

# Project Appraisal Report

Authority Scheme Reference	HP21
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LDW/CPW Number	CPW 1995
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Promoting Authority	Hartlepool Borough Council
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Scheme Name	Seaton Carew Northern Management Unit (Phase1)
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Recent damage and undermining sustained at the coastal defences in Seaton Carew.

Date	December 2010
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Version	2
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This form is to accompany the Project Appraisal Report for a works scheme submitted for grant. Form and PAR are to be sent to the appropriate Area Flood & Coastal Risk Manager of the Environment Agency.



For Official Use Only

Authority Ref:

Email: [laidbfinance@environment-agency.gov.uk](mailto:laidbfinance@environment-agency.gov.uk)

Coast Protection Act 1949 Sections 5(1) to 5(6)

## Certificate of Statutory Consultations and Responses to them

I hereby certify that Hartlepool Borough Council has complied with the provisions of the Coast Protection Act 1949 ('the Act'), the Coast Protection (Notices) (England) Regulations 2002 SI 2002/1278 ('the Regulations') and the Memorandum Relating to Scheme Approvals and Grants under the Coast Protection Act 1949 ('the Memorandum'), in respect of the project the Council wishes to undertake at:

Seaton Carew, Hartlepool

Project name: Seaton Carew Northern Management Unit (Phase1).

In particular, the Council has:

1. Published Notice of the project in the form laid down in the Regulations in the following local newspaper(s):

Name of newspaper	Date Notice published	Response(s) (Nos)	Objection(s) (Nos*)
The Northern Echo (see appendix L)	30 <sup>th</sup> September 2010	0	0
The London Gazette (see appendix L)	30 <sup>th</sup> September 2010	0	0

\* If consent to withdraw an objection was conditional please provide details below

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If required please continue on a separate sheet,  
(manual users) please use a separate sheet of paper and tick this box to indicate you have done so,  
(electronic users) please tick this box and a continuation page will be automatically generated.....

7

2. Served Notice of the scheme on those bodies specified under regulation 3 of the Regulations, namely:

Name of Body	Date Notice Served	Number of objections*
PD Teesport	11 <sup>th</sup> October 2010	0
Northumbrian Water	11 <sup>th</sup> October 2010	0

in the form required by regulation 2 of, and the Schedule to, the Regulations.

\* If consent to withdraw an objection was conditional please provide details below

If required please continue on a separate sheet,  
 (manual users) please use a separate sheet of paper and tick this box to indicate you have done so, ☐  
 (electronic users) please tick this box and a continuation page will be automatically generated.....

When is the latest expiry date of any of the above mentioned Notices? .....

3. Consulted the following bodies as required by the Memorandum with the identified responses

Name of Body	Date of service	Date of response or consent	Consent given (With/without condition*)
Crown Estate Commissioners	27/08/10	01/09/10	Yes
Natural England (see 5 below)	Received	19/10/10	Yes
Duchy of Cornwall**	NA		
Duchy of Lancaster***	NA		
Ministry of Defence Land Agent	NA		

Councils in \*\*Cornwall, \*\*\*Lancashire & Merseyside North of R. Mersey and others where the Duchy is known to have an interest.

\* If consent was conditional please provide details below

Natural England: Scheme may require an Appropriate Assessment, see Appendix K.

4. Obtained necessary permissions and consents

*Please tick appropriate boxes*

(a) Planning permission for the works was granted..... ☐

By  Date

Reference

Conditions applied

Planning application submitted, decision awaited

If required please continue on a separate sheet,

(manual users) please use a separate sheet of paper and tick this box to indicate you have done so, (electronic users) please tick this box and a continuation page will be automatically generated. ....

☐

**or**

Planning permission is not required for any of the proposed works.....

☐

Reason

If required please continue on a separate sheet,

(manual users) please use a separate sheet of paper and tick this box to indicate you have done so, (electronic users) please tick this box and a continuation page will be automatically generated. ....

☐

(b) All other necessary consents e.g. building consent, listed building consent etc. have been obtained. ....

☒

Type of consent

NONE

By

Date

**or**

No other consents were required.....

☐

(c) All necessary licences under Part II of the Food and Environment Protection Act 1985 will have been obtained before the commencement of works. ....

☒

**or**

No licences under Part II of the Food and Environment Protection Act 1985 are necessary. ....

☐

Reason

If required please continue on a separate sheet,

(manual users) please use a separate sheet of paper and tick this box to indicate you have done so, (electronic users) please tick this box and a continuation page will be automatically generated. ....

☐

(d) A resolution was passed by the Council or a Sub-Committee with delegated powers authorising application to the Secretary of State for approval of the proposed works.....

☒

Date of resolution

30/04/07

5. Further to 3 above and where necessary, Natural England has confirmed that either;

*Please tick appropriate box*

the works do not require an appropriate assessment, under  
The Conservation (Natural Habitats, &c.) Regulations 1994.....

☐

**or**

its agreement to the conclusions of the appropriate assessment,  
under The Conservation(Natural Habitats, &c.) Regulations 1994.....

☐

Natural England letter dated

19/10/10

attached (Appendix K).

6. Established ownership of the land required for the site

*Please tick appropriate box*

The Council owns the entire site of the proposed works.....

☐

**or**

The following persons or bodies own some or the entire site of the works and have  
consented to the carrying out of the works and their subsequent maintenance.....

☒

Name of person/body	Date of Agreement
Crown Estates	01/09/10
Hartlepool Borough Council Planning	Awaited

*Please tick appropriate box*

• I certify that no part of the permanent or temporary works relating to this scheme  
has been started (other than work relating to the design of the scheme). .....

☒

**or**

• I certify that the works comprising this scheme were carried out under the provisions of section  
5(6) of the Act as they appeared to the Council to be urgently necessary for the protection of land  
in its area.

☐

I am authorised by the  
to sign on its behalf.

HARTLEPOOL BOROUGH

Council

Signature



Date

17/11/10

Name in  
BLOCK letters

ALASTAIR SMITH

Position

ASSISTANT DIRECTOR – TRANSPORTATION  
AND ENGINEERING

Contact details

HARTLEPOOL BOROUGH COUNCIL  
CIVIC CENTRE  
VICTORIA ROAD  
HARTLEPOOL  
TS24 8AY



ENVIRONMENT AGENCY

**For Official use  
only**

Grant allocation no.

**Coast Protection Act 1949 Section 21(i) (a)**

# **Application for Formal Approval of Coast Protection Project**

Once completed, two signed copies of this form together with the Tender Assessment Report should be sent to the Area Flood Risk Manager for your river catchment.

Project name

**Seaton Carew Northern Management Unit (Phase1)**

Authority Ref.

**HP21**

Name of Local Authority

**Hartlepool Borough Council**

Date of consent to works {CPA Sect 5(5)}

Project Costs ( Grant Eligible)	£ 000s
Preliminary Investigations	
Construction	
Land Purchase/Compensation	
Staff Salaries/Costs	
Consultants Fees & Site Supervision	
Contingencies & inflation	
Total Cost	

**Economic Justification**

Benefits (PVb)	£25,740	Costs (PVc)	£2,205
Benefit/Cost Ratio (PVb/PVc)	11.7	Net Present Value	£23,535
Incremental Benefit/Cost Ratio	NA		

Date of Construction Start

**March 2011**

I confirm that all necessary supporting documents are attached to this form and the application is in accordance with the requirements set out in the Memorandum relating to Scheme Approvals and Grants to Local Authorities under the Coast Protection Act 1949.

Signature

Title



Date




**For Environment Agency use only**

Signature		Title		Date	
Signature		Title		Date	

## PAR for Seaton Carew Northern Management Unit (Phase1)

Version	Status	Signed off by:	Date signed	Date issued
1	Submission to PAB		17/11/10	17/11/10
2	Post PAB amendments		17/12/10	17/12/10

PAR Template Version – August 2010



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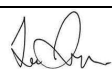
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## Approval History Sheet

APPROVAL HISTORY SHEET (AHS)			
1. Review (to be completed by promoting Authority)			
Project Title: Seaton Carew Northern Management Unit (Phase1)			
Authority Project Code: HP21		Date of PAR: December 2010	
Lead Authority: Hartlepool Borough Council			
Consultant: URS/Scott Wilson Ltd		Version No: 2	
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 eligible capital grant approval in the sum of £2,154k.			
Authority Project Executive	Alastair Smith		17/11/10
"I have reviewed this document and confirm that it complies with the current PAR guidelines for Local Authority and IDB submissions"			
PAR Reviewer	Dennis Hancock		17/11/10
"I confirm that I have consulted with the Head of FCRM & Business Finance and that the project is ready for submission to PAB/NRG"			
Area Flood Risk Manager	Ian Hodge		20/12/10
PAB – Project Assessment Board <input checked="" type="checkbox"/> (Projects less than £10 million) (Check box to indicate which is appropriate)		NRG – National Review Group <input type="checkbox"/> (Projects greater than £10 million)	
Date of Meeting(s): 9 December 2010		Chairman: Graeme Warren	
Recommended for approval: In the capital grant eligible sum of £2,154k		Date:	Version No:
<b>3. Project approval</b> Officers in accordance with the FSoD: Specified Officer; Regional Director; Director of Operations; Chief Executive or Director of Finance: Agency Board			
Version No:		Date:	
Capital Grant sum Approval	By: In the sum of: £ <i>(if different from above)</i>	Date:	
Breakdown of approved costs			
<b>4. Defra approval</b>			
Submitted to Defra or Not Applicable (as appropriate)		Date:	
Version No. (if different):			
Defra Approval: or Not applicable (as appropriate)		Date:	
Comments:			

## Coast Protection Scheme COVERSHEET to Signify Technical Approval




1.	<b>Project name</b>	<b>Seaton Carew Northern Management Unit (Phase1)</b>	<b>Start date</b>	March 2011
			<b>End date</b>	December 2011
	<b>Business unit</b>	North East Area	<b>Programme</b>	
	<b>Project ref.</b>	HP21	<b>FSoD ref. &amp; date</b>	

2.	<b>Role</b>	<b>Name</b>	<b>Post Title</b>
	<b>Project Sponsor</b>	Ian Hodge	Area FCRM Manager
	<b>Project Executive</b>	Alastair Smith	Assistant Director-Transportation and Engineering
	<b>Project Manager</b>	Dennis Hancock	Principal Engineer (Environmental Issues)

3.	<b>FSoD schedule</b>	<b>Description</b>	<b>Delegation</b>	
			<b>Regional – up to</b>	<b>Environment Agency – up to</b>
	<b>A1</b>	<input type="checkbox"/>	Projects (includes FCRM revenue)	£5m
	<b>A2</b>	<input checked="" type="checkbox"/>	FCRM capital project within approved strategy	£10m capital
	<b>A3</b>	<input type="checkbox"/>	FCRM capital project outside of approved strategy	£5m capital
	<b>A5</b>	<input type="checkbox"/>	Consultancy project	£300k
	<b>T2</b>	<input type="checkbox"/>	Purchase or lease of land and buildings	£1m purchase/£50k pa lease

4.	<b>FSoD value</b>	<b>£2,154k</b>
	<b>Preparation costs for FRM2/Business Case/PAR</b>	<b>£49k</b>
	<b>Project costs</b>	<b>£2,154k</b>

5. <b>Required level of Environmental Impact Assessment (EIA)</b>	<b>N/A</b> <input type="checkbox"/>	<b>Low</b> <input type="checkbox"/>	<b>Medium</b> <input type="checkbox"/>	<b>High</b> <input checked="" type="checkbox"/>
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6.	<b>FSoD approver name</b>	<b>Post title</b>	<b>Signature</b>	<b>Date</b>
	<b>David Dangerfield</b>	<b>North East Regional Director</b>		
	<b>FSoD consultee name</b>	<b>Post title</b>	<b>Signature</b>	<b>Date</b>
	Graeme Warren	PAB/LPRG Chair <div style="display: flex; justify-content: space-around; align-items: center;"> <span>RED <input type="checkbox"/></span> <span>AMBER <input type="checkbox"/></span> <span>GREEN <input type="checkbox"/></span> </div>		
	Ian Hodge	Area FCRM Manager		20/12/10
	Phil Welton	Area Coastal Engineer		12/12/10
	Dennis Hancock	Local Authority Project Manager		17/12/10

# 1 Executive Summary

## 1.1 Introduction and Background

### Location and Background

- 1.1.1 This report presents a robust business case to implement the preferred coastal defence strategy for the Seaton Carew Northern Management Unit (Phase1), SMP2 Management Area MA13.1A. Seaton Carew is located on the North East coast of England (Figure 1). Hartlepool Borough Council (HBC) has coastal management responsibilities for this frontage, and has powers under the Coast Protection Act 1949 to undertake the recommended coastal works.
- 1.1.2 The Seaton Carew Coastal Strategy was produced in Summer 2010. The strategy was presented to the National Review Group (NRG) for review in September 2010. The strategy was driven by outputs from the River Tyne to Flamborough Head SMP2. The SMP2 policy is to 'Hold the Line' along this frontage. This PAR was commissioned prior to final approval of the strategy as the works are urgently required to reduce existing health and safety risks and the possibility of significantly increased expenditure should the defence fail due to delay in the implementation of a preferred scheme.
- 1.1.3 Following NRG's initial review, the Seaton Carew Coastal Strategy is currently being amended to include more specific information on the economics, external contributions and Water Framework Directive prior to re-submission in Jan 2011. Comments received from NRG were focused primarily on other schemes proposed within the strategy due to their reliance on recreational benefit and/or the requirement for significant external contributions to render the schemes viable. For this particular scheme, these issues are not relevant and NRG gave indication, prior to recommending for approval, that they were satisfied with the direction of travel being followed and proposed scheme solution at MA13.1A.
- 1.1.4 At MA13.1A (the appraisal frontage), the existing seawall has been undermined and is at risk of collapse (Figure 2). Temporary emergency toe protection was provided in 2008 to delay further undermining. However this does not extend the full length of the wall at risk, and is inadequate in its volume. The frontage also includes a short section of low height seawall, the former 'North Shelter' area, which is overtopped and is a risk to public health and safety.

