at Hightown. This contribution came about as a result of the Council objecting to a housing development and the developer appealing the decision, the developer won the appeal but did have a condition imposed to make a contribution per house towards the cost of coastal defences The value of this fund currently stands at approximately £1,595,000 (June 2009). Whilst Sefton Council is the responsible body for spending this money its purpose is defined as to be used for coast protection at this location. Given that it is associated with houses in Hightown the Hightown Parish Council have been heavily involved in determining how the money will be expended for this purpose and the Council would expect to have their support prior to agreeing to spend the money.

- Sefton Council and its predecessors have been aware of the need to manage the coast for some years, as far back as the 1960's reports had been commissioned to consider issues such as coastal defence, environmental management and access with actions starting to be implemented in the seventies. An example of one of the actions was the purchase of a significant area of sand dunes at Formby Point in order to protect them from development pressure. This proactive approach has continued with key issues addressed both within the Council and via the Sefton Coast Partnership. Much of the legislative protection for this area is now provided through designations under the Habitats Regulations and it has not been seen as necessary to duplicate or reinforce these protection measures with designations relating purely to coastal defence.

- When discussing proposals for coast protection works at Hightown the Council has made it clear to residents and the Parish Council that like any coast protection works these would only be temporary and that the advantage of this early intervention and working with natural processes is that it retains maximum flexibility for future decisions.

Location and Designations

- The Crosby Marine Lake to Formby Point frontage is located on the east bank of the river channel of the Mersey as it emerges from the constrained dock section between Liverpool and Birkenhead/Wallasey, as shown in figure 1 (Appendix D).

- At its southerly boundary the frontage abuts the Port of Liverpool Seaforth Dock area and then runs generally parallel with the river channel for approximately 6km before the channel turns westerly and the shoreline moves curves convexly seaward into the large dune area of Formby.

- For shoreline management purposes the frontage is currently broken down into three strategy management units, defined by the present coastal and flood risk management and land use arrangements, each with significantly different social, economic and environmental characteristics:

  - Seaforth Dock to Hall Rd West, Blundellsands (SMU8/2)

- Hall Rd West, Blundellsands to River Alt, Hightown (SMU8/3)
- River Alt, Hightown to Formby Point (SMU8/4)

Key features associated with each of the strategy management units are shown on figures 2 (SMU 8/2); 3 (SMU8/3 south); 4 (SMU8/3 north) & 5 (SMU8/4). These are provided in Appendix D.

- The preferred policies for the different management units identified in the Shoreline Management Plan (1999) are as shown in the table below:

Strategy Management unit		SMP Preferred Policy	
		Short Term (0-20 years)	Anticipated Long Term (20-50 years)
8/2	Crosby Marine Lake to Hall Rd West, Blundellsands	Hold the Line	Hold the Line
8/3	Hall Rd West, Blundellsands to River Alt Pumping Station	Selective Hold the Line / Do Nothing	Selective Hold the Line / Managed Retreat
8/4	River Alt Pumping Station to Formby Point	Do Nothing	Do Nothing

- The draft SMP2, which has been out to public consultation and is currently being finalised, has presented the following revised policies for the strategy frontage:

Policy Unit		SMP Preferred Policy		
		Short Term (0-20 years)	Medium Term (20-50 years)	Long Term (50-100 years)
8.1	Seaforth to MEPAS Pumping Station	Hold the Line – Only intervene where assets are at risk. Maintain existing defences to appropriate standard. Maintain Alt training walls.	Hold the Line – Only intervene where assets are at risk. Maintain existing defences to appropriate standard. Maintain Alt training walls.	Hold the Line – Maintain existing defences to appropriate standard. Maintain Alt training walls.
8.2	MEPAS Pumping Station to Hightown	Managed Realignment - Allow natural processes to continue, limited intervention to maintain outfalls deflecting the Alt channel away from the shore.	Managed Realignment – Allow natural processes to continue, limited intervention to maintain outfalls deflecting the Alt channel away from the shore.	Managed Realignment – Only construct set back defences when assets within Hightown and / or railway justify. Allows natural processes to continue, outfalls deflecting the Alt channel away from the shore should be maintained.

Policy Unit		SMP Preferred Policy		
		Short Term (0-20 years)	Medium Term (20-50 years)	Long Term (50-100 years)
8.3	Hightown to mouth of the River Alt (east bank)	Hold the Line – Through limited intervention and dune management. Maintain Alt training walls. Additional training walls may be required to deflect the Alt channel in the future.	Hold the Line – Through limited intervention and dune management. Maintain Alt training walls. Additional training walls may be required to deflect the Alt channel in the future.	Hold the Line – Through limited intervention and dune management. Maintain Alt training walls. Additional training walls may be required to deflect the Alt channel in the future.
8.4	River Alt mouth (east and west banks) to the Alt pumping station	Hold the Line – Maintain channel training defences.	Hold the Line – Maintain channel training defences.	Hold the Line – Maintain channel training defences.
9.1	Mouth of the River Alt (west bank) to Weld Road, Southport (Formby dune system)	Managed Realignment – Allow the dune system to evolve naturally with limited intervention to manage dunes, and manage adaptation in the erosion risk zone (such as relocating paths and car parks), subject to consents.	Managed Realignment – Allow the dune system to evolve naturally with limited intervention to manage dunes, and manage adaptation in the erosion risk zone (such as relocating paths and car parks), subject to consents.	Managed Realignment – Allow the dune system to evolve naturally with limited intervention to manage dunes, and manage adaptation in the erosion risk zone (such as relocating paths and car parks), subject to consents.

- A comparison of the different management and policy unit boundaries and the policies for different sections of shoreline in SMP1 & SMP2 is shown below

<table>
<tr><th colspan="2" rowspan="2">Management Unit (SMP1)</th><th colspan="2" rowspan="2">Policy Unit (SMP2)</th><th colspan="2">0-20 YEARS</th><th colspan="2">20-50 YEARS</th><th>50-100 YEARS</th></tr>
<tr><th>SMP1</th><th>SMP2</th><th>SMP1</th><th>SMP2</th><th>SMP2</th></tr>
<tr><td>8/2</td><td>Crosby Marine Lake to Hall Rd West, Blundellsands</td><td>8.1</td><td>Seaforth to MEPAS Pumping Station</td><td>HTL</td><td>HTL</td><td>HTL</td><td>HTL</td><td>HTL</td></tr>
<tr><td rowspan="3">8/3</td><td rowspan="3">Hall Rd West, Blundellsands to River Alt Pumping Station</td><td>8.2</td><td>MEPAS Pumping Station to Hightown</td><td rowspan="3">HTL / DN</td><td>MR</td><td rowspan="3">HTL /MR</td><td>MR</td><td>MR</td></tr>
<tr><td>8.3</td><td>Hightown to mouth of the River Alt (east bank)</td><td>HTL</td><td>HTL</td><td>HTL</td><td>HTL</td></tr>
<tr><td>8.4</td><td>River Alt mouth (east and west banks) to the Alt pumping station</td><td>HTL</td><td>HTL</td><td>HTL</td></tr>
<tr><td rowspan="2">8/4</td><td rowspan="2">River Alt Pumping Station to Formby Point</td><td rowspan="2">9.1</td><td rowspan="2">Mouth of the River Alt (west bank) to Weld Road, Southport (Formby dune system)</td><td>DN</td><td rowspan="2">MR</td><td>DN</td><td rowspan="2">MR</td><td rowspan="2">MR</td></tr>
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</table>

- For the purposes of presentation and consistency within the supporting work carried out references in the StAR relate to the nomenclature adopted in the original SMP.

- The SMU 8/2 frontage from Seaforth Dock to Hall Rd West, Blundellsands is approximately 3km in length and characterised by formal hard coastal defences along its entire length, with significant open space and amenity land located immediately behind the defences, including a local leisure centre and artificial lake. Densely populated areas of commercial and residential development are located further to landward. United Utilities Mersey Estuary Pollution Alleviation Scheme (MEPAS) infrastructure (pipework and pumping stations) are located immediately behind the defences, with two major outfalls crossing the foreshore towards the southern end. Antony Gormley's "Another Place" statues are randomly located across the foreshore in this area. Photos 1-4 (Appendix C) illustrate the nature and characteristics of the shoreline and immediate hinterland across this strategy management unit.

- The SMU 8/3 frontage is a 3km long section of largely undeveloped and undefended natural dune frontage. Across the southern part of the frontage the shoreline was artificially reinforced from the 1940's to the 1970's by the tipping of rubble debris some of which was material arising from demolition of local buildings bombed during World War 2. The northern half of this section of frontage is a natural dune belt (80-300 metres wide) with only a short section of artificial defences (<100 metres) located at the Blundellsands Sailing Club (BSC).

- In the centre of the frontage a rubble training bank was constructed across the foreshore in the mid 1930s in an attempt to control the location of the River Alt channel, which meanders southwards along the shoreline from Hightown for about 2km before being turned south westerly to discharge into the Crosby channel.

- The hinterland immediately behind the shoreline is generally public open space. The Maritime and Coastguard Agency's Liverpool operations building is situated behind the defences at the southern end, whilst the MEPAS infrastructure continues northwards to a pumping station located at the root of the training bank. A number of short storm water and overflow outfalls are located across the frontage. At the southern end the area behind the public open space comprises the links of the West Lancashire Golf Club. At the northern end of the unit a large housing estate was constructed at Hightown in the 1970s (ref 2.2.10 above). Photos 4-7 (Appendix C) illustrate the nature and characteristics of the shoreline and immediate hinterland across this strategy management unit.

- The frontage north of the River Alt at Hightown (SMU 8/4) comprises the natural Formby and Ainsdale Dune belt (500-1500 metres wide) which continues for about 14km to Southport. The TAVRA firing range is located immediately behind the dunes over the first 2km of frontage. Further north there are only intermittent developments (caravan parks, car parks etc) located landward of the present dune line. Photos 8-10 (Appendix C) illustrate the nature and characteristics of the shoreline and immediate hinterland across this strategy management unit.

- The frontage is located within the boundaries of the following internationally and nationally designated sites of conservation interest:

  - Ribble and Alt Estuaries Special Protection Area (SPA)
  - Sefton Coast Special Area of Conservation (SAC)

- Altcar Sand Dunes and Foreshore RAMSAR site and
- Altcar Sand Dunes and Foreshore Site of Special Scientific Interest (SSSI).

In addition the dunes and meadows at Hightown (MU8/3) are a Site of Local Biological Interest (SLBI).

History of Coastal Erosion

- The strategy frontage has largely been subject to erosive tendencies since the start of the 20th century, although there are specific areas within the frontage where accretion has generally prevailed.

- Shoreline changes across the strategy frontage have been particularly influenced by the following, the effects of which are continuing to the present day.

- Reversal at the start of the 20th century, of the previous trend of accretion of Formby Point, which is on-going.
- The channel of the River Alt which discharges onto the foreshore at Hightown and meanders southerly across the strategy frontage
- Construction of a training bank to divert the course of the river in the 1930s
- Reinforcement of the natural shoreline with rubble and industrial waste, to combat erosion between Blundellsands and Hightown from the 1930s to 1970s
- Construction of artificial coastal defences between Seaforth and Blundellsands from the 1950s to the 1970s
- Construction of the Seaforth Dock in the late 1960s/early 1970s.
- A detailed resume of the behavior is provided in Appendix E.