### History of Flooding and/or Coastal Erosion

- 1.1.5 The MA13.1A seawall is a vertical concrete wall with a recurved parapet, built circa 1938. The wall is fronted by a sandy beach, that in response to wave and weather conditions, shows strongly varying levels over short periods of time. In recent years beach levels in front of the wall have reduced to reveal the toe and foundations (Plate 1, Appendix C).
- 1.1.6 Whilst the existing wall is in good condition, reduced beach levels have resulted in undermining of the defence toe and loss of fill material from behind the wall. Following detailed investigations in the Seaton Carew Coastal Strategy Stage A Report, the walls have been assessed as having a residual life of 5 years or less,

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but due to the exposed foundations a significant storm event could lead to catastrophic failure at any time (Plate 2 Appendix C).

- 1.1.7 These concerns are emphasised by two recent failures at the former 'North Shelter' area resulting in the loss of access steps in 2006 and a near fatality in 2007. These failures coincided with a simultaneous reduction in beach level leading to exposure of the wall foundations leaving the 4.5m high seawall in a potentially unstable condition and caused significant damage (Plate 3 to 5 Appendix C). HBC moved quickly to implement emergency engineering works to fill the damaged areas with mass concrete and provide rock armour to protect the foundation toe, but these are not considered a permanent solution.

## 1.2 Problem

- 1.2.1 The low beach levels and exposed seawall foundations, place the defence structure at high risk of collapse. A typical storm event could cause a catastrophic failure, and represents a significant health and safety risk to the general public and significant risk of increased expenditure as a result. Further high tides and storm events, would lead to accelerated and progressive failures of the adjoining sections of seawall in MA13.1A, and eventually compromise the refurbished defences to the north in MA12.2C and the defences to the south in MA13.1B.
- 1.2.2 Following failure, the assets at immediate risk from loss due to erosion include the promenade (year 5), the A178 coastal road (year 10), access infrastructure including Northumbrian Water rising main, civic sites and services (year 15) and 238 residential properties (valued at £41m, from year 30 onwards). Early intervention will eliminate the health and safety concerns associated with seawall collapse, and avoid significant future capital investment to rebuild the seawall.

## 1.3 Options Considered

- 1.3.1 From the long list of options considered in the Seaton Carew Strategy, two options were developed for detailed consideration to 'Hold the Line'. These options were a Full Height Revetment or Toe Protection (in the form of a low crested revetment). More detailed scheme options have now been developed based upon an analysis of the local site conditions, coastal processes and structure condition. These include:
- 1.3.2 Option 1 Rock Toe Berm: To protect the seawall foundations and provide a modest improvement in overtopping, a significant rock toe berm would be constructed at the seawall toe. The berm would extend from the foreshore bedrock up and over the seawall toe. The rock toe berm would have a design life of 50 years, after which it would need to be upgraded.
- 1.3.3 Option 2 Sheet Pile Toe: To protect the seawall from undermining, sheet piling would be installed in front of the wall foundations, with the existing emergency rock toe protection reinstated and enhanced. Option 2 represents the minimum capital works option, and would formalise the existing emergency works, but would require further upgrades in Year 30 and Year 70. The sheet piling will be anchored to the toe of the seawall with concrete to increase the stability of the piles. The existing rock revetment would be laid on a geotextile in front of the wall, and a new cover layer of rock provided.

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- 1.3.4 Additional works necessary for both of the above options are to raise a 70m length of existing low height seawall and conduct remedial repairs to infill the open construction joints and repair areas of spalled concrete. These are necessary to reduce overtopping and damage and minimise any long term defects affecting the residual life of the seawall structure.
- 1.3.5 Option 3 New Seawall: The Seaton Carew Strategy Stage A report has confirmed that the current wall is in good condition and is not in need of replacement unless undermining leads to collapse. To consider the cost implication of a seawall collapse, a replacement seawall option was costed for comparative purposes. However this was not taken forward for detailed appraisal, as it was not a recommended option from the strategy, and incurs high up front capital costs of over £6,200k.

## 1.4 Preferred Option

### Description

- 1.4.1 Option 1, the Rock Toe Berm, requires a significant volume of new rock armour, leading to high scheme cost and lower benefit/cost ratio. Concern also exists that significant damage could be caused to the berm following an event greater than the design standard, which could once again expose the wall foundations, and put the structure at risk of collapse.
- 1.4.2 On the basis of technical, environmental, and economic merit, **Option 2 Sheet Pile Toe** was selected as the Preferred Scheme Option for the MA13.1A frontage. This option achieves the strategic objectives of the StAR and has low environmental and amenity impact, while providing the full amount of benefits.

### Environmental Considerations

- 1.4.3 The coastal strategy Strategic Environmental Assessment has identified that MA13.1A lies outside of any statutory nature conservation areas. However, the northern end of the works would be immediately adjacent to the non-statutory designated sites of Long Scar & Little Scar LGS and Carr House Sands & West Harbour LWS. Therefore an Environmental Impact Assessment will consider the construction impacts of Option 2 on these non-statutory designated sites.
- 1.4.4 The scope of the EIA has been agreed with the Local Planning Authority via a formal scoping process and development of the EIA built upon the existing Strategic Environmental Assessment and considered landscape, visual, heritage, ecology and land-use issues.
- 1.4.5 Natural England has provided advice on the proposed scheme at MA13.1A through a letter of support (Appendix K). They consider that the scheme is likely to lead to an environmental acceptable solution, but may require an appropriate assessment. The Environmental Statement produced to supplement the Planning Application concludes that the works proposed would not result in adverse effects on the integrity of the designated sites and therefore an Appropriate Assessment is not required.
- 1.4.6 The preferred option will not have any significant long-term adverse impacts and will maintain and enhance access for amenity, tourism and recreation. The

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preferred option will include beneficial re-use of the existing emergency rock armour and the crushing and re-use of the existing access steps concrete as backfill to the former 'North Shelter' area.

## Benefits

- 1.4.7 The short-listed option benefits have been derived using the Environment Agency Flood Coastal and Erosion Management –Appraisal Guidance (EA FCERM-AG), associated Supplementary Guidance, and the Green Book (HM Treasury, 2003). An assessment of the erosion losses following seawall failure was undertaken and a list of properties and infrastructure at risk was compiled based on the Seaton Carew Coastal Strategy. There are a total of 238 residential properties at risk from erosion with a PV value of £7,286k. The commercial and infrastructure benefits have a PV value of £3,914k.
- 1.4.8 Due to the fact that Seaton Carew sits in a unique location south of Hartlepool and provides the only readily accessible beach frontage within an hours drive, recreational benefits have been included in the assessment, as it is considered tourism income would not be completely transferred elsewhere,.
- 1.4.9 The value of 'loss of enjoyment' was provided by HBC, the figures used are identical to those used within the adjacent Redcar Flood Alleviation Scheme. For Redcar economic values on the loss of enjoyment were estimated at £7.00 per day visitor and £23.60 per staying visitor. Visitor numbers to Seaton Carew were estimated by HBC. In the 'Do Nothing' scenario, it has been assumed that 33% of the visitors would be deterred from visiting the coast. The total loss in recreational value was then calculated by multiplying the number of deterred visitors by the value of their enjoyment per visit. To ensure the value of recreation benefits is conservative within the economic analysis only 30% of the annual tourism loss was taken for MA13.1A (£14,540k PV) as it is recognised that a portion of recreation income could be transferred or continue even if the frontage was lost under the "Do Nothing" scenario. This has been examined further through sensitivity testing of the preferred option.

## Costs

- 1.4.10 Option scheme costs have initially been estimated using Price Guides factored for restricted access and tidal working, and subsequently benchmarked against contractor's estimates or against similar works carried out previously at Seaton Carew. Investment timings have been based on the estimated residual life of existing structures. The appraisal base date is September 2010, with construction anticipated to commence in January/February 2011. A summary of the scheme costs for approval are shown in Table 1.1. The whole life PV cost for the preferred option is £2,205k. The scheme costs include an 'internal' contribution from the re-use of the existing rock armour, which reduces the volume of imported rock. This saving has been conservatively estimated at £60k. HBC are also to provide a direct contribution of £87k for landscaping works.

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**Table 1-1 Scheme Costs for Approval (£k)**

Activity	Option 2 Sheet piled toe £k (2010)
Authority Project Management Staff Salaries (including Planning Application)	10
Consultant fees for Design and Site Supervision	190
Construction	1,466
Landscaping	87
Inflation allowance	37
Risk Contingency	451
<b>Contribution from HBC for Landscaping</b>	<b>-87</b>
<b>Total (capital cost for approval)</b>	<b>2,154</b>

## Economic Summary, Outcome Measures and Priority

- 1.4.11 The Outcome Measures scores are summarised in Table 1.2 below. The only Outcome Measures relevant to the MA13.1A frontage are OM1 and OM2. The non-monetarised benefits listed in section 5.6.11 are not captured by the Outcome Measures scores. The preferred option protects 238 households from erosion achieves an Outcome Measure Score of 4.23, with a benefit to cost ratio of 11.7. The total PV Benefit is £25,740k.

**Table 1-2 Outcome Measure Contributions and Prioritisation Score**

Outcome Measure	Value
OM1- Economic Benefit	
PV Benefits (£k)	25,740
PV Costs (£k)	2,205
Benefit/Cost Ratio	11.7
OM2 Households at risk (Nr)	238
<b>Outcome Measure Prioritisation Score</b>	<b>4.23</b>

## Funding and Contributions

- 1.4.12 The construction costs include an 'internal' contribution from the re-use of the existing rock armour previously funded and placed by HBC which reduces the volume of imported rock. This has been conservatively estimated at £60k. HBC are committed to maintaining the aesthetic appearance of the area and therefore propose to landscape the promenade following completion of the coastal protection works; this is to be funded from HBC's own revenue budget. Therefore landscaping costs, estimated at £87k, have been included as a direct contribution to the scheme costs.

- 1.4.13 From the Seaton Carew Coastal Strategy, detailed discussions regarding contributions to identified schemes are ongoing between Hartlepool Borough Council and Northumbrian Water, PD Teesport, British Energy and prospective regeneration developers. These discussions are focused on contributions to works proposed to the south of the MA13.1A frontage and are at an advanced

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stage. Draft Memorandum's of Understanding are currently being agreed in relation to these works. No external contributions have been identified for this scheme as assets protected are predominantly residential with benefits to recreation, tourism and public safety.

## Key Delivery Risks

- 1.4.14 A high level risk register has been developed. This has identified the risks to the implementation of the scheme and the risk contingency. A risk contingency of 30% of the capital cost (£451k) was included in the sum for approval.
- 1.4.15 The project will be designed and managed by Hartlepool Borough Council. HBC are an experienced Coastal Protection Authority, with recent success in delivering similar coastal protection projects. The key project risk and proposed mitigation are summarised in Table 1.3 below.

**Table 1-3 Risk and Mitigation**

Key Project Risk	Adopted Mitigation Measure
Storm damage prior to or during the works	HBC routinely monitor the site for damage. Works programmed to start as soon as possible. Contractor to remove existing toe protection in phases.
Unknown ground conditions	Comprehensive ground and structure investigations were conducted as part of the strategy. A residual risk remains however, as the works include remedial repairs to an existing structure.
Project delays or changes in scope occur as a result of the availability of funding (e.g. departmental budget)	Hartlepool Borough Council has experience in the management of 'Grant in Aid' funded projects.

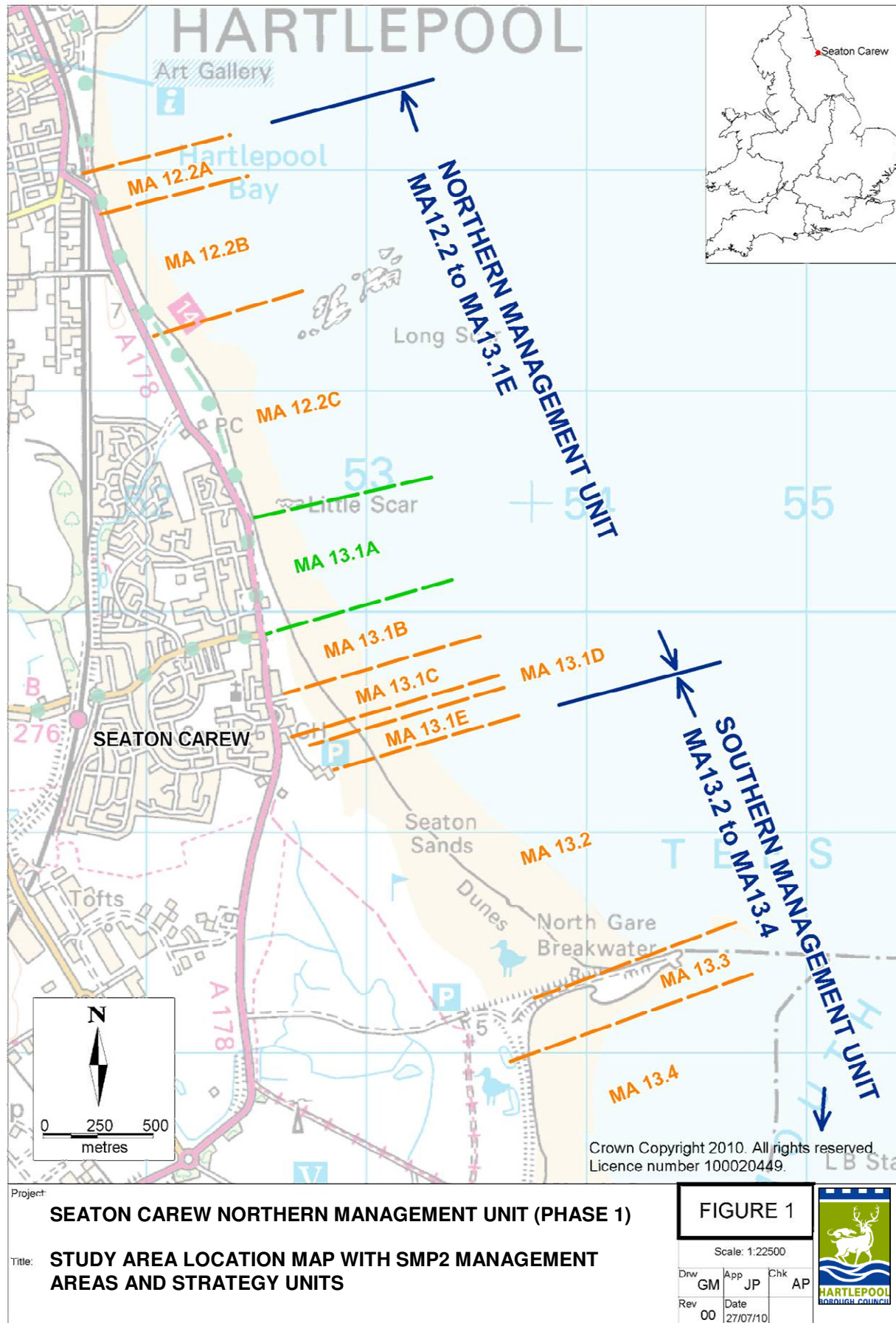
## 1.5 Summary

- 1.5.1 The urgent implementation of the preferred appraisal option; Option 2: Sheet Piled Toe for the MA13.1A frontage, will prevent failure of the existing seawall, eliminate health and safety concerns regarding collapse of the structure, reduce expenditure to a minimum and protect the town of Seaton Carew from coastal erosion. Option 2 is the preferred option on the basis of technical, environmental, and economic merit.
- 1.5.2 The total sum for capital grant aid approval is £2,154k. This option achieves the strategic objectives of the Seaton Carew Strategy and has low environmental and amenity impact, while providing the full amount of benefits, (£25.7m). The scheme benefit cost ratio is 11.7, with an Outcome Measure score of 4.23.

## 1.6 Briefing Paper

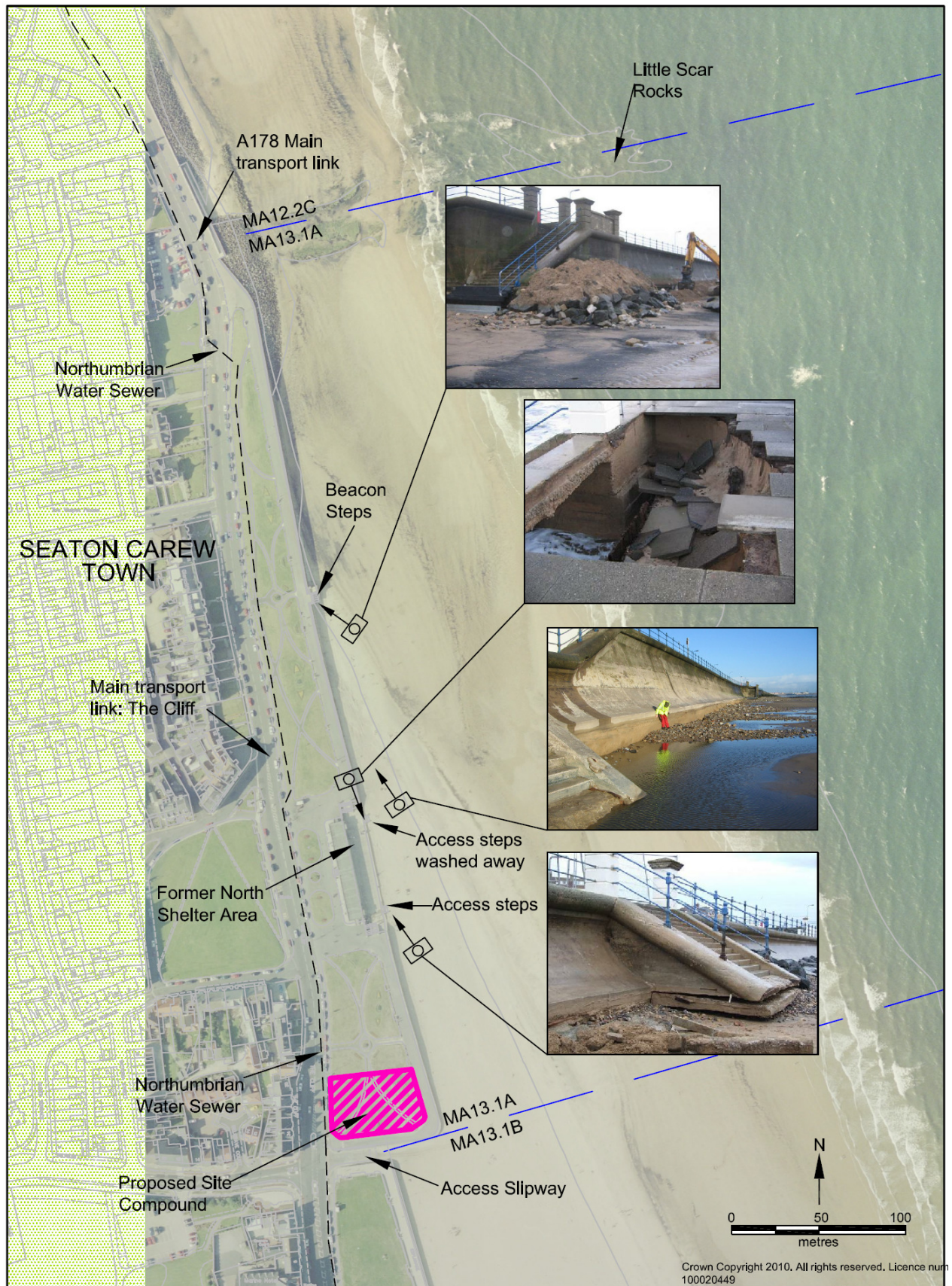
<b>Authority:</b>	Hartlepool Borough Council	<b>Project Executive:</b>	Alastair Smith		
<b>Project Title:</b>	Seaton Carew Northern Management Unit (Phase1)		<b>Code:</b>	HP21	
<b>Consultant:</b>	URS/Scott Wilson Ltd	<b>Contractor:</b>	-		<b>Cost Consultant:</b> -
<b>The Problem:</b>	Lowering of the beach in front of the seawall has lead to recent failures, structural damage and exposure of the wall foundations. As a result the wall is at risk of failure and has a residual life <5 years. Overtopping damage has also occurred at a low section of the wall.				
<b>Assets at risk:</b>	238 residential properties, main coastal road and a large diameter sewer pipe in the promenade. Benefits of tourism to the local area.				
<b>Existing standard of flood protection:</b>	NA		<b>Proposed standard of flood protection:</b>	NA	
<b>Description of proposed scheme:</b>	Urgent enhancement of existing emergency toe protection works, to provide a more robust structure to prevent undermining. Reduction in overtopping risk to members of the public at former North Shelter Area.				
<b>Costs (PVC, £k): (100 year life inc. maintenance)</b>	£2,205	<b>Benefits: (PVb)</b>	£ 25,740	<b>Ave. B: C ratio: (PVb/PVc)</b>	11.7
<b>NPV:</b>	£23,535	<b>Incremental B: C ratio:</b>	NA	<b>Whole life cost (cash value):</b>	£2,366
<b>Choice of Preferred Option:</b>	Toe protection revetment and piling works. Local raising of a low section of seawall.				
<b>Total eligible cost for which capital grant approval is sought:</b>				£ <b>2,154k</b> (incl. £37k inflation & £451k contingency)	
<b>Delivery programme:</b>	Planning Approval: February /March 2011 Award Construction Contract: February/March 2011 Construction Start: March 2011 Construction end: October/November 2011 End of Project: December 2011				
<b>Are funds available for the delivery of this project?</b>					
<b>External approvals:</b>					
<b>Outcome measures</b>	OM1:0.006957 ; OM2:0.00238 Overall OM score: 4.23 Contribution to Defra SDA Targets: 238 residential houses.				

## 1.7 Key Plan(s)



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## 2 Introduction and Background

### 2.1 Purpose of this Report

- 2.1.1 This Project Appraisal Report (PAR) is to support an application for Flood Defence Grant in Aid (FDGiA) funding and to seek approval to undertake coastal protection works. The report presents a robust business case to implement the preferred coastal defence works for the Seaton Carew Northern Management Unit (Phase1).
- 2.1.2 The appraisal has been carried out in accordance with the EA's Policy Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG), March 2010.