2.3 Current Approach to Flood & Erosion Risk Management

Measures to Manage Coastal Erosion

- Generally coastal erosion risk is currently managed through a regular monitoring and defence inspection regime that identifies changes and trends in beach behaviour, and changes in the location of the dune/beach interface that will influence exposure conditions and inform of the need, generally in advance, to carry out remedial works to defences. Specific management measures include:

  - Control of access and provision of fencing and planting to control erosion along dune frontages
  - Erection of appropriate signage and cordoning to warn pedestrians of risks e.g. steep drops at defence/beach interfaces

- In addition to the coastal erosion risk there is a residual flood risk applying, particularly between Crosby and Blundellsands (SMU 8/2) associated with overtopping of defences during extreme events which primarily has public safety implications for pedestrians and vehicles that use the car park facilities at Hall Rd West. Under more extreme event scenarios and in the future there is the potential for overtopping waters to spread inland. Elsewhere there is a similar but lower risk to the general public that uses the open space for recreation across the rubble defence frontage between Blundellsands and Hightown. Specific management measures include:

  - Use of Flood Warning Systems to close car park and promenade areas where necessary.
  - Erection of appropriate signage to warn pedestrians of risks from overtopping waters

- Whilst the Council have the option under PPS25 to designate coastal erosion zones this is not seen as necessary at this time as all the areas that would be included under such a designation would be within the areas designated under the Habitats Regulations which already provide a suitable level of protection.

- The Council continues to engage with the public to raise awareness and understanding of issues at the coast so that they are better able to participate in discussions about how we manage the coast and the Council also supports other partners on the coast when they engage with the public about issues on their sites.

- The Council provides technical advice to partners on the coast to inform their management actions and is currently completing a Coastal Change Adaptation Study that will more formally consider the impacts arising from coastal change and how both the Council and Partners adapt to these impacts.

3 Problem Definition and Objectives

3.1 Outline of the Problem

- The principal risk to the Crosby to Formby Point frontage arises from combinations of wave conditions and/or water levels and the impact of changes in the frequency and magnitude of these parameters on:

  - Movement of sediments across and along the foreshore and areas of erosion or deposition across the frontage
  - Erosion or accretion of "soft" dune frontages
  - Erosion of "soft" cliff frontages
  - The residual life of existing hard defences and their ability to provide continued coastal defence.

- With regard to the first of these impacts, the majority of wave and water level conditions modify the beach form, with the more extreme the conditions the greater the change that occurs.

- Erosion of soft frontages and/or damage to defences only occurs as a result of extreme conditions applying i.e. episodic events, when conditions are in excess of the normal loadings which do not induce change. The location of the shoreline does not setback unless specific storm conditions (magnitude and direction) occur during any given period. Conversely however soft dune frontages can accrete during "calm" periods when eroded material that has remained on the beach following erosion, is re-worked back into the dunes.

- The source of the risk is therefore the environmental conditions applying, the pathway is the form and profile of the foreshore and (natural or artificial) defence line. The receptor is the foreshore, hinterland and associated assets located therein that are affected by changes in the source and pathway parameters. These vary significantly across the frontage.

- The principal receptors affected by changes in the sources and pathways are as follows:

Strategy Management Unit 8/2

- Open Space Amenity Land
- Public Highway
- Residential Development
- MEPAS (sewerage) Infrastructure
- Internationally & Nationally Designated Marine Environmental Sites

Strategy Management Unit 8/3

- Open Space Amenity Land
- Residential Development
- MEPAS (Sewerage) Infrastructure
- Internationally, Nationally & Locally Designated Marine & Terrestrial Environmental Sites

- Golf Course Land
- Agricultural Land
- Railway Infrastructure and Assets

Strategy Management Unit 8/4

- Open Space Amenity Land
- Internationally & Nationally Designated Marine & Terrestrial Environmental Sites

- Monitoring of the location of the dune toe (SMU8/4 and SMU8/3 - North) indicates that all sections behave cyclically whether they are overall trending towards erosion or accretion. Correlation of this behaviour with recorded wave and water level records and beach profile data suggests that the dunes are only vulnerable to erosion when total water levels, i.e. tide + wave run up, exceeds typically 5.0m AOD.

- The rubble cliff frontages (SMU8/3 – South) erode due to the action of wave and tides with total water levels, i.e. tide + wave run up, exceeding typically 6.0m AOD.

- The residual life of sections of hard defences, based on on-going annual inspection and monitoring of the individual defence elements, are estimated as follows:

Management unit	Residual Life Expectancy (years)			
	Without Maintenance		With Maintenance	
	Min	Max	Min	Max
8/2 (5 Defence lengths)	5	20	10	30
8/3 (2 Defence Lengths)	1	5	5	20
8/4 (1 Defence lengths)	10	10	35	35

- Future rates of erosion are likely to be in excess of those recorded historically, primarily as a result of changes in wave conditions, sea levels and surges. Notwithstanding that there is still significant uncertainty over the effects of global warming on the future frequency and magnitude of wave conditions, increasing water levels allow for the propagation of higher waves to the shoreline giving rise to increased and therefore more frequent “total” water levels exceeding the values identified in 3.1.6 & 3.1.7 impacting the “soft” shorelines and greater wave energy events impacting the sections of hard defences increasing the likelihood of defence failure, if structures are not properly maintained.

3.2 Consequences of Doing Nothing

- Utilising the results of the beach monitoring, residual life expectancies and sea level rise assessments, predictions of the position of the shoreline over the next 100 years, without further intervention have been made. To enable the accuracy of the predicted shoreline change to be determined, confidence levels were applied to the 10, 50 and 100-year modelled ‘do-nothing’ scenarios. The original areas of change (see figures 6, 7 & 8, Appendix D) were taken as the 50% confidence limit, and these adapted to show 5 and 95% confidence limits.

Management Unit 8/2

- Generally under the Do-Nothing scenario there will be gradual deterioration in the structural fabric of the existing hard defences that will lead to failure which is estimated to spread across the whole frontage in the next twenty years. There are two potential failure mechanisms for the seawall: increasing deterioration and rapid loss of structural integrity and failure by overturning or undermining.

- At the southern end of this unit the bulk of the consequences occur later on in the appraisal period with loss of the Mariner's Road Storm Water Outfall in year 75. Land losses would occur in the extreme south of this section including sections of the access track and open space land. In year 90 the sluice across the Marine Lake would fail, causing the lake to be lost at this point in time.

- In the central part of the unit between Mariner's Road and The Serpentine, significant erosion consequences would begin in the middle of the strategy period and would include open land and promenade, including the MEPAS sewerage apparatus behind. Towards the end of the strategy period, sections of through-road would also be damaged. Properties would begin to be affected in year 70, with such losses continuing to the end of the 100 year horizon. An electricity sub-station would also be lost at the end of the strategy period.

- At the northern end of this unit the existing defences, which were damaged in 1990 and more recently in 2007 (photo 11, Appendix C), represent the weakest location within the unit with an estimated residual life, with no intervention, of < 5 years. Failure here will most likely be caused by wave impact, wash out of fill material and/or overturning.

- Erosion consequences across this section are similar to those identified across the central section. Land losses include the promenade, open land and larger sections of through-roads. Sewerage also runs under the promenade in this area and would be lost at the same time. Hall Road West car park would also be eroded. Properties would begin to be affected in year 65, again with losses continuing through to the end of the strategy period. Fountain Court and Holyrood electricity sub-stations would be lost at the end of the study period.

- At the extreme northern end the Maritime & Coastguard Agency Station (located at the boundary of SMU 8/2 & SMU 8/3) would be lost in year 40 with other properties located further landward lost later in the strategy period. Land losses at the boundary are primarily dune and scrubland, the southern fringe of the golf course, areas of car park and through-roads. In addition further sections of MEPAS infrastructure that continues northwards into the adjacent management unit would be lost.

- Do-Nothing would result in realignment of the coast. Sediment accretion at Seaforth Docks and Crosby Marine Lake poses a nuisance as wind blown sand which will affect coastal amenity, recreation and leisure in this area. The deterioration of existing defence structures over time resulting in structural failure, will release materials such as rocks, concrete and steel into the intertidal zone and pollution of the foreshore. In the absence of mitigation this would have a long term adverse effect to the integrity of the international and national conservation status along this section of the coast. Bird roosting and feeding activities within the intertidal zone would be adversely affected. However, this impact is unlikely to be significant due to a buffer zone which extends between the foreshore and the defences which is not used by birds. Furthermore Coastal amenity and, to some extent, heritage would also be adversely affected when

the integrity of the Crosby Marine Lake (including the car park) was eventually compromised.

- The MEPAS infrastructure diverts a significant amount of sewerage to a waste treatment facility and damage to this infrastructure would potentially lead to pollution of coastal land (soil) and water resulting in long term adverse impacts to biodiversity, coastal amenity, leisure and recreation. Although there is some degree of accretion, this would result in erosion of contaminated fill material behind the existing defence at Blundellsands consequently mobilising contaminants. This has the potential to result in land and water pollution which would adversely affect coastal amenity, aesthetics and the conservation integrity of the coast.

- In addition to the consequences arising from erosion of the shoreline the change in shoreline produces an increase in the risk of flooding. Under present day conditions the impacts of a 50% annual probability flood event (1 in 2 year return period) are insignificant, not extending as far as properties in the town. The +50 year probability map shows a marked increase in the likelihood of this happening and the predicted extent is wider - as expected with increased overtopping volumes, deteriorating defence conditions and shoreline setback. The +100 year probability map shows further increases in event frequency with the 1-10% annual probability events will cause flooding to significantly larger areas than the earlier scenarios. These changes are illustrated in figures 9, 10 & 11 (Appendix D).

Management Unit 8/3

- Erosion is predicted across the whole of this unit over the strategy timescale.

- Across the southern part of the unit, between Hall Rd West and Far Moss, periodic erosion of the rubble bank will continue and on-going recession will take place. This will ultimately threaten property and infrastructure, as identified in section 3.2.14 below. Erosion is caused by severe storm events and/or high water or surge tide levels, which remove material from the base of the vertical cliff, resulting in undercutting and collapse of the unsupported material above.

- Without remedial attention to the Alt training bank, the channels (see photo 12, Appendix C) will increase in size providing the potential for the channel to punch its way through and meander across the lower beach to the south. The promontory at the root, of the training bank, although retreating, will continue to control the location of the channel immediately adjacent to the shoreline and it will not break through here until such time that all the rubble has been eroded and the original dune deposits are exposed. With the deposits up to 100 metres wide such behaviour is not likely to occur in the next 100 years. As a consequence migration of the river channel is only considered likely to impact on the lower beach areas of the frontage.

- Damage and failure of the terminal defences at Hall Rd West (Defence length 8707a) would open up the shoreline behind to erosion with setback eventually leading to outflanking of the main Blundellsands defences and loss of the Coastguard station (estimated year 40-50). On-going erosion of the tipped rubble between the Coastguard station and the Alt training bank will eventually expose the MEPAS rising main which will be severed and undermine the pumping station which will be lost (year 53). Erosion of the shoreline north of the training bank will lead to loss of open space but will not cause any damage to property and infrastructure until such time that the rubble fill has been eroded exposing the dune behind. Continued erosion of the dune would eventually lead to a breach which, due to the lower lying land behind, would allow the passage of tidal and flood waters and which would cause intermittent flooding to the

northern part of the West Lancashire golf course, the surrounding agricultural land and would cause intermittent disruption to operation of the Liverpool to Southport railway (year 83).

- Do-Nothing would lead to the deterioration of defences at the southern end resulting in erosion of land adjacent to West Lancashire Golf Course and damage to adjacent sand dunes and scrubland. This would potentially have adverse impacts to coastal amenity, access, leisure and biodiversity. The MEPAS infrastructure diverts a significant amount of sewage to a waste treatment facility and damage to this infrastructure may have significant consequences on coastal land (soil) and water quality in the Estuary. Other infrastructure damage to storm water overflow and a combined discharge could also have consequences for coastal land (soil) and water quality.

- Do-Nothing at the Hightown end of the frontage would result in on-going erosion of dune frontages with land losses split between dunes, salt marshes and scrubland, affecting roads and rights of way, thus potentially adversely affecting coastal amenity and access. This would have a negative effect on conservation through on-going loss of the SAC with a consequent threat to sand lizard and Natterjack toad habitats. The existing heritage interests on the foreshore (submerged forest) would be subject to similar pressures as currently occurring with alternate covering and un-covering taking place.

- At the northern end of this unit periodic erosion and slumping of the dunes would be caused by severe storm events and/or high water or surge tide levels, leading to possible deterioration in protection performance, erosion, and retreat of the dunes. Due to their generally poor condition, the only artificial defences at the Blundellsands Sailing Club would be expected to fail in the short term, followed by onset of steady erosion of the landmass behind with loss of access to the river as the landing stage becomes detached and loss of the sailing club property (estimated at year 20). Erosion is only estimated to threaten the residential properties of Hightown in the long term (after year 50).

Management Unit 8/4

- Under a Do - nothing scenario the majority of the shoreline in this section is predicted to advance with only the northern most (2km) length continuing to erode.

- The river defences on the west bank of the River Alt would suffer increasing visual deterioration and loss of structural integrity from year 10 onwards. This would lead to increasing risk of failure by overturning or undermining, with the probability significantly increasing after 10 -15 years. However, other than the impact on its river training function, there would be no significant impacts in respect of coastal erosion losses or flooding.

- Accretion across the majority of the length would incur no economic loss in the Do Nothing case. The northern half is an area of dunes and scrubland which would continue to erode throughout the study period but with no economic losses other than land. It is appropriate to note here that erosion of the dunes is anticipated to continue to the north side of Formby Point, beyond the strategy limits, and that the SMP policy for this section (SMP 11b, MU 8/3) is the same as for the section considered within the strategy.

- Do-Nothing would have a negative effect on conservation through continued loss of the sand dune habitat (SAC). The ecological losses, though naturally induced, are

potentially significant resulting in adverse effects on biodiversity through continued loss of habitat and species underpinning the conservation designations at Formby Point including Ramsar, SPA, SAC and Formby Point Local Nature Reserve. Do-Nothing is also likely to result in loss to heritage and archaeological interest along this section of the coast due to erosion.

3.3 Objectives

- The key objective for the Crosby Marine Lake to Formby Point Coastal Defence Strategy Study, in common with similar strategies prepared for other parts of England and Wales, was to develop and implement sustainable coastal defences in line with the Government's Flood and Coastal Defence Policy Aim (MAFF 1993), defined as:

"To reduce risks to people and the developed and natural environment from flooding and coastal erosion by the provision of technically, environmentally and economically sound and sustainable defence measures"

- with the primary Policy focus on: *"the protection of life and hence of urban factors."*

- The specific aims and objectives of the Crosby Marine Lake to Formby Point Strategy Study identified at the outset are detailed below:

  - To protect assets of environmental importance and to adopt and mitigate the effects of climate change
  - To develop a scheme strategy plan in accordance with DEFRA guidelines, reconciling with the coastal policies established through the SMP and taking due account of all existing information
  - To establish the preferred option for each stretch of coastline and to make decisions on the most appropriate management of the coastal defences
  - To develop a phased programme of sustainable works and maintenance for the shoreline
  - To develop an appropriate understanding of the environmental sensitivities and likely extent of erosion in the future
  - To enhance the environment where possible and to propose effective mitigation measures against environmental degradation where necessary
  - To achieve appropriate and sustainable coastal defence given the complex processes and known risks along this stretch of the coast
  - To prepare a list of alternative design concepts for the future management of the coastal defences within the study area; ranging from 'do nothing' through 'do minimum' to management approaches and more capital intensive scheme options
  - To identify an optimal approach to coastal management based on a synthesis of economic constraints, engineering and environmental issues
  - To meet the needs of the local community and wider social and economic services compatible with the environmental status of the Coast.

- These objectives were developed from the specific objectives identified in the Shoreline Management Plan.

- At the outset of Strategy production key stakeholders, identified from the long list of consultees prepared for the production of the Shoreline Management Plan, were contacted in order to focus development of the strategy on the specific issues relevant to the strategy frontage. The key stakeholder consultees are identified in Appendix O.

  - Blundellsands Sailing Club

- English Nature (now Natural England)
- Hightown Parish Council
- Environment Agency
- Merseyside Archaeological Service, NMGM
- Merseyside Environmental Advisory Service
- Ministry of Defence
- Sefton Council, Planning Department
- Sefton Council, Leisure Services Department
- United Utilities

- Formal consultation on the draft strategy was carried out with the above bodies.

3.4 Strategic Issues

- The Cell 11a (Liverpool Bay) Shoreline Management Plan (1999) identified a number of frontage lengths across the plan frontage, in accordance with the then MAFF interim guidance on the development of strategies, which met the criteria appropriate for strategy development in order to develop plan policies into appropriate action plans for future coastal defence management. The Crosby Marine Lake to Formby frontage was one of the lengths.

- The key criteria that confirmed that a strategy would be appropriate for the frontage were:

  - The impacts of shoreline response in one area, impacting process behaviour across the whole area e.g. erosion of Formby Point providing drift material to the beaches at Crosby.
  - The extensive international and national designation of the foreshore for conservation interest which extended across the whole strategy frontage.
  - The tendency of the shoreline to erosion across significant lengths and, despite clear land use boundaries e.g. at Hall Rd West, Blundellsands, the interconnection of benefit areas resulting from that erosion.
  - The relatively low level of benefits applying in the short term but with significantly increasing risk of erosion and flooding in the medium to long term, which required arrangements to be defined over a longer time scale than 5-10 years.

- The study boundaries were defined from examination of the SMP Policy Units. The strategy area comprises the whole of Coastal Process Unit No. 8 defined in the SMP, apart from management unit 8/1 – Seaforth Dock. This section of frontage is under private ownership, does not constitute a coastal defence, and was constructed under Mersey Harbour Act powers vested in the then Mersey Docks and Harbour Board.

- Key uncertainties addressed by the strategy related to:

  - Life expectancy of existing hard defence structures
  - Future erosion behaviour of the shoreline
  - Identification of the level of risk to land, property and infrastructure

- Notwithstanding the work carried out during preparation of the strategy, future behaviour and hence the level of risk will be driven by future storm frequency and magnitude and specifically the coincidence of, predominantly wind driven, storm conditions with higher water levels. Additional work is currently being carried out as part of on-going SMP2 additional studies to better identify the probabilities of such

conditions applying, not withstanding that actual behaviour will almost certainly be different.

- Furthermore although substantial rates of accretion are predicted south of Formby Point (in SMU 8/4) based on historic data, there is some residual uncertainty as to how long this will continue and when the trend may or may not change, and, if it does, what effect it will have on physical processes at the shoreline. Similarly there is on-going uncertainty associated with potential movement of the transition point (from accretion to erosion) currently situated just to the south of Formby Point.

- Whilst the previous two points refer to uncertainty this has been taken in to account in the development of options and is not considered to be significant in the short term although the long term policies may need to be reviewed as our understanding improves.

- The Study has been developed in conjunction with the River Alt Strategy, specifically in relation to the pumping regime and how this might affect the route of the River across the beach.

3.5 Key Constraints

- The key constraints on future coastal and flood risk management measures identified for the strategy frontage are:

  - Assessments under the Conservation Regulations (Natural Habitats, etc.) 1994, as amended.
  - Future availability of funding for coastal risk management
  - Continued use of Altcar Firing Range by TAVRA (Territorial Army Volunteer Reserve Association) who are land owners but have no legal right to coast protection.
  - Proposed actions for Flood Risk Management within the Alt/Crossens catchment
  - Potential pollution arising from erosion of existing/future rubble deposits
  - Future of the Alt training bank

- The principal environmental constraints on future coastal risk management are:

  - The Conservation Regulations (Natural Habitats, etc.) 1994, as amended.
  - Maintenance and preservation of the submerged forest on the beach at Hightown
  - Feeding and Roosting periods for birds within the SPA.
  - Potential access limitations for management actions arising from site designations.
  - Impacts of release of pollutants from eroding shorelines on designated habitats
  - Recycling of wind blown sand
  - Landscape impacts associated with new/reconstructed defences

- A Strategic Environmental Assessment has been produced to identify the impacts of the options examined in the strategy (Sefton MBC, July 2009). The key issues identified by the SEA are:

Natural Processes

- Impacts on habitats and species
- Flooding and subsequent loss of habitats through erosion
- Sand blow at Crosby
- Accretion and erosion from the River Alt Pumping Station to Formby Point
- Changing surface sediments

- Climate change (Impact to Fauna and Flora)

Man-made Infrastructure

- Overtopping of existing flood defences
- Potential contamination from erosion at Hightown/Blundellsands
- Discharge rate from River Alt
- Impact to Waste Water Infrastructure
- Visual Impact and Landscape Character Change
- Archaeology
- Long term effects on Crosby Marine Lake
- Effects on access as a result of new infrastructure
- Economic impacts
- General pollution from coastal defence works

Use of the coast

- Amenity access
- Visitor economy
- Noise and Vibration
- Compatibility of land uses and functions as coastal profile evolves
- Environmental health and safety through management choices

- In addition to the SEA a Habitats Screening of the Strategy has also been carried out in accordance with the Conservation Regulations (Natural Habitats, etc.) 1994, as amended. The screening has identified a range of actions that are likely to give rise to impacts on the Natura 2000 sites, as follows:

  - Erosion of the existing coastline
  - Accretion of the existing coastline
  - Increase in dune habitat
  - Decrease in intertidal sand and mudflat habitat
  - Potential smothering of habitats
  - Short term loss of habitat or impacts on habitats
  - Construction and decommissioning related disturbance to birds
  - Potential for construction and decommissioning related pollutants
  - Maintaining existing coastal defences
  - Use of rock armour

- The screening also considered issues and conflicts arising from the various overlapping conservation designations and potential in combination effects with other plans and projects, including:

  - The permanent installation of “Another Place”
  - Extension to the Seaforth Dock Facilities – “The Seaforth Triangle”
  - The Crosby Water Centre and Pipeline

- The Screening concluded that there were unlikely to be any significant or unknown impacts arising from implementation of the strategy but that mitigation measures would be required in relation to specific elements, specifically:.

  - Deliver increased dune habitat and implement dune management as part of the proposed Hightown Dunes Restoration Works – to minimise impacts from access tracks;
  - Phasing of coastal defence projects such that over winter bird periods (November to March) are not disturbed by coastal defence activities;

- Preparation, implementation and compliance with a Construction Environmental Management Plan for each project – to be secure through an appropriate legal mechanism (e.g. planning condition);
- Reduce area to be lost to rock armour to absolute minimum that enables effective control of erosion of designated features of the Sefton Coast SAC and Ribble & Alt Estuaries Ramsar (above high tide).