### 2.2 Background

#### Strategic and Legislative Framework

- 2.2.1 The Seaton Carew Coastal Strategy was produced in Summer 2010. The strategy was presented to the National Review Group (NRG) in September 2010. The strategy was driven by outputs from the River Tyne to Flamborough Head SMP2. The SMP2 policy is to 'Hold the Line' along this frontage. This PAR was commissioned prior to the strategy being recommended for approval, as the works are urgently required to reduce existing health and safety risks, and the possibility of significantly increased expenditure should the defence fail due to a delay in the implementation of a preferred scheme.
- 2.2.2 Following NRG's initial review, the Seaton Carew Coastal Strategy is currently being amended to include more specific information on the economics, external contributions and Water Framework Directive prior to re-submission in Jan 2011. Comments received from NRG were focused primarily on other schemes proposed within the strategy due to their reliance on recreational benefit and/or the requirement for significant external contributions to render the schemes viable. For this particular scheme, these issues are not relevant and NRG gave indication, prior to recommending for approval, that they were satisfied with the direction of travel being followed and proposed scheme solution at MA13.1A.
- 2.2.3 The strategy area is defined as the coastline between Newburn Bridge to the north and the Tees Estuary to the south and comprises Management Areas MA12.2, MA 13.1, MA13.2, MA13.3 and MA13.4 as defined in the River Tyne to Flamborough Head SMP2 (Figure 1).
- 2.2.4 The Seaton Carew Strategy recommends managing the coastline as two Management Units. The Northern Unit encompasses the residential and commercial frontage of Seaton Carew with a Hold the Line Policy and the Southern Unit (MA13.2-Seaton Sands to MA13.4 North Gare Sands) consists of dunes controlled by two control structures, the North Gare Breakwater and the Seaton Channel Training Wall. The recommended policy for the Southern Unit includes 'No Active Intervention' at the dunes of Seaton and North Gare Sands

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with significant capital works to reinstate the breakwater and training wall structures.

- 2.2.5 Hartlepool Borough Council (HBC) has coastal management responsibilities within the appraisal area. HBC has powers under the Coast Protection Act 1949 to undertake the recommended coastal works along the frontage.
- 2.2.6 The Habitat Regulations Assessment (HRA) Screening Report prepared for the Seaton Strategy concluded that there was no potential for significant effects on the Teesmouth and Cleveland Coast Special Protection Area (SPA) and Ramsar site. MA13.1A lies outside of any statutory nature conservation areas. However, the Strategy Environmental Assessment (SEA) identified that the northern end of the works would be immediately adjacent to the non-statutory designated sites of Long Scar & Little Scar LGS and Carr House Sands & West Harbour LWS. An Environmental Impact Assessment (EIA) Scoping Opinion, based on the Strategy SEA report, has confirmed the need for an ES to be carried out under the Town and Country Planning (EIA Regulations) 1999. This has considered landscape, visual, heritage, ecology and land-use issues during the scheme construction and operation.

## Previous Studies

- 2.2.7 The Seaton Carew Coastal Strategy StAR was produced in Summer 2010 and presented to NRG in September 2010. No further detailed studies for this frontage have been completed.

## Social and Political Background

- 2.2.8 The Seaton Carew frontage MA13.1A protects 238 households within the 100 Year erosion envelope as well as a range of commercial properties, including hotels and shops, and the A178 critical transport link.
- 2.2.9 The regeneration of the Seaton Carew frontage is a primary objective for HBC. Preliminary regeneration proposals are to regenerate the frontage situated behind the defences in MA13.1 B – E which is located immediately to the south of this frontage. Reinforcement of the defence in MA13.1A is critical to these proposals to maintain the strong residential, commercial and industrial links and the important role that this section of defence plays in linking the whole frontage of Seaton Carew together. HBC consider the provision of coastal defences compatible with these proposals as essential to the long-term regeneration of Seaton Carew.
- 2.2.10 The Index of Deprivation (2007) shows that out of a total of 32,482 the Seaton Carew area was ranked 7,408 on the Health Deprivation and Disability index, and 15,124 on the Index of Multiple Deprivation. The frontage provides access to large amenity beaches and a wide promenade. It is therefore an important area for local tourism and recreation which contribute significantly to the local economy, social well being and health.

## Location Description

- 2.2.11 The seaside town of Seaton Carew is located on the North East coast of England, approximately 2 miles south of Hartlepool. The northern half of the town

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is protected by a linear seawall defence (MA13.1A) with some emergency rock toe protection (Figure 1). Further north (MA12.2C) coastal protection works were undertaken in 2002 to provide a full height rock revetment and wave wall. To the south of MA13.1A, the defences are in a state of disrepair with spalling concrete exposing the reinforcement in some places. However unlike MA13.1A, these defences are afforded some protection by the presence of a wide beach.

## History of Flooding or Coastal Erosion

- 2.2.12 At MA13.1A, the seawall comprises a vertical concrete wall with a recurved parapet, and was built c.1938. The seawall is generally in good condition and is fronted by a sandy beach, of strongly varying levels over short periods of time. The frontage also includes a short section of low height seawall, the former 'North Shelter' area, which is overtopped and is a risk to public health and safety (Figure 2).
- 2.2.13 Whilst the existing seawall is in good condition, reduced beach levels have resulted in undermining of the defence toe and loss of fill material from behind the wall. Following detailed investigations in the Seaton Carew Coastal Strategy Stage A report, the seawalls have been assessed as having a residual life of 5 years or less due to the exposed foundations which leave the walls vulnerable to catastrophic failure (Plate 1, 2 Appendix C).
- 2.2.14 These concerns are emphasised by two recent failures at the former 'North Shelter' area, which is lower than the adjoining promenade and only 2m above mean high water springs. It is particularly vulnerable to overtopping and failure (Plate 3 to 5 Appendix C). In 2006 the access steps were lost, and in 2007 in a near fatal accident, a member of the public fell into a 2m deep void that opened up in the promenade behind the defence following a storm (Figure 3, Appendix D). In response to these events, HBC moved quickly to implement emergency engineering works to fill the damaged areas with mass concrete, but these are not considered a permanent solution. After further consideration, HBC was forced to close off this area due to the health and safety risk to the public and this area still remains closed.
- 2.2.15 The only remaining access steps along this frontage, the 'Beacon Steps' are also of concern and were found to be prone to structural movement and cracking, following routine monitoring by HBC. In response high level rock armour was placed around the steps in an attempt to prevent further movement.
- 2.2.16 Along the remainder of this frontage, the full height seawall continues to prevent coastal erosion and gives some protection from wave overtopping, though localised remedial repairs are required to open construction joints and small areas of spalled concrete to maximise the structure's residual life (Plate 6, Appendix C).

## 2.3 Current Approach to Coastal Erosion Risk Management

- 2.3.1 HBC currently manages the coastal defences along the frontage through routine monitoring, general and reactive maintenance, emergency works, and closing the promenade and beach access as required to maintain public safety.

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## 3 Problem Definition and Objectives

### 3.1 Outline of the Problem

- 3.1.1 Site investigations undertaken during the strategy study have confirmed that the existing seawall is in relatively good condition. However the stability of the seawall is being compromised by the wall foundation resting on consolidated beach sand, which is open to ongoing rapid scour by waves due to fluctuating beach levels. An average storm could further erode these weak foundations to the point of failure, leading to loss of toe stability, catastrophic collapse and coastal erosion.
- 3.1.2 This risk was demonstrated by a storm in March 2006 which exposed the underside of the seawall toe and compressed sand on which the wall was founded (Plate 1). Fortunately this was identified immediately by HBC and was not sufficient to compromise wall stability. To mitigate this risk, emergency rock toe protection was provided, however this is by no means a permanent solution as it does not extend along the full length of the wall at risk, is inadequate in its volume and it does not prevent loss of beach sand through the voids between rocks (Plate 7, Appendix C).
- 3.1.3 Due to health and safety concerns, HBC does close off sections of the promenade and beach access and will be increasingly forced to do so in the future to maintain public safety. Following collapse, HBC would be required to implement emergency control measures to make the site safe. Further high tides and storm events, would lead to accelerated and progressive failures of the adjoining sections of seawall in MA13.1A, and eventually compromise the refurbished defences to the north in MA12.2C and the defences to the south in MA13.1B leading to significantly increased expenditure.
- 3.1.4 The recent failures and events of undermining of the wall toe highlight the urgent need for works to prevent failure of the seawall and promenade, which would lead to the likely future erosion scenario for the assets behind the seawall predicted by the strategy. (Figure 4, Appendix D). These include loss of the promenade and rising main (year 5), the A178 coastal road (year 10), access infrastructure, civic sites and services (year 15) and residential properties (year 30 onwards). Future storms, exacerbated by rises in predicted sea level rise and storm severity will accelerate the erosion process.
- 3.1.5 Without urgent intervention, significant future capital investment will be required to reinstate the defence line, protect Seaton Carew Town and continue the SMP2 policy of 'Hold the Line'. Early intervention now will maintain the benefits that the frontage provides in terms of large amenity beaches which are an important part of this 'seaside town' and contribute significantly to the local economy.

### 3.2 Consequences of Doing Nothing

- 3.2.1 Along the Seaton Carew frontage, failure of a section of the defence would lead to erosion of the hinterland behind the defence and eventual loss of assets. Full development of the erosion scenario along the Seaton Carew frontage is

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documented in the Seaton Carew Coastal Strategy – Stage B Report. Erosion lines were calculated for the 100 year appraisal period as shown in Figure 4, Appendix D.

- 3.2.2 Within the Seaton Carew Strategy the key assets and services at risk from erosion as a consequence of the ‘Do Nothing’ scenario were identified and valued. These have been taken forward into this PAR.
- 3.2.3 In the ‘Do Nothing’ scenario, the seawall is anticipated to fail within 5 years, leading to loss of the promenade and the 900mm Northumbrian Water sewer, followed by the A178 ‘Coronation Drive’ critical transport link (year 10). Residential properties and commercial premises are at risk from year 30 of direct erosion or are indirectly affected due to the loss of services or access. The ‘Village Green’, designated under the Commons Act 2006 would be eroded from year 50. In the longer term, the failure of the defences at this frontage, will eventually outflank and compromise the refurbished defences to the north in MA12.2C and the older defences in MA13.1B southwards.
- 3.2.4 Prior to defence failure, HBC would be forced to close off areas of the promenade and beach for public safety, leading to a long term negative impact on social well being and health. In addition Seaton Carew will suffer social and economic damages to local tourism and recreation.
- 3.2.5 Table 3-1 below outlines the key damages and their associated economic value.

**Table 3-1 MA13.1A key damages and values**

Management Unit	Asset Type	Number of or area at risk	Cash Value (2010) £k
MA13.1A	Residential Property	238	41,435
	Commercial Property	3	1,675
	General Infrastructure / Services	-	1,237
	Northumbrian Water Sewer	-	651
	Civic sites	6	1,300
	Loss of designated Village Green	0.9 Ha	-
	Recreation & tourism	-	54,798
	Major Health and Safety Risks	-	Not Costed
	Loss of A178 Coastal Access road - critical transport link.	-	2,000
	<b>TOTAL</b>	-	<b>103,095</b>

### 3.3 Strategic Issues

- 3.3.1 The MA13.1A PAR builds upon the Seaton Carew Coastal Strategy, which after considering the wider strategic implications, recommended a ‘Hold the Line Policy’. Strategically if the MA13.1A defences were allowed to fail, coastal erosion could in the longer term, outflank the refurbished defences to the north in MA12.2C and the older defences in MA13.1B southwards, compromising the ‘Hold the Line Policy’ of these management areas. To address significant health and safety issues and the potential for increased expenditure if delayed, the StAR proposed that the works along MA13.1A be fast-tracked ahead of final approval of the strategy.

- 3.3.2 The StAR considered a series of options for the frontage on economic, environmental and technical grounds, and recommended raising the former 'North Shelter' area and providing improved toe protection along the whole frontage. The following aspects were to be developed in further detail as part of the PAR: economic appraisal, optimisation of the final form of the preferred option, outline design, environmental mitigation measures and more detailed scheme costings.

## 3.4 Key Constraints

- 3.4.1 The frontage provides access to large amenity beaches and a wide promenade, and is therefore an important area for local tourism and recreation. Any proposed works will need to minimise adverse impacts on these benefits, fulfil any environmental constraints and maintain public safety.
- 3.4.2 A detailed Environmental Impact Assessment and Planning Permission are required as part of the detailed design stage. The scope of the EIA has been agreed with the Local Planning Authority via a scoping exercise. The EIA built upon the existing Strategic Environmental Assessment and considered landscape, visual, heritage, ecology and land-use issues. Although statutorily an EIA is required, MA13.1A lies outside of any statutory nature conservation areas.
- 3.4.3 A small minority of the works are located below MHWS, therefore a FEPA licence will be required.