4 Options for Managing Coastal Erosion & Flood Risk

4.1 Potential FCRM Measures

- The SMP policy options for the Crosby to Formby frontage encompass the full range of potential policies, apart from advancing the line i.e. Do-Nothing, Hold the Line, Managed Re-alignment.

- There are various engineering and coastal management options available to achieve the SMP policy options with different associated investment costs and consequent damages/benefits applying. For each policy option several technical options have been considered; these have been developed, based on the following generic option types (simplified for the purposes of strategic assessment):

  - **Do-Nothing -** Allow natural processes to act without intervention;
  - **Maintain defences –**the minimum "do-something" option which entails intervention with the defences;
  - **Sustain Standard of Defence** – this option sustains the present standard of defence for the intended strategy life of 100 years (e.g. by keeping pace with, or pre-empting, sea level rise).
  - **Improve Standard of Defence** - this option improve the present standard of defence for the intended strategy life of 100 years (i.e. so that even at the end of the scheme life the standard is higher than at present).

- The term "Standard of Defence" (SoD) is more readily applied to flood risk management where the SoD is expressed simply as the return period of the threshold of tolerable flooding. In the case of coastal erosion the term is used in an equivalent sense in terms of the probability (expressed as a return period) of failure of the defence structure, from which point erosion ensues. For the strategic level of consideration adopted for the strategy however, structural failures are identified in deterministic terms rather than probabilistically.

- Regardless of the size and standard of defence provided by a coastal scheme, warning systems, evacuation procedures to safeguard lives, and emergency service communications and transportation have all been considered. Ideally, such contingency planning involves the publication of flood/erosion risk information to allow owners of property or other assets the opportunity to make provisions for protection (i.e. sand bagging, construction of minor flood embankments, etc). As well as dealing with residual risk through the mechanism of emergency planning other methods of risk management such as use of the planning system have been considered although they have not been discussed in detail in order to avoid complicating discussions of structural options.

- Furthermore due to on-going uncertainty over rates of erosion and accretion, residual lives of defences etc, monitoring of the shoreline, to determine when appropriate action may be required, forms an essential part of future coastal erosion and flood risk management across the strategy frontage.

4.2 Long List of Options

- Within the strategic study area, the principal threats to the coastal defences arise from:

  - beach retreat and, hence, lowering – prospect of undermining of existing defences; also increasing water depth can allow more severe wave attack to penetrate to the defences, leading to increased wear and tear, and overtopping;
  - general deterioration of defences through ageing and weathering;
  - geotechnical failure due to lowering of the beach in front of the structure;
  - dune drawdown and breach – the potential for overtopping due to rapid dune sand washout
  - persistent cliff erosion – the gradual removal of more resistant natural or man made materials until such time that softer deposits are exposed or crest levels reduce allowing for breaching and/or overtopping to take place allowing penetration of tidal waters inland

- A range of techniques / management approaches have been considered within each management unit to accord with the generic options of Do Nothing, Maintain, Sustain and Improve, where these are appropriate to the SMP policy option for each strategy length.

- The typical coastal defence measures, considered alone or in combination to accord with these options, are outlined below:

  - general maintenance and repair: this includes measures such as repairs to cracks, grouting, replacement of dislodged capping, promenade resurfacing, cosmetic measures, and so forth, but does not include any major rebuilds, new or replacement construction;
  - beach recharge: this defence option tends to avoid the need to renew linear defences. Suitable beach material is deposited on the beach and renewed periodically throughout the study period;
  - dune management: recycling of wind blown sand; fencing; planting
  - timber cribwork containing rock;
  - partial defence replacement: the older and poorer sections of defences are replaced with new defence elements;
  - all new linear defences: new defences in rock, concrete or earth embankments are built to replace the existing defences along existing or, if appropriate, retired (setback lines)

4.3 Options Rejected at Preliminary stage

- Options or techniques considered but rejected as inappropriate on technical, economic or environmental grounds included:

  - beach wide groyne ‘fields’ - not technically appropriate for the beach or tide conditions applying, and would unnecessarily interfere with longshore drift
  - offshore breakwaters – not technically or environmentally appropriate for the conditions applying. Also rejected on health and safety grounds and on the potential impact adjacent to a busy shipping channel – the foreshore is a designated “beaching” zone for vessels that lose control.
  - large rock groynes or shore connected breakwaters – as for offshore breakwaters

- gabion defences – generally inappropriate for use along much of the frontage, where exposure conditions are too high.

- The option to provide a formal coastal defence across the eroding dune frontage at Formby Point (SMU8/4) was dismissed as being inappropriate on all counts for a natural frontage. Recharging beach levels was identified as providing a potential option but was rejected on cost benefit grounds, there being little or no financial benefits applicable to this frontage.

4.4 Options Short-listed for Appraisal

- The basis for strategy option evaluation and examination has been the units identified in the SMP for policy definition, which were, following further assessment of conditions applying, considered appropriate for on-going strategy consideration.

- Within each strategy unit the frontage is sub-divided into smaller lengths representing differences in the types of defence. These smaller defence lengths have varying properties including different residual lives. It follows that development of the strategy has had to adapt to these variations which will include defence replacement at different times.

- Due to the varying nature of the existing defence line the baseline case for option appraisal is the Do-Nothing scenario, the consequences of which are described in section 3.2 above, which is designated as Option 1 in all cases.

- In addition to the above, option appraisal for each unit therefore considers an appropriate solution / range of actions that are appropriate for the specific management unit in question under all or some of the generic options identified i.e.:

  - Maintain Existing Defences
  - Sustain Existing Standard of Service
  - Improve Existing Standard of Service
  - Provide Defences on a Retired Line

- Detailed definition of the options examined with each of the strategy units/sub-units is provided in Appendix F.

- For Strategy Management Unit 8/2, the SMP Policy is “Hold the Line” for both short and medium term epochs. The options examined reflect this and are in accordance with the principal generic options of Maintain, Sustain & Improve.

- For Strategy Management Unit 8/3, the SMP Policy is “Do Nothing with Selective Hold the Line” in the short term and “Do Nothing with Selective Managed Retreat in the medium term. The options examined reflect this and the relatively lower level of benefits applying with options identified covering the whole range of actions identified in para 4.4.4 above.

- For the purposes of examination the management unit is split into two sub sections denoted as:

  - Hall Rd West to Far Moss – 8/3/1

- Hightown Dunes – 8/3/2

- For Strategy Management Unit 8/4, the SMP Policy is “Do Nothing” for both short and medium term epochs. Whilst the effects of this are considered options to “Maintain” and “Hold the Line” have been considered to put the policy in context.

5 Options Appraisal and Comparison

5.1 Technical Issues

General

- Within the Option Appraisal, Option 1 in all cases relates to the No Active Intervention or Do-Nothing scenario, as described in section 3.2 above.

Strategy Management Unit 8/2

- The key aspects in examination of the options for this strategy unit relate to the relative merits of maintaining existing structures compared to re-building them and the level of protection they provide.

- Maintenance of existing structures alone cannot be sustained on the present defence line for the next 100 years and if the existing defence line is to be maintained in accordance with the current SMP policy then capital works will need to be constructed across most if not all the frontage at some time within the strategy timescale.

- The predicted Do-Nothing behaviour of the shoreline inextricably links actions within this unit and the adjacent unit to the north (8/3). The preferred options identified for both these units must be compatible with each other e.g. Hold the Line in 8/2 and Do-Nothing at the southern end of 8/3 would not be compatible.

- Given the buffer of land behind the current defence line, any reconstruction of defences under the Sustain or Improve options could be carried out without any further encroachment into the designated conservation areas, SPA etc.

Strategy Management Unit 8/3

- The key aspects in examination of the options for this strategy unit relate to the general presumption of no intervention allied with the need to provide protection at key locations where significant numbers of properties and infrastructure are at risk.

- The predicted Do-Nothing behaviour of the shoreline inextricably links actions within this unit and the adjacent unit to the south (8/2). The preferred options identified for both these units must be compatible with each other e.g. hold the Line in 8/3 and Do-Nothing at the southern end of 8/2 would not be compatible.

Strategy Management Unit 8/4

The key aspects in examination of the options for this strategy unit relate to the general presumption of working with rather than against natural processes, no intervention other than that required to manage external pressures e.g. public access, wind blown sand etc, the largely natural character of the foreshore, shoreline and hinterland and the dearth of tangible assets at risk.

5.2 Environmental Assessment

General

- Environmental Assessment of potential strategy options has been carried out within the SEA produced by Sefton Council, supplemented where appropriate by the Habitat Screening carried out under the Conservation Regulations (Natural Habitats, etc.) 1994, as amended. Details of the supporting environmental reports are provided in Appendix P. A letter of support from Natural England can be found in appendix Q who supported the conclusions of the Habitat Screening that was undertaken.

- The Environmental Impacts of each of each of the options is identified and discussed within section 4.4 above with the key points for each of the strategy management units, 8/2, 8/3 & 8/4, summarised in tables 5.1-5.4 respectively below:

Table 5.1: Strategy Management Unit 8/2 - Key Environmental Impacts, Mitigation and Opportunities

Key Positive Impacts	Key Negative Impacts	Mitigation/ Enhancement Opportunity
Option 2 - Maintain		
Prevents leaching of potential pollutants, arising from buried material behind defences and infrastructure loss, onto beach in short to medium term	Leaching of potential pollutants onto beach would occur in medium to long term	Choose alternative option. Infrastructure could be re-routed (by others) before impact arises
Provides for on-going clearance of wind blown sand to maintain amenity	Impact on SSSI, Ramsar, SPA and SAC designations arising from maintenance actions e.g. access in short to medium term	Impact only temporary and would cease in long term
	Negative landscape affects arising from failed defences	Removal of old defences as they fall down (NB. Costs only allowable on safety grounds)
	Negative impact on SSSI, Ramsar, SPA and SAC designations arising from failed defences	
	Provides for loss of land, amenities and flooding in medium to long term.	
	Long term induced blight on the shoreline	
	Reduced community well being.	
Option 3 – Sustain		
Prevents leaching of potential pollutants, arising from buried material behind defences and infrastructure loss, onto beach in short, medium and long term	Increased flood risk over time (Long term)	Future enhancement of defences as in Improve option
Prevents erosion and loss of land, property, infrastructure and amenities.	Impact on SSSI, Ramsar, SPA and SAC designations arising from capital construction and maintenance actions e.g. due to access	Impact only temporary

Key Positive Impacts	Key Negative Impacts	Mitigation/ Enhancement Opportunity
Maintains community well being.		
Improved public safety		
Option 4 - Improve		
Prevents leaching of potential pollutants, arising from buried material behind defences and infrastructure loss, onto beach in short, medium and long term	Impact on SSSI, Ramsar, SPA and SAC designations arising from capital construction and maintenance actions e.g. due to access	Impact only temporary
Prevents erosion and loss of land, property, infrastructure and amenities.		
Maintains community well being.		
Maintains level of flood protection		
Improved public safety		

Table 5.2: Strategy Management Unit 8/3/1 - Key Environmental Impacts, Mitigation and Opportunities

Key Positive Impacts	Key Negative Impacts	Mitigation/ Enhancement Opportunity
Option 2 - Maintain		
	Impact on SSSI, Ramsar, SPA and SAC designations arising from maintenance actions e.g. access in short to medium term	Impact only temporary and would cease in long term
	Negative landscape affects arising from failed defences	Removal of old defences as they fall down (NB. Costs only allowable on safety grounds)
	Negative impact on SSSI, Ramsar, SPA and SAC designations arising from failed defences.	
	Leaching of potential pollutants from infrastructure loss onto beach would occur in medium to long term	Infrastructure could be re-routed (by others) before impact arises
	Loss of land, amenities and flooding to properties, golf course and agricultural land in long term.	
	Long term impact on local communities arising from flood disruption to railway in long term.	Intermittent behaviour
Option 3 – Maintain & Protect Key Points		
Prevents leaching of potential pollutants, arising from infrastructure loss, onto beach in short, medium and long term	Loss of land, amenities and flooding to golf course and agricultural land in long term.	
	Impact on SSSI, Ramsar, SPA and SAC designations arising from capital construction and maintenance actions e.g. due to access	Impact only temporary

Key Positive Impacts	Key Negative Impacts	Mitigation/ Enhancement Opportunity
	Long term impact on local communities arising from flood disruption to railway in long term.	Intermittent behaviour
Option 4 - Sustain		
Prevents leaching of potential pollutants, arising from infrastructure loss, onto beach in short, medium and long term	Impact on SSSI, Ramsar, SPA and SAC designations arising from capital construction and maintenance actions e.g. due to access	Impact only temporary
Prevents erosion and loss of land, property & infrastructure		
Maintains protection to agricultural land and railway		
Option 5 - Improve		
Prevents leaching of potential pollutants, arising from infrastructure loss, onto beach in short, medium and long term	Impact on SSSI, Ramsar, SPA and SAC designations arising from capital construction and maintenance actions e.g. due to access	Impact only temporary
Prevents erosion and loss of land, property & infrastructure		
Maintains protection to agricultural land and railway		

Table 5.3: Strategy Management Unit 8/3/2 - Key Environmental Impacts, Mitigation and Opportunities

Key Positive Impacts	Key Negative Impacts	Mitigation/ Enhancement Opportunity
Option 2 - Maintain		
	Continued erosion of dunes at Hightown would affect SAC habitats	Loss of terrestrial habitat may be balanced by gain in marine habitat
	Impact on SSSI, Ramsar, SPA and SAC designations arising from maintenance actions e.g. access in short to medium term	Impact only temporary
	Negative landscape affects arising from failed defences	Removal of old defences as they fall down (NB. Costs only allowable on safety grounds)
	Negative impact on SSSI, Ramsar, SPA and SAC designations arising from failed defences.	
	Impact on foreshore heritage interests arising from maintenance actions e.g. access in short to medium term	Ensure areas are accurately recorded before works commence. Enforce restrictions on access routes to minimise damage
	Loss of land and flooding to hinterland in long term.	
	Adverse affect on local amenity e.g. BSC	Re-siting/replacement of facilities in different locations
Option 3 – Managed Retreat		
Prevents flooding to hinterland	Continued erosion of dunes at Hightown would affect SAC habitats	Loss of terrestrial habitat may be balanced by gain in marine habitat

Key Positive Impacts	Key Negative Impacts	Mitigation/ Enhancement Opportunity
Increased inter-tidal zone area	Loss of dune area	
	Potential for loss or damage to foreshore heritage interests	
Option 4 – Sustain (Linear Defences)		
Prevents loss of land and flooding to hinterland	Impact on SSSI, Ramsar, SPA and SAC designations arising from capital construction and maintenance actions e.g. due to access	Impact only temporary
Potential for coverage and protection of foreshore heritage interests	Impact on foreshore heritage interests arising from maintenance actions e.g. access in short to medium term	Ensure areas are accurately recorded before works commence. Enforce restrictions on access routes to minimise damage
	Potential for interference with natural process behaviour if linear defence adopted	
Option 5 – Sustain (Dunes)		
Prevents leaching of potential pollutants, arising from infrastructure loss, onto beach in short, medium and long term	Impact on SSSI, Ramsar, SPA and SAC designations arising from capital construction and maintenance actions e.g. due to access	Impact only temporary
Prevents erosion and loss of land, property & infrastructure		
Maintains protection to agricultural land and railway		

Table 5.4: Strategy Management Unit 8/4 - Key Environmental Impacts, Mitigation and Opportunities

Key Positive Impacts	Key Negative Impacts	Mitigation/ Enhancement Opportunity
Option 2 - Maintain		
Natural function maintained	Negative impact on SSSI, Ramsar, SPA and SAC designations arising from on-going erosion	Management measures – fencing, access restriction, planting etc can mitigate against effects of erosion without significantly altering behaviour. Erosion provides shifting balance between terrestrial and marine habitats

5.3 Social and Community Impacts

- Identified in 5.2 above

5.4 Option Costs

- The general approach and methodology adopted for the economic appraisal of options is detailed in Appendix I.

- Strategy costs were originally provided to a Q2 2006 base data. Comparison of the Predicted Q2 2009 Tender Price Index with that from Q2 2006 identifies less than 0.5% change. No amendment to Q2 2006 prices has therefore been made.

- The estimated costs are based on unit rates collated from a number of sources (contractors, suppliers, previous projects of a similar nature etc.) supplemented by published pricing data e.g. CESMM3, Spons etc. Costs include an allowance for future appraisal, design and construction fees as a proportion of the total cost of construction.

- All costs include a 60% Optimism bias in accordance with current FCDPAG guidance, apart from those for SMU8/3/1 and 8/3/2 which have been developed to PAR detail, utilising more detailed cost data. In these cases a value of 30% has been added. Appendix N details the derivation of these figures.

- The Option Costs for each of the options examined for each of the strategy management units 8/2, 8/3 & 8/4, are summarised in tables 5.5-5.8 respectively below:

Table 5.5: Strategy Management Unit 8/2 - Summary of Options Present Value (PV) Costs

Option Ref.	**Option 1 (£k)**	**Option 2 (£k)**	**Option 3(L) (£k)**	**Option 3 (BR) (£k)**	
Option Description (Full details in Appendix F)	**Do-Nothing**	**Maintain Existing Defences – Do Minimum**	**Improve Defences – Linear Protection**	**Improve Defences – Beach Recharge**	
Initial implementation cost (Year 0-5)					
Capital	0.00	0.00	0.00	0.00	
Non-capital	0.00	403.97	403.97	400.72	
Sub Total		403.97	403.97	400.72	
Future Costs (Year 6-20)					
Capital	0.00	1007.09	4374.66	3627.31	
Non-capital	0.00	1143.48	496.93	436.37	
Sub Total		2150.56	4871.59	4063.68	
Future Costs (Year 21-100)					
Capital	0.00	0.00	3020.50	2551.10	
Non-capital	0.00	106.73	402.00	1050.08	
Sub Total	0.00	106.73	3422.50	3601.18	
Total PV Cost	0.00	2661.26	8698.06	8065.57	

Table 5.6: Strategy Management Unit 8/3/1 - Summary of Options Present Value (PV) Costs

Option Ref.	Option 1 (£k)	Option 2 (£k)	Option 3 (£k)	Option 4 (£k)	Option 5 (£k)
Option Description (Full details in Appendix F)	**Do-Nothing**	**Maintain Existing Shoreline – Do Minimum**	**Maintain Existing Shoreline and Protect Key Points**	**Sustain Existing Shoreline**	**Improve Existing Shoreline – Linear Protection**
Initial implementation cost (Year 0-5)					
Capital	0.00	0.00	0.00	1347.30	4438.88
Non-capital	0.00	39.44	39.44	42.52	34.01
Sub Total	0.00	39.44	39.44	1389.82	4472.89
Future Costs (Year 6-20)					
Capital	0.00	207.75	476.17	166.12	0.00
Non-capital	0.00	29.18	29.18	32.50	19.10
Sub Total	0.00	236.93	505.35	198.62	19.10
Future Costs (Year 21-100)					
Capital	0.00	45.15	111.72	293.07	464.85
Non-capital	0.00	47.08	47.08	47.80	26.48
Sub Total	0.00	92.23	158.80	340.87	491.33
Total PV Cost	0.00	368.59	703.58	1929.31	5028.32

Table 5.7: Strategy Management Unit 8/3/2 - Summary of Options Present Value (PV) Costs

Option Ref.	Option 1 (£k)	Option 2 (£k)	Option 3 (£k)	Option 4 (£k)	Option 5 (£k)
Option Description (Full details in Appendix F)	**Do-Nothing**	**Maintain Existing Defences – Do Minimum**	**Managed Re-Alignment**	**Sustain Existing Shoreline & Defences (Linear Defences)**	**Sustain Existing Shoreline & Defences (Dune Restoration)**
Initial implementation cost (Year 0-5)					
Capital	0.00	126.42	126.42	1116.42	894.39
Non-capital	0.00	35.72	35.73	31.30	31.30
Sub Total	0.00	162.14	162.15	1147.72	925.69
Future Costs (Year 6-20)					
Capital	0.00	89.62	96.40	0.00	0.00
Non-capital	0.00	75.85	75.85	79.19	74.01
Sub Total	0.00	165.47	172.25	79.19	74.01
Future Costs (Year 21-100)					
Capital	0.00	167.54	372.72	89.20	620.48
Non-capital	0.00	107.05	119.38	119.18	111.42
Sub Total	0.00	274.59	492.10	208.38	731.90
Total PV Cost	0.00	602.20	826.50	1,435.29	1,731.60

Table 5.8: Strategy Management Unit 8/4 – Summary of Options Present Value (PV) Costs

Option Ref.	Option 1 (£k)	Option 2 (£k)
Option Description (Full details in Appendix F)	**Do-Nothing**	**Maintain Existing Defences – Do Minimum**
Initial implementation cost (Year 0-5)		
Capital	0.00	0.00
Non-capital	0.00	1533.34
Sub Total		1533.34
Future Costs (Year 6-20)		
Capital	0.00	38.26
Non-capital	0.00	2320.20
Sub Total		2358.46
Future Costs (Year 21-100)		
Capital	0.00	8.32
Non-capital	0.00	3080.07
Sub Total	0.00	3088.39
Total PV Cost	0.00	6980.19

5.5 Options Benefits (Damages Avoided)

- Benefits have been valued in accordance with the methodologies laid down in the Multi Coloured Manual (MCM) (Middlesex Flood Hazard Research Centre (FHRC) 2003) and the Green Book (HM Treasury, 2003). These documents have been used in combination with the DEFRA FCDPAG series and Supplementary Guidance Notes, as appropriate.

- Strategy benefits and damages were originally valued to a Q2 2006 base data and have been updated to Q2 2009, as detailed below:

  - Residential properties at risk of erosion have been valued on the basis of the average value for the appropriate Council Tax Band (Base date: September 2001 updated to Q2 2006 (Strategy value) by the increase in the Nationwide House Price Index applicable. Q2 2009 values allow for a -9.6% decrease in average prices in Sefton since the strategy date.
  - Present day infrastructure valuations have been obtained direct from Utilities companies and have been substituted, where appropriate, for the original strategy values.
  - Land values, calculated in accordance with FCDPAG3 for the strategy have been updated to Q4 2008 using data from the Agricultural Land Market Survey of 2009 (Savills, 2009) which identified an average value for land in the NW of England of £9716/ha and an estimated fall in value of 5% over the first half of 2009.
  - Flood damages to residential and commercial properties have been updated from the figures identified in the strategy by an increase of 2.7% for building related elements and an increase of 7.6% (rise in RPI Q2 2006 to Q2 2009) for contents related elements (2005-2009).