## 3.5 Objectives

- 3.5.1 To achieve the long term management objectives of the Seaton Carew Coastal Strategy, the StAR put forward a series of capital works schemes to be developed through a series of PAR's in priority order. These works were prioritised based on a series of objectives. Of these, the following are achieved by implementing the preferred strategy option at MA13.1A:
- a. Prioritise works to address the most significant risks;
  - b. Reduce risks with regards to public safety and health and safety issues along the frontage;
  - c. Prevent the loss of assets (economic and environmental) to coastal erosion;
  - d. Achieve the SMP2 Management Policy over the entire strategy period, where this is shown to be justified in terms of economic and environmental assessment;
  - e. Retain the natural protection provided by the beach;
  - f. Address the increased pressure on the existing coastal defences as a result of rising sea levels;
  - g. Achieve the above with minimal adverse impact on the existing social and environmental assets and where possible enhance these assets.

## 4 Options for Managing Coastal Risk

### 4.1 Potential FCRM Measures

- 4.1.1 Seaton Carew Coastal Strategy – Stage A Report included intrusive, structural and ground investigations of the MA13.1A frontage, and concluded that if the existing seawall was suitably protected from undermining, it would not require replacement. However the existing emergency toe protection is not sufficient to prevent undermining and protect against wall failure. Therefore the Seaton Carew Coastal Strategy Stage B Report considered generic coastal protection options to implement the SMP2 ‘Hold the Line’ policy. These options were appraised in the StAR and summarised below.

### 4.2 Long List of Options

- 4.2.1 Table 4-1 below is reproduced from the StAR and summarised the key options for the Northern Management Unit highlighting the options rejected at the preliminary assessment stage. The four options taken forward for further consideration included Maintenance, Toe Protection, Revetments and a Seawall.

**Table 4-1 StAR long list of options for Northern Management Unit**

Management Option	Tech	Env	Econ	Key Reasoning	Rejected
Beach Recharge				Not sustainable in the long-term due to high capital costs	YES
Groynes				Would change character of frontage and impact amenity of the beach. It is also unsustainable due to high capital costs.	YES
Offshore Breakwaters				Would significantly alter the character of the frontage and is unsustainable due to high capital costs.	YES
Maintenance of Existing Defences				Maintenance would be suitable for areas of good defence or to maintain improved defences in the future.	NO
Toe Protection				Would address undermining issues. Cost effective solution	NO
Revetments				Would address undermining and overtopping issues	NO
Seawall				Would address structural and overtopping issues	NO

### 4.3 Short List of Options and Preferred Strategy Options

- 4.3.1 In developing a preferred option, the Strategy took forward the short-listed options for appraisal on the grounds of technical, environmental, social and economic considerations.
- 4.3.2 The Strategy determined that the provision of a small amount of rock armour in front of the existing seawall would dissipate wave energy by inducing breaking and would prevent removal of sediment from the base of the structure. Therefore it was considered that a rock type solution would also be an effective upgrade or replacement option. However the full height revetment solution was rejected in

favour of the toe protection option due to the higher environmental impact and cost associated with the high level revetment with only a marginal increase in the degree of asset protection.

- 4.3.3 The preferred option included raising of the seawall along the former 'North Shelter' area with infill behind and remedial repairs to the existing seawall.

## 4.4 Options Short-listed for PAR appraisal

- 4.4.1 Compared to the Strategy, a PAR considers the technical, environmental, and economic merits of different options with a greater level of detail. Therefore, to determine the preferred scheme, the toe protection option was taken forward for detailed analysis and tested in three different configurations. These are summarised in Table 4-2.

**Table 4-2 Short-listed options for PAR appraisal**

Option 1	Provision of new toe protection in the form of a low crested rock toe berm to protect the seawall. Raise the former 'North Shelter' area.
Option 2	Provision of anchored sheet piling to secure the wall foundations. Existing rock toe protection supplemented with additional rock. Raise the former 'North Shelter' area.
Option 3	Provision of new seawall along entire frontage.

- 4.4.2 As part of the PAR, more detailed preliminary scheme designs have been developed. The designs are based upon an analysis of the local site conditions, coastal processes and structure condition determined in the Seaton Carew Strategy Stage A Report. The preliminary designs are described below and typical cross sections are shown in Appendix E.

### Option 1: Rock Toe Berm

- 4.4.3 To protect the seawall foundations and provide a modest improvement in overtopping, a large rock toe berm would be constructed. The seawall foundation would be excavated and a core of fill placed. A two rock thick armour layer would then be installed on a geotextile to form a 1:1.5 sloping berm. The berm will extend from the foreshore bedrock, up and over the seawall toe. The rock toe berm has a design life of 50 years, at which point it would be upgraded with an additional primary armour layer.
- 4.4.4 The toe protection will tie into the existing full height revetment at MA12.2C, with a sloping transition, and extend the full length of MA13.1A (including the raised seawall at the North Shelter) to just before the access slipway at the southern end of the management area (c. 490 m), where it will terminate with a 'round-head'.

### Option 2: Sheet Piled Toe

- 4.4.5 To protect the seawall from undermining, sheet piling would be installed in front of the wall foundations. The sheet piling will be anchored to the toe of the seawall to increase the stability of the piles. The gap between the wall toe and the sheet piles will be filled with mass concrete. Once complete the existing emergency rock armour would be re-instated on a geotextile and covered with a new single layer of armour stone, to formalise the existing emergency toe works. This will act as a falling apron.

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- 4.4.6 Option 2 represents the minimum capital works required to maintain the wall. Due to its smaller cross section, the sheet piled toe option has a design life of 30 years, and will be supplemented with additional rock armour in Year 30 and Year 70.
- 4.4.7 The sheet piling and rock protection will tie into the existing full height revetment at MA12.2C, with a small sloping transition, and extend the full length of MA13.1A (including the raised seawall at the North Shelter) to just before the access slipway at the southern end of the management area (c. 490 m), where it will terminate.

### **Option 3: New Seawall**

- 4.4.8 A new seawall option has also been costed to indicate potential future costs if implementation of the preferred option is delayed and the existing seawall fails. However this was not a preferred strategy option and has not been taken forward in this PAR.
- 4.4.9 All the short-list options include the raising of the seawall along the former 'North Shelter' area and remedial repairs to the existing seawall. These are described in further detail below.

### **Raising of the former 'North Shelter' area**

- 4.4.10 As a priority to reduce the levels of overtopping and prevent further damage to the promenade, the existing low height section of seawall in front of the former 'North Shelter' needs to be raised. The top of the existing seawall would be locally broken out and the existing access steps removed. A new full height section of concrete seawall, suitably dowelled into the existing wall would then be cast on top, to match the form and level of the adjoining seawall structures. The area behind the seawall will then be backfilled and paved to form a new promenade area.

- 4.4.11 New access steps will be provided from the raised promenade to the beach.

### **Seawall remedial repairs**

- 4.4.12 Along the length of the frontage, seawall remedial repairs will be conducted to address critical areas which could, in the long term, compromise the residual life of the seawall structure. From the extensive visual and intrusive site investigations conducted in the Seaton Carew Strategy Stage A studies, it has been identified that repairs are required to spalled reinforced concrete on the upper parts of the seawall at the cope and to the open construction joints in the seawall face to prevent washing out of fines and to maintain fill containment.
- 4.4.13 By conducting seawall remedial repairs the residual life of the structure can be maximised with minimal impact and without incurring the high capital costs associated with constructing a new seawall.
- 4.4.14 As part of these works, the existing fragile 'Beacon' access steps (Figure 2), will be removed and replaced.

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## 5 Options Appraisal and Comparison

- 5.1.1 The following short listed options were taken forward for detailed appraisal: Option 1 Rock Toe Berm, Option 2: Sheet Piled Toe. These were appraised on the grounds of technical, environment, social and economic considerations.

### 5.2 Technical Issues

- 5.2.1 Option 1 provides robust protection of the seawall foundation in response to beach lowering, scour and erosion of the foreshore bedrock. However it also requires a significant volume of additional rock armour. This option provides a small positive reduction in overtopping, but will still require signage to be provided to manage this risk. Should sometime in the future, these issues lead to unacceptable levels of risk due to overtopping, the rock toe berm could be extended further or an additional rock layer provided. The rock toe berm provides a flexible form of protection, capable of adjusting to future change in beach levels, and can be upgraded at a later date.
- 5.2.2 Compared to Option 1, Option 2 provides a minimum capital works option, with a smaller footprint but reduced design life (30 years) which requires further intervention sooner. The additional capital works in Years 30 and 70 include provision of additional rock armour to supplement the existing, and provide a more flexible adaptive approach to future uncertainty with regard to sea level rise and climate change impacts.
- 5.2.3 Both options would follow typical construction techniques, with the works timed to coincide with low tides, and proceed in an incremental manner completing short sections of the wall at a time to avoid destabilising the wall. The disturbance due to the increase volume of rock and excavations required for Option 1 is considered broadly equivalent to the additional disturbance of the sheet piling and concrete works associated with Option 2.

### 5.3 Environmental Assessment

- 5.3.1 An Environmental Impact Assessment (EIA) Screening Opinion Request was submitted to Hartlepool Borough Council Planning Authority. This screening opinion confirmed the need for an EIA to be carried out under the Town and Country Planning (EIA Regulations) 1999 (as amended).
- 5.3.2 An EIA Scoping Report has been prepared by Hartlepool Borough Council and agreement reached regarding the content of the supporting Environmental Statement
- 5.3.3 Management Area (MA)13.1A is within 100 m of residential and commercial properties, however noise and vibration and air quality impacts have been scoped out of the ES as all impacts will be temporary in nature (limited to the construction phase) and are unlikely to be significant.

- 5.3.4 MA13.1A provides a boundary to the Seaton Carew Conservation Area. The Conservation Area was originally designated in 1969 and was subsequently extended in 1976 and 2002. The Environmental Statement will assess any impacts on built heritage during the construction phase.
- 5.3.5 MA13.1A lies outside of any statutory nature conservation areas. However, the northern end of the works would be immediately adjacent to the non-statutory designated sites of Long Scar & Little Scar LGS and Carr House Sands & West Harbour LWS. Therefore the ES will consider the construction impacts on these non-statutory designated sites.
- 5.3.6 The Habitat Regulations Assessment (HRA) Screening Report prepared for the Seaton Carew Coastal Strategy concluded that there was no potential for significant effects on the Teesmouth and Cleveland Coast Special Protection Area (SPA) and Ramsar site, so no further HRA work is proposed. A letter of support has been provided by Natural England (Appendix K), who consider that the scheme is likely to lead to an environmental acceptable solution.
- 5.3.7 A landscape/ townscape and visual impacts assessment has been carried out as part of the EIA process. This has considered construction and operational impacts on the site and its setting.
- 5.3.8 In considering the potential environmental impact of the short-listed strategy options, the StAR determined that for the toe berm, the environmental impact would be minimised as the structure footprint is smaller than for example a full height revetment, and a rock revetment would be visually compatible with the defences to the north.

**Table 5-1 Key Environmental Impacts, Mitigation and Opportunities**

Key Positive Impacts	Key Negative Impacts	Mitigation/ Enhancement Opportunity
<b>Option 1</b>		
Protection of seawall	Loss of intertidal beach area	Construction timed to consider ecological and tourism impacts
Reduced overtopping risk at former North Shelter	Noise and vibration associated with delivery and placement of revetment	Backfill rock armour with beach sand to reduce visual impact
Small reduction in general overtopping risk		
Safer beach access from promenade		
<b>Option 2</b>		
Protection of seawall	Loss of intertidal beach area	Construction timed to consider ecological and tourism impacts
Reduced overtopping risk at former North Shelter	Noise and vibration associated with piling and concrete works	Backfill rock armour with beach sand to reduce visual impact
Safer beach access from promenade		



## 5.4 Social and Community Impacts

- 5.4.1 Consultation with statutory and local stakeholders has been carried out as part of the Seaton Carew Coastal Strategy. The Seaton Carew Stakeholder Engagement Strategy ensured that consultees had an input into the strategy options selection process and to identify any potential social and community impacts as a result of these options. This process will continue for MA13.1A forming an integral part of the planning application.
- 5.4.2 The regeneration of the Seaton Carew frontage and foreshore adjacent to MA13.1A is a primary objective for Hartlepool Borough Council. Both short-listed options are consistent with the aims of the regeneration policy and the regeneration proposals being considered will be carefully developed to be in line with the defence strategy.
- 5.4.3 Both short-listed options would maintain the important tourism industry in Seaton Carew and avoid the potential negative economic losses associated with the 'Do Nothing' scenario, whereby the MA13.1A shoreline is closed to the public, leading to a significant reduction in the total beach area (-30%) and the total promenade length (-50%) at Seaton Carew.