- The Maritime and Coastguard Agency's building has been valued based on its 2003 HM Treasury valuation of £523,000 updated to the present day by the increase in the Tender Price Index.

- The Benefits & Residual Damages for each of the options examined for each of the strategy management units 8/2, 8/3 & 8/4, are summarised in tables 5.9-5.12 respectively below:

Table 5.9: Strategy Management Unit 8/2 - Summary of Options Present Value (PV) Damages and Benefits (£k)

	Damage (PVd)	Damage Avoided	Benefits (PVb)	Key non-monetarised Benefits
Option 1	5845.76			
Option 2	2907.19	2938.57	2938.57	
Option 3	44.80	5800.97	5800.97	

Table 5.10: Strategy Management Unit 8/3/1 - Summary of Options Present Value (PV) Damages and Benefits (£k)

	Damage (PVd)	Damage Avoided	Benefits (PVb)	Key non-monetarised Benefits
Option 1	738.21			
Option 2	526.21	212.00	212.00	
Option 3	3.36	734.85	734.85	
Option 4	0.00	738.21	738.21	
Option 5	0.00	738.21	738.21	

Table 5.11: Strategy Management Unit 8/3/2 - Summary of Options Present Value (PV) Damages and Benefits (£k)

	Damage (PVd)	Damage Avoided	Benefits (PVb)	Key non-monetarised Benefits
Option 1	1900.98			
Option 2	1103.11	797.88	797.88	Loss of SAC habitat
Option 3	98.42	1802.57	1802.57	Loss of SAC habitat
Option 4	0.00	1900.98	1900.98	
Option 5	0.00	1900.98	1900.98	Protects SAC Species

Table 5.12: Strategy Management Unit 8/4 - Summary of Options Present Value (PV) Damages and Benefits (£k)

	Damage (PVd)	Damage Avoided	Benefits (PVb)	Key non-monetarised Benefits
Option 1	26.87			
Option 2	18.98	7.89	7.89	

6 Selection and Details of the preferred option

6.1 Selecting the Preferred Option

Strategy Management Unit 8/2

- In the short to medium term timeframe damages associated with the Do-Nothing scenario (option 1) are low by virtue of limited recession and a significant buffer between the coast and the assets at risk. Across the most northerly section, where the existing defences are in the poorest condition and most at risk of imminent failure, the damages are greater.

- The results of the benefit cost appraisal for the unit as a whole are presented in Table 6.1 below, with the preferred option "greyed out".

Table 6.1: Strategy Management Unit 8/2: Summary Benefit-Cost Assessment

	Costs and benefits £k				
	Option 1	Option 2	Option 3(L)	Option 3(BR)	
PV Costs PVc		2,661.26	8,698.06	8,070.46	
PV damage PVd	5,845.76	2,907.19	44.80	44.80	
PV damage avoided		2,938.57	5,800.97	5,800.97	
Total PV benefits PVb		2,938.57	5,800.97	5,800.97	
Average benefit/cost ratio		1.10	0.67	0.73	
Incremental benefit/cost ratio (1)			-	0.54	
Incremental benefit/cost ratio (2)			0.48	0.54	
		Highest b/c	-	-	

Notes:
1) Incremental benefit/cost ratio (1) is relative to previous lower cost option
2) Incremental benefit/cost ratio (2) is relative to lowest cost option in each case

- None of the mitigation options deliver any significant benefits but the Maintain option (2) does provide a case for on-going investment, although this can only be achieved in the short to medium term, until such time that the defences require replacement. At that time it would be appropriate for the case for investment to be re-examined.

- Of the Sustain options considered, 3(L) & 3 (BR) the provision of linear defences (3L) provides the most appropriate method of delivery with significantly less risk due to its fixed nature compared to beach recharge which requires significant on-going management to maintain its function, the frequency and magnitude of which are subject to future environmental variability that cannot be accurately determined at present.

- Splitting the unit to acknowledge the different benefit streams applying and the difference in residual life expectancy of the existing structures confirms that the Maintain option is still justifiable in both sub sections but that, as would be expected, there is greater justification for the Sustain option in the northern part of the frontage. Taking this a stage further adoption of a hybrid approach, whereby structures are maintained (southern part) and where necessary replaced (northern part) if they become life expired, provides a solution that provides parity between costs and benefits over the strategy timescale.

- The present SMP policy for the frontage is Hold the line and this policy has been also been identified as the draft policy for this section of frontage, within SMP2, unless the MEPAS infrastructure were to be relocated (by others).

- However neither Do Nothing nor the Maintain option accord with this policy and adoption of either in the long term would produce significant environmental and social impacts, including degradation of defences and potential leaching of polluted fill from behind failed defences.

- On the basis of this assessment it is considered that Option 2, maintaining existing structures and replacing parts of those structures most in need of reinstatement, when necessary, provides an equitable approach to coastal defence at the present for minimum public investment. Such an approach provides in the short term an adequate standard of defence set against the risks applying, safeguards the environment and social fabric of the area and allows for time to reconsider (20-30 years) what actions are appropriate for the long term management of the frontage.

- Allowance has been made for capital maintenance of defence elements with the lowest residual life, which is currently estimated to be 10 years. However should on-going monitoring identify that this work can be deferred then the timing of this expenditure will be reviewed accordingly.

Strategy Management Unit 8/3/1

- The results of the benefit cost appraisal for this frontage length are presented in Table 6.2 below.

Table 6.2: Strategy Management Unit 8/3/1: Summary Benefit-Cost Assessment

	Costs and benefits £k				
	Option 1	Option 2	Option 3	Option 4	Option 5
PV Costs PVc		587.63	1,089.72	1,929.31	5,028.32
PV damage PVd	738.20	526.20	3.36	0.00	0.00
PV damage avoided		212.00	734.85	738.20	738.20
Total PV benefits PVb		212.00	734.85	738.20	738.20
Average benefit/cost ratio		0.36	0.67	0.38	0.15
Incremental benefit/cost ratio (1)			1.04	0.00	-
Incremental benefit/cost ratio (2)			1.04	0.39	0.12
		-	Highest b/c	-	-

Notes:
1) Incremental benefit/cost ratio (1) is relative to previous lower cost option
2) Incremental benefit/cost ratio (2) is relative to lowest cost option in each case

- The present SMP policy for the frontage is Do Nothing with Selective Hold the Line. The preferred draft policy identified in SMP2 for the section of frontage from Hall Rd West to the MEPAS Pumping station is Hold the line, including maintaining the Alt training bank, unless the MEPAS infrastructure were to be relocated (by others), North of the training bank the draft policy is to carry out managed re-alignment.

- The assessment has identified that there are insufficient tangible benefits and that expenditure to improve defence integrity at the present time cannot be justified.

- The option that provides best economic performance combines routine management and monitoring of the existing rubble cliff, with the construction and maintenance of defences in the future at key points on the shoreline, however in order for this to achieve a positive benefit:cost ratio then the costs identified have to be reduced. This can be achieved by deferring the capital expenditure into the future (year 15-20) and carrying out monitoring and management of the eroding shoreline in the interim. Benefits accrue in the medium to long term hence there is no difference in PVb between expenditure incurred at the present time or if it is deferred.

- The results of the revised benefit cost appraisal for this frontage length, assuming the costs are deferred are presented in Table 6.3 below, with the preferred option "greyed out".

Table 6.3: Strategy Management Unit 8/3/1: Summary Benefit-Cost Assessment (Deferred Expenditure)

	Costs and benefits £k				
	Option 1	Option 2	Option 3	Option 4	Option 5
PV Costs PVc		368.59	703.58	1,929.31	5,028.32
PV damage PVd	738.20	526.20	3.36	0.00	0.00
PV damage avoided		212.00	734.85	738.20	738.20
Total PV benefits PVb		212.00	734.85	738.20	738.20
Average benefit/cost ratio		0.58	1.04	0.38	0.15
Incremental benefit/cost ratio (1)			4.51	0.00	-
Incremental benefit/cost ratio (2)			4.51	0.39	0.12
		-	Highest b/c	-	-

Notes:
1) Incremental benefit/cost ratio (1) is relative to previous lower cost option
2) Incremental benefit/cost ratio (2) is relative to lowest cost option in each case

- Option 3 meets the objectives for the frontage and provided the capital expenditure is deferred into the future (estimated to be no later than year 20) then it meets the necessary economic criteria for investment. Under this approach works to re-construct all the necessary defences (Hall Rd West Terminal works, Alt Training bank and Alt Promontory) would be carried out concurrently. This is considered to represent the preferred approach for the frontage.

Strategy Management Unit 8/3/2

- The results of the benefit cost appraisal for this frontage length are presented in Table 6.4 below, with the preferred option "greyed out".

Table 6.4: Strategy Management Unit 8/3/2: Summary Benefit-Cost Assessment

	Costs and benefits £k				
	Option 1	Option 2	Option 3	Option 4	Option 5
PV Costs PVc		602.20	826.50	1,435.29	1,731.60
PV damage PVd	1,900.98	1,103.11	98.42	0.00	0.00
PV damage avoided		797.87	1,802.57	1,900.98	1,900.98
Total PV benefits PVb		797.87	1,802.57	1,900.98	1,900.98
Average benefit/cost ratio		1.32	2.18	1.32	1.10
Incremental benefit/cost ratio (1)			4.48	0.16	-
Incremental benefit/cost ratio (2)			4.48	1.32	0.98
		-	Highest b/c	-	-

Notes:
1) Incremental benefit/cost ratio (1) is relative to previous lower cost option
2) Incremental benefit/cost ratio (2) is relative to lowest cost option in each case

- The present SMP policy for the frontage is Do Nothing with Selective Hold the Line with the potential for managed re-alignment in the medium term. The draft SMP2 identifies different policies for different sections of the frontage as identified below:

  - Between Far Moss and the Hightown southern boundary – Managed Re-Alignment
  - Across the remainder of the frontage - Hold the line through limited intervention and dune management and maintenance of channel training defences in the River Alt.

- The strategy assessment has confirmed that provision of defences on the exiting line, whilst providing a benefit to cost ratio in excess of unity, does not represent the best value for money for public and that allowing the shoreline to recess naturally and building a new retired line defence in the future, when properties are at more immediate risk, (option 3) provides a more appropriate use of public funds.

- Environmentally the preferred economic approach has significant environmental dis-benefits associated with the loss of SAC habitat for rare species (Natterjack Toads and Sand Lizards). In addition this would significantly impact on amenity interests requiring re-siting of sailing club assets.

- The provision of linear defences along the dunes would provide habitat protection but at the expense of unacceptable interference in natural process behaviour by interfering with natural beach/dune interaction.

- The preferred approach socially and environmentally is identified as Option 5, although this approach is not the most economically advantageous option. Funding of such a scheme is however to be carried out using Section106 monies deposited with the Council, as identified in section 2 earlier. As such these works, which accord with the present SMP1 and draft SMP2 policies, and have broad community and statutory body support, are to be carried out without the use of any public funds.

Strategy Management Unit 8/4

- The results of the benefit cost appraisal for this frontage length are presented in Table 6.5 below, with the preferred option "greyed out".