## 5.5 Option Costs

- 5.5.1 The short-listed options were taken forward for detailed costing. To ensure complete whole-life costings, option costs include capital construction, future capital and routine maintenance. The costings also include the anticipated detailed design development fee and project implementation costs. Land purchase or compensation is not applicable. The construction costs include an 'internal' contribution from the re-use of rock armour, which reduces the volume of additional rock required, and has been conservatively estimated at £60k.
- 5.5.2 HBC are to landscape the promenade following completion of the coastal protection works. These works have been estimated at £87k and will be funded from HBC's own revenue budgets. HBC are committed to maintaining this aesthetic improvement as part of the works. HBC's Landscape Architect has been fully involved with the proposals and a copy of the landscape plan PR 401-CD-05 is included in Appendix H.
- 5.5.3 Detailed discussions regarding contributions are ongoing with Northumbrian Water but these are focused on works proposed along the next frontage MA 13.1 B-E, due to the position of their Headworks asset in MA13.1 E. A draft Memorandum of Understanding is currently being agreed in relation to those works. No discussions regarding external contributions for this scheme have been carried out as assets protected are predominantly residential, recreation and tourism and public safety.
- 5.5.4 Option costs have been estimated using Price Guides factored for restricted access and tidal working, and subsequently benchmarked against contractor's estimates, or similar works previously carried out at Seaton Carew. Breakdowns of costs are provided in Appendix F.

- 5.5.5 All materials selected for the options are typical of civil engineering projects (e.g. concrete, steel, plastic sheet piles, imported fill and rock) and are therefore considered at less risk of price volatility. A nearby rock quarry has been used successfully in previous coastal protection works at Seaton Carew and has been identified as a potential supplier of rock armour for this scheme.
- 5.5.6 Both options include works to the former 'North Shelter' area, seawall remedial repairs, and replacement access steps.
- 5.5.7 Investment timings have been based on the estimated residual life of existing structures. The appraisal base date is September 2010, with construction anticipated to commence in March 2011.
- 5.5.8 Implementation costs for the preferred options include £10k for Local Authority project management, £100k for development of the detailed design and £90k for site supervision. All options include future upgrades and maintenance costs; to replace lost rock armour, to maintain the existing seawall, and to provide new barriers and signage to mitigate the overtopping risk.
- 5.5.9 The following tables (Table 5-2 and Table 5-3) include a summary of the cash and PV option costs for the two preferred options and a new seawall, for comparison:

**Table 5-2 Summary of Option Capital Costs £k (2010)**

£k (2010)	Option 1 Rock toe berm	Option 2 Sheet piled toe	Option 3 New Seawall
Authority Project Management Staff Salaries	10	10	10
Consultant fees for Design	100	100	100
Early Contractor Involvement (ECI)	0	0	0
Cost consultant fees	0	0	0
Site investigation & survey	0	0	0
Construction Yr0-5	2,226	1,466	6,234
Site supervision	90	90	90
Compensation	0	0	0
Other	0	0	0
Future construction + maintenance	510	700	493
Optimism Bias (20%)	506	368	1,123
<b>Total Cash Cost</b>	<b>3,442</b>	<b>2,734</b>	<b>8,069</b>

**Table 5-3 Summary of Option PV Costs £k**

£k	Option 1 Rock toe berm	Option 2 Sheet piled toe	Option 3 New Seawall
PV Cost (Construction & Maintenance)	2,532	1,838	5,613
Optimism Bias (20%)	506	368	1,123
<b>Total PV Cost</b>	<b>3,039</b>	<b>2,205</b>	<b>6,735</b>

- 5.5.10 An appropriate level of Optimism Bias was developed in accordance with the Defra Supplementary guidance note (2003). By scoring positive and negative risk items, the level of Optimism bias was adjusted, relative to the default value of 30%. Key risk reduction factors include HBC experience with coastal protection works, the design adopted and the lack of environmentally designated sites at this frontage. Key risk increase factors include funding delay due to a change in Government prioritisation and the risk of significant damage to the existing seawall prior to implementation. Appendix J includes a summary table of positive and negative bias items and their significance. On this basis the Optimism Bias was revised, and a value of 20% recommended for budgeting purposes. Upon receipt of competitive tenders this can be reviewed and potentially reduced for the construction allocation
- 5.5.11 The seawall option demonstrates that the rebuild costs for a new seawall following failure are significant (£6,735k PV) compared to the cost of early intervention to protect the existing wall from further scour and undermining. The option costs were taken forward to the selection of preferred option.

## 5.6 Options Benefits (Damages Avoided)

- 5.6.1 The short-listed option benefits have been derived using the latest guidance provided in EA FCERM-AG, associated Supplementary Guidance, and the Green Book (HM Treasury, 2003). The base date is September 2010. The economic appraisal summary tables are shown in Appendix G.
- 5.6.2 An assessment of the erosion losses following seawall failure was undertaken and a list of properties and infrastructure at risk was compiled based on the initial assessment and predicted erosion rates determined in the Seaton Carew Coastal Strategy Stage B report. For details of the assets included in the benefits refer to Table 3-1. For the predicted erosion lines over the appraisal period and assets at risk, refer to Figure 4, Appendix D. Care was taken to avoid double counting between coastal management units, and erosion epochs.
- 5.6.3 Residential and commercial property values were obtained from the Seaton Carew Coastal Strategy Stage B Report. These values were compared against the latest Land Registry Office values and updated where required. For this study, prices have also been checked against available local house pricing websites, which have included historical data of sales values.
- 5.6.4 Although wave overtopping rates over the seawall exceed safe guidelines, within the appraisal area there are no assets at risk of flooding due to this overtopping, which drains back over the seawall. No allowance has been made for damage to the promenade or seawall as a result of overtopping or emergency service costs in response to these events.
- 5.6.5 The financial benefit obtained from protecting infrastructure assets from erosion were obtained from the Seaton Carew Coastal Strategy Stage B Report, and were derived from utility company mapping. These values were updated based on Contractor Quotes or Price Guides, and represent the cost of relocation or diversion of the asset. No allowance was made for disruption to supplies or waste

services. An allowance was made for the diversion of the coastal access road and the Northumbrian Water sewer main beneath the promenade.

- 5.6.6 Due to the fact that Seaton Carew sits in a unique location south of Hartlepool and provides the only readily accessible beach frontage within an hours drive, it was considered appropriate to generate an amount of tourism income that would not be easily transferred elsewhere, and therefore recreational benefits have been included in the assessment.
- 5.6.7 The value of 'loss of enjoyment' was provided by HBC, the figures used are identical to those used within the adjacent Redcar Flood Alleviation Scheme. For Redcar economic values on the loss of enjoyment were estimated at £7.00 per day visitor and £23.60 per staying visitor. Visitor numbers to Seaton Carew were estimated by HBC. In the 'Do Nothing' scenario, it has been assumed that 33% of the visitors would be deterred from visiting the coast. The total loss in recreational value was then calculated by multiplying the number of deterred visitors by the value of their enjoyment per visit. To ensure the value of recreation benefits is conservative within the economic analysis only 30% of the annual tourism loss was taken for MA13.1A (£14,540k PV) as it is recognised that a portion of recreation income could be transferred or continue even if the frontage was lost under the "Do Nothing" scenario.
- 5.6.8 The annual loss of enjoyment was inserted into the FCDPAG3 erosion sheets as a recurring value that would be lost annually from the time of defence failure and the commencement of erosion along the frontage. However, to demonstrate a robust business case, sensitivity analysis on the level of recreation benefits has been carried out, refer to Section 6.3.
- 5.6.9 Table 5-4 below summarises the PV Damages and Benefits, discounted in accordance with FCERM appraisal guidance over 100 years. The detailed benefit appraisal sheets are contained in Appendix G.

**Table 5-4 Summary of Present Value (PV) Damages and Benefits (£k)**

	Damage (PVd)	Damage Avoided	Benefits (PVb)
All Options	0	25,740	25,740

- 5.6.10 There are a total of 238 residential properties at risk from erosion following seawall failure. The total PV benefit including residential, commercial, infrastructure and tourism is £25,740k. The short-listed options have been developed to provide continued protection over the 100 year appraisal period. Both options provide essentially the same benefits in terms of extending the structural life of the existing seawall. Therefore, Benefits are equal to the Damages defined under the 'Do Nothing' scenario. As there is no change in benefits between options, no incremental benefits are used in the economic analysis, as the standard of protection is identical.
- 5.6.11 For the 'Do-Nothing' scenario there are a series of key non-monetarised damages which include:

- Significantly increased Health and Safety risk;
- Reduction in economic activity, and loss of future regeneration funding;
- Disruption to local services;

- d. Negative impacts on local community social well being and health.
- 5.6.12 Quantifying these aspects as economic damage is extremely uncertain, and therefore they have not been included in the economic appraisal of the options
- 5.6.13 The total PV benefits were taken forward with the PV costs to consider the preferred option.

## 6 Selection and Details of the Preferred Option

### 6.1 Selecting the Preferred Option

- 6.1.1 The preferred option should provide the best level of coastal protection that the economics allow and an appropriate standard of protection to be maintained over the appraisal period.
- 6.1.2 The Strategy requires a 'Hold the Line' policy within MA13.1A. Both options considered in detail within this PAR would achieve this policy and prevent failure of the seawall and coastal erosion. Both options make best use of and retain the natural protection provided by the beach, and provide a defence scheme similar to other existing rock revetment defences along this frontage.
- 6.1.3 The Sheet Pile Toe (Option 2) is, in essence, a minimum capital works option with a scaled down toe berm. The defence footprint leads to a reduced environmental, beach and visual amenity impact compared to the Rock Toe Berm (Option 1). However some of these benefits are offset in the short term by the need for piling and concrete at the wall toe.
- 6.1.4 Option 2 would require less rock to be imported than Option 1, which reduces the capital construction cost, as the toe is held primarily by a short length of sheet piling, with the rock dissipating wave energy when beach levels fall. The Option 2 design also reduces the need for excavation at the seawall toe, which could locally destabilise the seawall, and therefore represents a reduced construction risk compared to Option 1.
- 6.1.5 With regards to climate change, both options could be upgraded to provide a higher level of protection in the future should sea level rise be higher than current estimates. Option 2 would require further works to be completed in Year 30, providing an opportunity to address this uncertainty, as opposed to incorporating 50-70 years of climate change risk into a scheme with a longer design life.
- 6.1.6 The rock armour layer in both options is at risk of movement during a storm event in excess of the design event. This potential risk is greater for Option 2, due to the smaller cross section area and the single primary armour layer. However the sheet pile toe would maintain the integrity of the wall foundations in the short term while the rock armour is reinstated to its original cross section. The risk of rock armour movement is reduced in Option 1, however if significant damage were to occur, this could expose the seawall foundation and lead to potential wall failure.
- 6.1.7 For the existing case, overtopping rates exceed those required for public safety. The Rock Toe Berm Option (Option 1) will lead to a modest improvement in overtopping, however rates will still exceed official guidelines for safety to pedestrians. Overtopping rates will be unaffected by the Sheet Pile Toe Option (Option 2). However overtopping is not a risk to assets but to pedestrian safety along the promenade. Although a key strategy objective is to reduce health and safety risks, the management of access to the promenade area during storms

combined with toe protection offers a more cost efficient compromise solution, while achieving the same protection of assets.

- 6.1.8 The summary results from the economic analysis are presented below (Table 6-1), and show that Option 2, the Sheet Piled Toe, has the highest benefit to cost ratio.