Table 6.5: Strategy Management Unit 8/4: Summary Benefit-Cost Assessment

	Costs and benefits £k				
	Option 1	Option 2			
PV Costs PVc		6,980.19			
PV damage PVd	26.87	18.98			
PV damage avoided		7.89			
Total PV benefits PVb		7.89			
Average benefit/cost ratio		0.001			
Incremental benefit/cost ratio (1)					
Incremental benefit/cost ratio (2)					
		Highest b/c			

Notes:
1) Incremental benefit/cost ratio (1) is relative to previous lower cost option
2) Incremental benefit/cost ratio (2) is relative to lowest cost option in each case

- The present SMP policy for the frontage is Do Nothing. The draft SMP2 identifies different policies for different sections of the frontage as identified below:
  - West Bank of the River Alt – Hold the Line through maintenance of river training defences
  - Across the remainder of the frontage - Managed Re-Alignment, allowing the dune system to evolve naturally with minimal intervention to manage dunes, and manage adaptation in the erosion risk zone (such as relocating paths and car parks etc).

- The value of assets at risk within this unit are relatively low, based on predicted dune behaviour, and there is no justification for public coastal defence expenditure

- TAVRA (Territorial Army Volunteer Reserve Association) are responsible for maintenance and/or replacement of defences on the west bank of the River Alt

- Elsewhere, dune management for for purposes other than coastal defence, will be carried out by Sefton Council in partnership with, TAVRA, Natural England, National Trust etc to manage the shoreline as it naturally evolves (both erosion and accretion). Non coastal defence management relates to controlling public access through the dunes e.g. provision of boardwalks, fencing and planting to control wind blown sand movement , manage blow outs etc.

- Formal beach and dune monitoring is currently being carried out and this will be developed through the CERMS initiative to provide data to inform managers from appropriate agencies.

- The costs of maintaining the river defences are relatively low and will be carried out by others.

6.2 Sensitivity Testing

- The results of the assessment are sensitive to a wide range of factors. In particular the Strategy identified the following as being of specific importance in respect of the Crosby to Hightown frontage (SMU 8/2 & 8/3):

  - The effect of including/excluding decommissioning costs;
  - The quantity/rate for potential rock revetment works;
  - The timing of intervention.

In addition post strategy examination of key areas has considered the impact of changes in the rate of shoreline movement on option choice in SMU 8/3 particularly.

- In SMU 8/2 the sensitivity testing showed that the economic result is sensitive to the inclusion or exclusion of decommissioning costs, and the approach adopted. Whereas it can be demonstrated that the inclusion of decommissioning costs can significantly increase the b/c ratio this needs to be cautiously considered, bearing in mind that the added benefits arise from the deferral of inevitable costs, not through any improvement in terms of flood or erosion protection. The results here are marginally sensitive to the rate and/or quantity of the principal material.

- The timing of intervention in the management unit is a key issue. By deferring the cessation of maintenance in defence lengths in the southern part and the installation of new defences in the northern part of SMU8/2 by 10 years, the b/c ratio increases from 0.96 to 1.38. In the case that maintenance is extended beyond 30 years in the southern part, some additional benefits accrue from the avoidance of both deferred erosion losses and flooding.

- In SMU 8/3 the economic result is fairly insensitive to the inclusion or exclusion of decommissioning costs as the latter relate only to short lengths of defences. Also, in the case of SMU8/3, the timing of intervention does not have a significant impact on the economic result (as it does in SMU8/2); this is because, by allowing for the installation of defences on a "need to" basis, the damages avoided (Do Nothing damages) and the costs incurred tend to go hand in hand. The result is largely insensitive to material costs as only small quantities of materials are identified as required in this unit.

- No sensitivity testing was considered necessary for SMU8/4.

6.3 Details of the Preferred Option

Technical Aspects

Strategy Management Unit 8/2

- Maintenance of the existing coastal defence elements across the southern half of SMU8/2 comprises maintenance of the concrete seawall (repairs to joints, spalls etc), resurfacing of the promenade, and recycling wind blown sand, thus keeping the defence functional and cosmetically satisfactory.

- Within the northern part the timber breastwork is approaching life expiry and wholesale replacement of this section is estimated to be required in the next ten years along with repairs to concrete copings and in places recasting of concrete stepped revetment

sections. Also required would be resurfacing of the promenade. This work is deemed to be "Capital Maintenance". The exact timing of this operation will however be subject to review and the results of on-going monitoring of defence condition.

- Although the strategy advocates review of proposals after 20/30 years, if the northern section of works were replaced at this time whilst the southern section was allowed to decay, the following would apply:

  - New defences would most appropriately be constructed in rock although more detailed project appraisal would be required at the time to confirm whether this remained the technically and environmentally preferred solution.
  - There would need to be a counter wall installed at the southern end of the new defences to prevent the recessing shoreline from outflanking the remaining works. In time this would require extending.

- Regular visual and photographic inspections of defences and bi-annual monitoring of foreshore conditions would be used to inform on-going maintenance and defence renewal.

- As the Strategy for the next 20-30 years is essentially the same for both the Maintain and Sustain Options, the former figures have been used as the basis of the preferred option.

Strategy Management Unit 8/3/1

- The physical works to safeguard the terminal end of the defences at Hall Rd West will be constructed generally to the existing footprint and will provide for a hydraulically more efficient interface between beach and shoreline. The works to protect the promontory at the Alt training bank are located at the top of the existing rubble beach with no direct interface with the environmentally important lower beach sections. Again the hydraulically more efficient interface between beach and shoreline here will improve the beach/shoreline interaction.

- The scheme provides no new flood warning opportunities but monitoring of scheme performance is an integral part of the proposals that is necessary to inform definition of trigger conditions for future management actions.

- Based on historical recession behaviour of the shoreline, there will need to be on-going management and maintenance of the rock and rubble frontages to maintain defence performance and provide information to support definition of timing of future intervention actions.

- Regular (minimum quarterly but more likely monthly) monitoring of the cliff edge will be carried out to provide warning of changes in recession rates/behaviour that may impact on future scheme arrangements, specifically along the section between Hall Rd West and the training bank. Should this data show that recession could impact on the MEPAS infrastructure then remedial attention as identified in the Sustain option would be required.

- The existing defences at Hall Rd West will be monitored through the present coastal defence monitoring inspections and remedial actions undertaken to maximise residual life potential. New rock armour defences will be similarly monitored and maintained on a regular basis, as required. With predicted climate change, modifications to the crest

levels may be required at some stage in the future, dependant on actual conditions applying, to maintain design protection levels. This will necessitate some additional import of material and reprofiling. Additionally some rock may need to be replaced if its durability becomes suspect. This will depend on the nature and type of rock used.

- Regular visual and photographic inspections (annual) and topographic surveys (5 yearly) of the training bank will be carried out to monitor structure behaviour. Allowance is also included for a repeat topping up of levels 50 years after the initial works are carried out.

Strategy Management Unit 8/3/2

- Technically, the principal element of the preferred scheme is recycling of sand from other areas of the Sefton shoreline, where the material presently causes a nuisance. This sustainable use of material limits the quantities of imported material required to construct the works. The option is seen as being preferred to the beach recharge option due to the limited inter-tidal area available between the River Alt channel and the shoreline. Spreading of sand across this area has significantly greater risk of sand being drawn down into the channel and requires more extensive works to control it across the foreshore.

- Based on historical movement of the dune frontage, there will be the need to repeat the capital dune works on an estimated 20-25 year frequency, although incorporation of a number of improvements – sailing club defences, outfall improvements will mitigate against some of the adverse effects that have occurred during the past 25-30 years, which may decrease the frequency.

- Regular (minimum quarterly but more likely monthly) monitoring of the dune/beach interface will take place, with the results correlated against known tidal and wave conditions collected under the Cell 11 Regional Monitoring Strategy. This data will be used to define trigger conditions, beyond which repeat dune restoration is required.

- To aid dune stability annual maintenance works will be carried out, as necessary to improve dune resistance to aeolian and tidal forces e.g. vegetation transplantation, provision of fencing etc

Strategy Management Unit 8/4

- There are no specific technical aspects in respect of this section of frontage by virtue of there being no intervention actions other than replacement of channel training works in the River Alt channel and dune management works.

- Non coastal defence dune management operations will be carried out by other agencies (Sefton Coast & Countryside; Natural England; National Trust etc) in accordance with the overall Sefton Coast Management Objectives and will be informed by results of a Coastal Adaptation study (www.defra.gov.uk/environment/flooding/manage/pathfinder/index.htm). These actions will work with the natural processes to manage the shoreline accordingly and will have no implications in respect of future funding requirements through FDGiA nor will this give rise to any potential claims for compensation resulting from the strategy arrangements.

- Replacement river training works will be provided in the River Alt by the TAVRA (Territorial Army Volunteer Reserve Association) or its Agents, when existing sections are life expired.

Environmental Aspects

Strategy Management Unit 8/2

- The present defences across the northern section of the frontage encase tin slag and other potential pollutants that were tipped on the foreshore in the 1930s and 40s to slow erosion, prior to the erection of formal defences. Maintenance of the defences would prevent the release of this material onto a widely used amenity beach and prevent adverse environmental impacts for the designated conservation areas.

- In the medium to longer term erosion at the south end of the frontage would see a reversion back to more natural shoreline conditions here although there would be loss of well used amenity greensward as well as a general change in social well being arising from the increasing flood and erosion risk.

Strategy Management Unit 8/3/1

- Although maintaining the training bank provides little coastal defence benefit it provides significant environmental benefit in mitigating against potential environmental damage as a result of meandering of the discharge of the River Alt channel across important bird feeding areas within the SPA. Elsewhere the approach provides little opportunity for environmental enhancement, however the regular maintenance of the rubble bank and associated removal of undesirable materials will improve the aesthetic appearance of the frontage. The existing beach/shoreline interface will be largely unchanged apart from reprofiling of the cliff edge to remove the present vertical nature of the cliff face.

Strategy Management Unit 8/3/2

- Environmentally the preferred scheme safeguards the local biological interest of the Hightown dunes and Meadows providing an area of habitat that fluctuates between inter-tidal and terrestrial, as well as providing opportunities for replenishing existing dune areas and allowing for continuation of natural interaction between processes and the shoreline.

- The principal impacts have been identified as follows:

  - Covering of areas of upper foreshore with sand – impact on bird feeding areas and availability of invertebrates
  - Initial increased area of terrestrial habitats and reduced area of marine habitat. With future dune erosion over time, marine area will increase and terrestrial area will decrease.
  - Partial coverage and protection of exposed “submerged forest” remains
  - Temporary impacts on beach deposits associated with access arrangements
  - Repeatability of above on 20-30 year basis

- An environmental action plan is to be agreed with Natural England, prior to implementation. This will cover specific requirements such as:

  - Allowable times of year for carrying out initial works and on-going management actions

- Specific requirements relating to access arrangements
- Monitoring Arrangements

Strategy Management Unit 8/4

- Continued erosion of the dunes across Formby Point and the accretion of the dunes to the south provides for naturally induced change which provides for impacts on designated conservation areas, changing the balance between terrestrial and marine habitats. The SEA identifies that this "would result in adverse effects on biodiversity through continued loss of habitat and species underpinning the conservation designations at Formby Point including Ramsar, SPA, SAC and Formby Point Local Nature Reserve. This loss will be more predominant to the north where erosion currently occurs. The ecological losses, though naturally induced, would be significant".

- Over the next 100 years it is estimated that up to 300ha of sand dune habitat will be lost across Formby Point at a rate of between 50 and 80 ha every twenty years (Newton, 2009). Conversely there will be a change in the inter-tidal habitat abutting the length of eroding dunes, although these changes will depend on the distribution of material within the inter-tidal zone and relative movement in the position of the high and low water marks. Also the net loss of dune habitat will be less than these figures as there will be an increase in dune habitat (Sea Level Rise not withstanding) in those areas of dune to either side (some within SMU 8/4 and other across the Ainsdale frontage to the north).

Costs of the Preferred Option

- A summary of individual annual costs for the first five years and total future costs thereafter for Strategy Management Unit SMU8/2 are provided in Table 6.6 below.

Table 6.6: Costs of Preferred Option for SMU8/2

Cost	2010/11 (£K)	2011/12 (£K)	2012/13 (£K)	2013/14 (£K)	2014/15 (£K)	Future Year (£K)	Total (£K)
Capital	0.00	0.00	0.00	0.00	0.00	1797.36	1797.36
Non-Capital	118.12	9.50	9.50	9.50	9.50	673.76	829.88
Total	9.50	9.50	9.50	9.50	118.12	2471.12	2627.24

- A summary of individual annual costs for the first five years and total future costs thereafter for Strategy Management Unit SMU8/3/1 are provided in Table 6.7 below.

Table 6.7: Costs of Preferred Option for SMU8/3/1

Cost	2010/11 (£K)	2011/12 (£K)	2012/13 (£K)	2013/14 (£K)	2014/15 (£K)	Future Year(£K)	Total (£K)
Capital	0.00	0.00	0.00	0.00	0.00	1488.07	1488.07
Non-Capital	20.00	5.06	0.00	0.00	7.46	232.31	264.84
Total	20.00	5.06	0.00	0.00	7.46	1720.38	1752.91

- A summary of individual annual costs for the first five years and total future costs thereafter for Strategy Management Unit SMU8/3 are provided in Table 6.8 below.

Table 6.8: Costs of Preferred Option for SMU8/3/2

Cost	2010/11 (£K)	2011/12 (£K)	2012/13 (£K)	2013/14 (£K)	2014/15 (£K)	Future Year (£K)	Total (£K)
Capital	0.00	712.08	0.00	0.00	0.00	1974.93	2687.00
Non-Capital	4.20	5.64	5.64	5.64	5.64	550.68	577.44
Total	4.20	717.72	5.64	5.64	5.64	2525.61	3264.44

- The figures in Tables 6.6-6.8 are costs at present day (2009) prices. They are not discounted and do not include the optimism bias. Neither do they allow for inflation.

- There are no capital or non-capital costs associated with SMU8/4.

- A breakdown of the first five year capital costs for SMU8/3/2 is provided in Appendix J.

- Expenditure profiles for years 1-30 for SMU8/2 and for years 1-100 for SMU8/3/1 & SMU8/3/2 are provided in Appendix K.

Contributions and Funding

- Funding for all capital and capital maintenance elements of the strategy will be through FDGiA, apart from the works designated to be carried out in strategy management unit SMU8/3/2, which will be funded through Section 106 monies which have been deposited with Sefton Council, expressly and only for use in the construction and maintenance of coastal defence measures to be carried out at Hightown.

- In tables 6.6-6.8 above the following identifies the proposed funding stream for different strategy elements:

- Costs to be funded through FDGiA are highlighted in red.
- Costs to be funded through Section 106 contributions are highlighted in green.
- Non- capital elements, funded through Sefton Council's Revenue Budget, are highlighted in cyan.
- Sefton Council will continue to work together with the Agency and other interested parties to investigate and, were possible, secure contributions to future coastal defence expenditure from third parties who benefit significantly from defence provision e.g. United Utilities.

6.4 Summary of Preferred Strategy

- The preferred strategy for the Crosby to Hightown Frontage comprises generally of management and maintenance of existing defences in the short term with minimum capital investment to protect key areas where infrastructure is at risk or where existing defences become life expired. The exact timing of these interventions is subject to on-going review and assessment supported by on-going monitoring.

- Short term potential FDGiA funded elements of the Strategy together with medium and long term intervention is subject to future review.

- No works are identified to be carried out to the natural dune frontage between the River Alt and Formby other than dune management which will principally be carried out by others agencies, although this will be informed by the results of the Coastal change pathfinder work, for which Sefton has received grant aid from DEFRA (http://www.defra.gov.uk/environment/flooding/manage/pathfinder/index.htm).

- The exception to this general model is at Hightown (ref Strategy Management Unit 8/3/2) where section 106 monies are to be used, initially during the first five years and regularly thereafter, as conditions dictate, to reinstate natural defences (by recycling of sand from other strategy areas) in order to reduce coastal defence risk, safeguard internationally rare species that would otherwise be endangered and maintain amenity interests. This option conforms to the policy in SMP2 and whilst intervention would occur at a later date if grant-in-aid was being used it would still conform with the policy of 'Hold the Line'. This option maintains maximum flexibility for the review of options within the SMP in the future.

- The strategy for much of the frontage will require on-going review and update as future conditions dictate but will be supported by strategic and local monitoring to determine more precisely the future intervention requirements for the frontage, which cannot at the present time by prescribed with any great degree of certainty.

- The Benefit Cost summary for the preferred strategy is provided in Table 6.9.

Table 6.9: Summary of Preferred Strategy

	SMU8/2	SMU 8/3/1	SMU 8/3/2	SMU8/4	Total
Standard of Protection	NA	NA	NA	NA	
PV Costs (£k)					
Capital	1007.08	587.89	1514.88	0.00	3109.85
Non-capital	1654.18	115.69	216.72	0.00	1986.59
Total PV Costs (£k)	2661.26	703.58	1731.60	0.00	5096.44
PV Benefits (£k)	2938.57	734.85	1900.98	26.87	5601.27
Average Benefit/Cost Ratio	1.10	1.04	1.10	NA	
Cash Costs (£k)					
Capital					
Non-capital					
Total Cash Costs (£k)					

- Details of the proposals for each Strategy Unit, within the short term epoch are provided in Appendix G with a project programme for works during this epoch provided in Appendix L.

- There will be a continuation of non-structural management work that is delivered via the Council's staff, this will include the use of planning policy to prevent inappropriate development, engagement with the public, provision of technical advice to Partners on the coast and the completion of a Coastal Change Adaptation Study.

7 Implementation

7.1 Project Planning

Phasing and Approach

Strategy Management Unit 8/2

- Works to be carried out in accordance with agreed structure maintenance plan, to be updated and amended annually, based on details and results from on-going defence and shoreline monitoring.

Strategy Management Unit 8/3/1

- Action plan for intervention, including predicted future recession contours to be devised utilising results from actual cliff edge and structure monitoring, which will be used to update predictions and identify optimum timing for intervention.

Strategy Management Unit 8/3/2

- Relevant approvals and design of the works will be sought during the next financial year with implementation during late spring and summer of 2011. Following on from completion of the works on-going monitoring of scheme performance and dune management will be carried out with the results being utilised to inform timing of future interventions as necessary.

Strategy Management Unit 8/4

- On going management of dune frontages (by Sefton Council;, Natural England, National Trust etc) will be informed by results of Coastal Adaptation study (www.defra.gov.uk/environment/flooding/manage/pathfinder/index.htm).

Programme and Spend Profile

- Key dates to completion of capital works are provided in table 7.1 below.

Table 7.1: Key Dates

Activity	Date
SMU 8/3/2 – Hightown Dunes Restoration	
Commence detailed appraisal	2009/10
Planning Approval	Summer 2011
Construction start	May 2011
Construction completion	August 2011

- Works to be carried out to avoid the principal bird feeding and roosting times – (November to March). From a construction perspective avoidance of autumn and winter working (October to April) is preferable.

- A joint appraisal/design/construction/hand-over programme for the works identified in SMU 8/3/2, will be agreed following appointment of a Contractor, as identified in section 7.2 below.

- The spend profile for the first five years is provided in Table 7.2 below.

Table 7.2: Annualised Spend Profile and OM Priority Score

Costs (£k)	2010/11[1]	2011/12[1]	2012/13[1]	2013/14[1]	2014/15[1]	Future Year[2]	Total
Maintenance & Future Capital Works: SMU 8/2 Priority Score = NA							
Capital	0.00	0.00	0.00	0.00	0.00	1797.36	1797.36
Non-capital[3]	23.62	33.95	34.83	35.67	36.56	673.76	838.39
Maintenance & Future Capital Works: SMU 8/3/1 Priority Score = 0.28							
Capital	0.00	0.00	0.00	0.00	0.00	1488.07	1488.07
Non-capital	20.00	5.19	0.00	0.00	8.23	232.31	2565.73
Dune Restoration SMU 8/3/2 Priority Score = NA							
Capital	0.00	729.88	0.00	0.00	0.00	1974.93	2704.81
Non-capital	4.20	5.78	5.93	6.07	6.23	550.68	578.89

Notes: [1] Figures for first five years include inflation at 2.5% per annum.
[2] Figures for future years' do not include for inflation.
[3] Non –capital figures for SMU8/2 assume first year figures identified by strategy are spread over first five years, to accord with Authority revenue budgets .

Outcome Measures Contributions

- "Projects that contribute towards the Defra Outcome Measures 1, 2 and 3 must be funded by *capital* Flood Defence Grant in Aid (capital FDGiA) and deliver benefits during the period from 1st April 2008 to the 31st March 2011".

- The works proposed in SMU 8/3/1 does not deliver benefits during this period.

- The only scheme within the strategy that provides an outcome measure score during this period are the works proposed in SMU8/3/2, which have moved 125 properties in Hightown out of any flood, or coastal erosion probability category to a lower one (OM2). This scheme does not contribute to DEFRA Outcome Measure Targets as it is wholly funded by non FDGiA monies.

7.2 Procurement Strategy

- A procurement review has been carried out to establish the procurement strategy for the SMU 8/3/2 works. The proposed strategy for procurement is to obtain tenders from contractors to be evaluated on a 70/30 quality:cost basis. This will be followed by early contractor involvement in the determination of a target cost to be used in a target cost contract.

- Tenderers will be selected from Constructionline. There is no requirement to advertise for Contractors in the OJEU as the total scheme costs fall below the required threshold.

- The major part of the quality submission will comprise information for the Construction Environmental Management plan including a traffic impact assessment. In addition, it

will include information on contract methodology, contract administration, contract organisation and management, health and safety, programme, previous work, and references.

- The form of contract will be NEC3 Option C: Target Contract with Activity schedule.

- Maintenance Works to be carried out in SMU 8/2 and 8/3/1 will be procured via Council's Maintenance term contract (renewed on 5 yearly basis).

- Procurement of Capital Maintenance works in the future will be subject to further review

7.3 Delivery Risks

High Level Risk Register

- Key project risks identified in the delivery of the works identified in the first five years are identified in table 7.6 below.

Table 7.3: High Level Risk Schedule and Mitigation

Key Project Risk	Adopted Mitigation Measure
Natural England Approval	• NE involved in strategy development process – concerns addressed as strategy approval has progressed
Habitats Regulations Assessment(s)	• Early screening to identify risks and identify potential issues that require resolution. NE confirmation that they agree with screening findings (ref Appendix Q)
Availability of Revenue Funding	• Works to be prioritised for revenue funding within SC revenue budgets
FEPA Approval	• On-going MFA liaison to be carried out

Safety Plan

- The Key Parties under the CDM Regulations will be as follows:

  - Client: Sefton Council
  - Designer: Capita
  - CDM Co-ordinator: To be confirmed

- Public Safety Risk Assessments will be produced for each separate strategy element prior to implementation of Works.