**Table 6-1 Benefit-Cost Assessment**

	PV Costs (£k)	PV Benefits (£k)	Av. Benefit/Cost Ratio
Option 1: Rock Toe Berm	3,039	25,740	8.5
Option 2: Sheet Piled Toe	2,205	25,740	11.7

## 6.2 The Preferred Option

- 6.2.1 Option 1 was rejected on the basis of the lower benefit/cost ratio, the higher construction risk and the potential that an event greater than the design event could cause sufficient damage to the revetment to expose the wall foundation.
- 6.2.2 On the basis of technical, environmental, and economic merit, Option 2 Sheet Piled Toe was selected as the preferred scheme for the MA13.1A frontage. The urgent implementation of this option will prevent failure of the existing seawall, eliminate health and safety concerns regarding collapse of the structure, and will ensure that the 238 residential households, local road infrastructure including the A178 main transport link and other commercial assets at most risk behind the defence line, will be protected from coastal erosion.
- 6.2.3 The preferred option includes raising the former 'North Shelter' area to a similar level to the adjacent promenade and protecting the seawall with the piled toe. This will address the significant health and safety risks currently posed to pedestrians and the potential for further damage, and collapse of the seawall.
- 6.2.4 The EIA has considered the potential environmental impacts and effects of the proposed works and highlighted that no long-term significant adverse effects are anticipated to occur, although there may be some temporary effects during the construction phase. These can be minimised through the use of standard management and mitigation procedures and the construction costs in the PAR allow for this. The preferred option will maintain and enhance access for amenity, tourism and recreation.
- 6.2.5 The preferred option costs include beneficial re-use of the existing emergency rock protection. The volume of existing rock toe protection was estimated, allowing for degradation and breakage during re-handling, and then deducted from the volume of additional rock required. These savings were conservatively estimated at £60k. The preferred option also includes the crushing and recycling of the existing access steps concrete as backfill to the former 'North Shelter' area. The existing beach access steps will be replaced with new structures to maintain safe public access to the beach.
- 6.2.6 The implementation of the preferred option, as priority works, will maintain a suitable level of coastal protection taking into account climate change and sea level rise. The preferred option will avoid the potential high capital expenditure in

the short-term to replace the existing seawall following failure and will accrue the non-monetarised benefits listed in section 5.6.11.

- 6.2.7 The total sum for capital grant aid approval is £2,154k. This option achieves the strategic objectives of the Seaton Carew Coastal Strategy, has low environmental and amenity impact, while providing the full amount of benefits, (£25.7M). The scheme achieves a benefit cost ratio of 11.7.

### 6.3 Sensitivity Testing

- 6.3.1 A series of sensitivity tests were conducted to show the robustness of the preferred option (Table 6-2). With regard to scheme benefits these included:

- a. An increase in the residual life for the seawall from 5 to 10 years;
- b. The exclusion of all recreational benefits;
- c. Assuming that the coastal access road and the sewer pipe are abandoned with no requirement for diversion;
- d. Failure of the seawall in Year 1, bringing forward the loss of each asset by 4 years.

- 6.3.2 For the scheme capital costs, the following tests were included:

- a. A 20% increase in seawall remedial repairs, following storm damage;
- b. A 20% increase in rock revetment cost;
- c. A 24 month delay in securing funding, which would delay capital expenditure, and incur higher short term maintenance costs.

**Table 6-2 Benefit-Cost Sensitivity Testing**

	PV Cost (£k)	PV Benefits (£k)	Benefit/Cost Ratio
Baseline Case	2,205	25,740	11.7
Seawall residual life + 5 years		22,012	10
No recreational benefit		11,200	5.1
No access road or sewer diversion benefits		23,683	10.7
Seawall failure Year 1		29,087	13.2
Remedial repairs +20%	2,213		11.6
Rock supply cost + 20%	2,265		11.4
24 month delay + high maintenance cost	2,152		12.0

- 6.3.3 The sensitivity testing shows that the benefit cost ratio for the preferred option is robust to changes in the benefits, project costs and implementation for a range of scenarios. The preferred option is most sensitive to the loss of recreational benefits. Even when these benefits are transferred elsewhere and excluded from the analysis, the benefit to cost ratio remains strongly positive at 5.1. This extreme scenario is not considered likely, as Seaton Carew provides the only readily accessible amenity beach frontage near Hartlepool. The sensitivity tests do not change the preferred option.



## 6.4 Details of the Preferred Option

### Technical Aspects

- 6.4.1 The preferred option is to raise the former 'North Shelter' area, complete seawall remedial repairs, and to protect the existing seawall toe with a sheet piled toe and rock protection. The proposed works will immediately prevent wall failure and the associated health and safety risk, and prevent future coastal erosion. A cross section through the preferred option is shown in Appendix E. Indicative plans of the preferred option are shown in Appendix H.
- 6.4.2 At the former 'North Shelter' area, a vertical extension to the existing seawall will be cast, with a form and level similar to the adjoining seawall. The extensions will be suitably dowelled into the existing wall. The existing access steps will be broken out and replaced. The existing hand railing and stone wall landscaping works at the back of the promenade will be taken down for future re-use, with the paved area behind the seawall being broken up and then backfilled to the height of the main promenade using imported fill and crushed concrete from the demolished access steps. Finally the raised area will be paved and a new handrail installed.
- 6.4.3 The beach works will include the seawall remedial repairs to the open cracks and spalled areas of concrete on the cope. These will be made good using structural repair concrete and infilled to maintain the residual life of the seawall. The existing handrail along the seawall cope will be replaced, to maintain public safety.
- 6.4.4 The existing Beacon access steps will be demolished and the material used as backfill to form a new set of concrete access steps from the promenade down to the beach.
- 6.4.5 At the seawall toe, the existing emergency toe protection will be carefully removed in sections and stockpiled on the beach for re-use. The piles will be driven adjacent to the seawall foundations. The pile design will be based on the significant site investigation carried out as part of the coastal strategy, additionally HBC holds records of previous piling works to secure the southern steps at North Shelter. The surface end of the pile will be shortened to be flush with the top of the seawall toe and secured using grout anchors. The voids between the seawall and the sheet piles will be filled with mass concrete. The piling works will extend along the entire length of the frontage.
- 6.4.6 Upon completion of each section of piling, the existing stockpiled rock protection will be placed on a geotextile and capped with new larger rock armour to formalise the toe protection. Any excavated beach sand will be backfilled over the toe of the berm. The rock works will extend along the length of the frontage (c.490m) to tie into the existing full height revetment at the north of the frontage and end just short of the access slipway to the southern end of the frontage.
- 6.4.7 Following substantial completion of the works, the site compound will be dismantled and the site made good. To raise public awareness and manage the residual overtopping health and safety risk, new signage will be provided along the frontage length. HBC are to complete further landscaping improvements to

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the promenade area following completion of the works, these works do not form part of the coastal protection works or costs, but are considered as a contribution, valued at £87k. A landscaping plan is included in Appendix H.

- 6.4.8 For sustainability, the future management requirements are to replace and re-position any rocks that have been displaced over time. The displacement of rock is not expected to be a common occurrence; however this may happen during periods of storms and extreme weather. The structure may need to be modified in the future to take into account the future sea level rise.

## Environmental Aspects

- 6.4.9 The project requires an Environmental Impact Assessment (EIA). An EIA screening report has been agreed with HBC Planning Department as part of the planning application. The EIA screening is based on the Strategy SEA report, and was followed by a scoping process to determine the extent of the EIA. The Marine Management Organisation considered that the proposed works fall outside of the EIA Directive pursuant to the Marine Works Regulations (2007) and as such a statutory EIA is not required. However, they acknowledged and welcomed that an EIA would be carried out under the Town and Country Planning Act.
- 6.4.10 Any environmental effects associated with the preferred option have been considered in detail within the EIA including ground and surface water, and compliance with the Water Framework Directive (WFD). Potential construction impacts have been identified and these can be dealt with by standard mitigation procedures. It is therefore concluded that during the construction phase with mitigation in place, residual effects are not considered significant or are highly unlikely to occur. No effects on water quality are predicted during the operation of the scheme. The mitigation measures proposed in the EIA are standard industry practice and will be taken forward into the scheme detailed design and operation through an environmental management plan.
- 6.4.11 The preferred option makes best use of the existing rock toe protection and demolished access steps by recycling these materials in the final works, reducing the material volumes for delivery by road, and providing a financial contribution. Planning Permission and a FEPA license are being sought for the project.
- 6.4.12 Natural England has provided advice on the proposed scheme at MA13.1A through a letter of support (Appendix K). They consider that the scheme is likely to lead to an environmental acceptable solution, but may require an Appropriate Assessment. The Environmental Statement produced subsequently to supplement the Planning Application concludes that the works proposed would not result in adverse effects on the integrity of the designated sites and therefore an Appropriate Assessment is not required.

## Costs for the Preferred Option

6.4.13 The PV, Whole Life Capital and Capital Grant Approval Project costs are shown in Table 6-4 overleaf. The project is seeking approval for £2,154k Grant-in-Aid funding. This includes detailed design fees, capital construction costs, site supervision, and a 12 month inflation allowance at a rate of 2.5% per annum. The approval sum also includes a risk contingency at 30% of the capital construction cost (£451k). The capital construction costs for the preferred option have been benchmarked using experienced Contractors, and a full breakdown is shown in Appendix F.

## Contributions and Funding

6.4.14 HBC are to landscape the promenade following completion of the coastal protection works from internal budgets. The costs include an 'internal' contribution of £60k from the re-use of the existing rock armour and a direct contribution of £87k from HBC for landscaping works.

## Outcome Measures and Funding Priority

6.4.15 The Outcome Measures (OM) scores are summarised in Table 6-3 below. The only Outcome Measures relevant to the MA13.1A frontage are OM1 and OM2. There are no residential households in a high risk erosion band in the first 20 years under the 'Do Nothing' scenario (OM2b). Seaton Carew is not a deprived area (OM3) and there are no opportunities for habitat creation (OM5). The need for these works is on the basis of public safety and to avoid high capital expenditure in the short term if the seawall is allowed to fail. These issues and the non-monetarised benefits listed in section 5.6.11 are not captured by the Outcome Measures scores.

**Table 6-3 Outcome Measure Contributions and Prioritisation Score**

Outcome Measure	Value
OM1- Economic Benefit	
PV Benefits (£k)	25,740
PV Costs (£k)	2,205
Benefit/Cost Ratio	11.7
OM2 Households at risk (Nr)	238
<b>Outcome Measure Prioritisation Score</b>	<b>4.23</b>

**Table 6-4 Project Costs for Preferred Option (£k)**

	Cost for economic appraisal (PV)	Whole life cash cost	Capital Grant approval project cost
<b>Costs to PAR: (excluding costs of approved study)</b>			
Staff costs	Sunk Costs	0	
Site investigation & survey	Sunk Costs	0	
Consultant fees	Sunk Costs	40	
Contractor fees	Sunk Costs	0	
Cost consultant fees	Sunk Costs	0	
<b>Sub-total</b>	Sunk Costs	40	40
<b>PAR to Construction:</b>			
Authority Project Management Staff Salaries	10	10	10
Site investigation & Survey	0	0	0
Consultant fees for Design / EIA	100	100	100
Contractor fees	0	0	0
Cost consultant fees	0	0	0
<b>Sub-total</b>	110	110	110
<b>Construction:</b>			
Construction costs	1,466	1,466	1,466
Inflation Allowance (12 months@2.5%)			37
Environmental enhancement/mitigation	0	0	0
Consultant fees	0	0	0
Site supervision	90	90	90
Landscaping	0	0	87
Compensation	0	0	0
<b>Sub-total</b>	1,556	1,556	1,593
<b>Future Costs:</b>			
Maintenance	29	90	
Future construction	143	610	
<b>Risk Contingency:</b>			
Optimism Bias (20% PV Cost)	368	368	
Risk Contingency (30% Construction Cost)			451
<b>Contributions (HBC Landscaping)</b>			-87
<b>TOTAL</b>	<b>2,205</b>	<b>2,774</b>	<b>2,154</b>

# 7 Implementation

## 7.1 Project Planning

### Phasing and Approach

- 7.1.1 Given the urgent need for the works, Phase 1 has been programmed to mobilise in early 2011 by establishing a site compound behind the promenade, with beach access via the nearby beach slipway, to the south of MA13.1A (Figure 2).
- 7.1.2 Phase 1 will include the seawall remedial repairs to the open cracks and spalled areas of concrete on the cope, preparatory works at the former 'North Shelter' and at the seawall toe. Phase 2 will include the toe piling, rock armour and seawall raising works. The timing of these works will reduce any potential adverse impacts on the environment. The works will be substantially completed by October/November 2011, when the signage and landscaping will be completed, followed by the removal of the site compound.
- 7.1.3 Throughout the project, it is anticipated that the Contractor will commence work at the northern end of MA13.1A and work south toward the access slipway, to reduce the length of exposed seawall during construction.
- 7.1.4 There are no land purchase requirements. Enabling works will be required to set up the site compound and a safe access route via the existing slipway. Throughout the works careful site supervision will be required to prevent public access to the foreshore works. It is proposed to close the beach access steps during these periods.
- 7.1.5 The construction of the toe protection will require delivery of rock armour, concrete and sheet piles to the site. For the previous coastal protection work at Seaton Carew (MA12.2), the rock was delivered by road from a nearby quarry and stockpiled on the beach. It is anticipated that the same approach could be adopted for the MA13.1A works.
- 7.1.6 The EIA has considered the potential environmental impacts and effects of the proposed works and highlighted that no long-term significant adverse effects are anticipated to occur. Therefore the construction impacts can be minimised through the use of standard management and mitigation procedures and the construction costs have been developed to allow for this. .
- 7.1.7 The project will be designed and managed by Hartlepool Borough Council. HBC are an experienced coastal protection authority, with recent management experience of similar coastal protection projects.

### Programme and Spend Profile

- 7.1.8 An overview of the key project dates is shown in Table 7-1. The works are programmed to commence in March 2011, with substantial completion in October/November 2011, a period of 9 months. A detailed programme to take the

<b>Title</b>	Seaton Carew Town Frontage MA13.1A					
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project forward from PAR to works completion is shown in Appendix I. The programme includes provision of detailed design and statutory permissions.

**Table 7-1 Key Dates**

Activity	Date
PAR approval and sign off	January 2011
Risk workshop/value engineering complete by	November 2010
EIA complete by	November 2010
Detailed design complete by	Completed
Planning permission received	Application in, decision Feb 2011
Target price agreed by	December 2010
Phase 1 works start on site in	March 2011
Works substantially complete by	October / November 2011
Project closure	December 2011

- 7.1.9 The annualised spend profile is shown in Table 7-2 below. The project expenditure is compatible with the HBC Medium Term Plan and HBC's FRM1.

**Table 7-2 Annualised Spend Profile**

	2010/11	2011/12	2012/13	2013/14	2014/15	Future Years	Total
Authority Project Management	5	5	-	-	-	-	10
Design & Supervision Fees	80	110	-	-	-	-	190
Construction	250	1,253	-	-	-	-	1,503
Environmental mitigation	-	-	-	-	-	-	-
Environmental enhancement	-	-	-	-	-	-	-
Compensation	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
Risk contingency	75	376	-	-	-	-	451
<b>Total grant eligible sum</b>	<b>410</b>	<b>1,744</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2,154</b>

Notes: Capital Construction figures include inflation at 2.5%.

## 7.2 Delivery Risks

### High Level Risk Register

- 7.2.1 A risk register has been developed (Appendix J). This has identified the risks to the implementation of the scheme and was used to determine the risk contingencies.
- 7.2.2 Table 7-3 below highlights the most significant high level risks and corresponding mitigation measures. To determine the contingency sum, a risk review of the proposed works was completed. It was identified that storm damage and unknown ground conditions could impact the construction programme and cost. However the frontage is relatively short and can be phased to reduce this risk.

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- 7.2.3 Re-use of the existing rock armour does not increase risk or have any programme implications as this is all covered within the requirements of the contract. The rock protection options considered in the costing are typical coastal protection works, and this type of work has been successfully managed by HBC in the past, including the revetment works at the adjacent MA12.2 frontage. The project has been tested for sensitivity to project delays or the risk of a change in funding priority and remains robust. .
- 7.2.4 A 20% Optimism Bias was added to the PV costs in the Option Appraisal stage.
- 7.2.5 For the final cash 'Sum for Approval', a risk contingency of 30% of the construction cost (£451k) was applied.

**Table 7-3 Level Risk Schedule and Mitigation**

Key Project Risk	Adopted Mitigation Measure
Storm damage prior to or during the works	HBC routinely monitor site for damage. Works programmed to start as soon as possible. Contractor to remove existing toe protection in phases.
Unknown ground conditions	Extensive ground and structure investigations were conducted as part of the StAR. A residual risk remains however, as the works include remedial repairs to an existing structure.
Project delays or changes in scope occur as a result of the availability of funding (e.g. departmental budget spent or insufficient contingency funds)	Hartlepool Borough Council has experience in the management of 'Grant in Aid' funding projects.
Change in Government fiscal policy may lead to change in priority score threshold or pressure on local funds.	External risk. Sensitivity testing has shown project to be robust despite funding delays.

## Safety Plan

- 7.2.6 A Public Safety Risk Assessment will be established prior to construction.
- 7.2.7 The detailed design of the works is being undertaken by HBC. HBC will appoint key parties under the CDM Regulations. All parties will be fully engaged in the detailed design processes to manage construction safety and risks.

## Appendix A

## Project Report Data Sheet

Entries required in clear boxes, as appropriate.

### GENERAL DETAILS

Authority Project Ref. (as in forward plan):	HP21
Project Name (60 characters max.):	Seaton Carew Northern Management Unit (Phase1)
Promoting Authority:	Defra ref (if known)
Name	CPW 1995 Hartlepool Borough Council
Emergency Works:	No Yes/No
Strategy Plan Reference:	Seaton Carew Coastal Strategy (2010)
River Basin Management Plan	NA
System Asset Management Plan	NA
Shoreline Management Plan:	River Tyne to Flamborough Head
Project Type:	Project within Strategy / Coastal Protection
Shoreline Management Study/ Preliminary Study/ Strategy Plan/Prelim. Works to Strategy/ Project within Strategy/Stand-alone Project/ Strategy Implementation/Sustain STANDARD OF SERVICE. Coast Protection/Sea Defence/Tidal Flood Defence/Non-Tidal Flood Defence/Flood Warning Tidal/Flood Warning - Fluvial/Special	

### CONTRACT DETAILS

Estimated start date of works/study:	March 2011
Estimated duration in months:	9
Contract type*	External Contractor

(\*Direct labour, Framework, Non Framework, Design/Construct )

### Costs

	APPLICATION (£000's)
PAR Preparation:	40
Capital Grant for Environment Agency approval:	2,154
Total Whole Life Costs (cash):	2,205

For breakdown of costs see Table in Section 2.4

### CONTRIBUTIONS

Own Resources:	£87k (HBC Landscaping)
Windfall Contributions:	0
Deductible Contributions:	0
Loans:	0
ERDF Grant:	0
Other excluded Items:	0

### LOCATION – to be completed for all projects

EA Region/Area of project site (all projects):	North East
Name of watercourse (fluvial projects only):	N/A
District Council Area of project (all projects):	Hartlepool Borough Council
Grid Reference (all projects):	NZ524301

(OS Grid reference of typical mid point of project in form ST064055)



## DESCRIPTION

Specific town/district to benefit:

Seaton Carew, Hartlepool

Brief project description including essential elements of proposed project/study  
(Maximum 3 lines each of 80 characters)

Carry out remedial repairs to the existing seawall, and to formalise existing emergency rock toe protection with sheet piling along the frontage length to prevent seawall failure, and hence coastal erosion. The low height seawall at the former 'North Shelter' will also be raised in height and in-filled to improve public health and safety.

## DETAILS

Design standard (chance per year):	1 in 100	yrs
Existing standard of protection (chance per year)	NA	yrs
Design life of project:	50	yrs
Fluvial design flow (fluvial projects only):	NA	m <sup>3</sup> /s
Tidal design level (coastal/tidal projects only):	NA	m
Length of river bank or shoreline improved:	520	m
Number of groynes (coastal projects only):	NA	
Total length of groynes* (coastal projects only):	NA	m
Beach Management Project?	No	Yes/No
Water Level Management (Env) Project?	No	Yes/No
Defence type (embankment, walls, storage etc)	Seawall & toe protection	

\* i.e. total length of all groynes added together, ignore any river training groynes

## ADDITIONAL AGREEMENTS:

Maintenance Agreement(s):	NA	Not Applicable/Received/Awaited
EA Region Consent :	Awaited	Not Applicable/Received/Awaited
Non Statutory Objectors:	No	Yes/No (For coastal schemes complete CPA1/CPA2)
Date Objections Cleared:	-	
Other:	NA	Not Applicable/Received/Awaited

## ENVIRONMENTAL CONSIDERATIONS

Natural England (or equivalent) letter:	Received	Not Applicable/Received/Awaited
Date received	19/10/10	

## SITES OF INTERNATIONAL IMPORTANCE

(Answer Y if project is within, adjacent to or potentially affects the designated site)

Special Protection Area (SPA):	No	Yes/No
Special Area of Conservation (SAC):	No	Yes/No
Ramsar Site	No	Yes/No
World Heritage Site	No	Yes/No
Other (Biosphere Reserve etc)	No	Yes/No

**SITES OF NATIONAL IMPORTANCE** (Answer Y if project is within, adjacent to or potentially affects the designated site)

Environmentally Sensitive Area (ESA):	No	Yes/No
Site of Special Scientific Interest (SSSI):	No	Yes/No
National/Regional Landscape Designation:	No	Yes/No
National Park/The Broads	No	Yes/No
National Nature Reserve	No	Yes/No
AONB, RSA, RSC, Other- Village Green	Yes	Yes/No
Scheduled Ancient Monument	No	Yes/No
Other designated heritage sites	No	Yes/No

**OTHER ENVIRONMENTAL CONSIDERATIONS**

Listed structure consent	NA	Not Applicable/Received/Awaited
Water Level Management Plan Prepared?	NA	Yes/No
FEPA licence required?	Awaited	Not Applicable/Received/Awaited
Statutory Planning Approval Required	Yes	Yes/No/Not Applicable

**COMPATIBILITY WITH OTHER PLANS**

Shoreline Management Plan	Yes	Yes/No/Not Applicable
River Basin Management Plan	NA	Yes/No/Not Applicable
Catchment Flood Management Plan	NA	Yes/No/Not Applicable
Water Level Management Plan	NA	Yes/No/Not Applicable

**SEA/ENVIRONMENTAL IMPACT ASSESSMENT**

SEA	NA	Statutory required/ voluntary/not applicable
EIA	Yes	Yes (schedule 1); Yes (schedule 2); SI1217; not applicable
SEA/EIA status	Draft	Scoping report prepared/draft/draft advertised/final

Other agreements	Detail	Result	(Not Applicable/Received/Awaited for each)

**COSTS, BENEFITS & SCORING DATA**  
(APPORTION TO THIS PHASE IF PART OF A STRATEGY)

**Local authorities only:** For projects done under Coast Protection Act 1949, please separately identify: FRM = Benefits from reduction of asset flooding risk; CERM = Benefits from reduction of asset erosion risk

**Benefit type** (DEF: reduces risk (contributes to Defra SDA 27); CM: capital maintenance; FW: improves flood warning; ST: study; OTH: other projects)

DEF

**LAND AREA**

Total area of land to benefit:	20.2	Ha
of which present use is:	FRM	CERM
Agricultural:	0	Ha
Developed:	10.4	Ha
Environmental/Amenity:	9.8	Ha
Scheduled for development	0	Ha

## PROPERTY & INFRASTRUCTURE PROTECTED

	Number		Value (£'000s)	
	FRM	CERM	FRM	CERM
<sup>1</sup> Residential		238		41,435
Commercial/industrial		3		1,675
Critical Infrastructure		NA		3,887
Key Civic Sites		6		1,300
Other (description below):		-		54,798
Description:	Recreational / Amenity			

## Costs and Benefits

<sup>1</sup> Present value of total project whole life costs (£'000s): Include all costs including ineligible	2,205	
Project to meet statutory requirement? Y/N	N	
	Value (£'000s)	
	FRM	CERM
Present value of residential benefits:	0	7,286
Present value of commercial/industrial benefits:	0	844
Present value of public infrastructure benefits:	0	3,070
Present value of agricultural benefits:	0	0
Present value of environmental/amenity benefits:	0	14,540
<sup>1</sup> Present value of total benefits (FRM & CERM)	25,740	
Net present value:	23,535	
Benefit/cost ratio:	11.7	
Base date for estimate:	Sept 2010	
PAG Decision Rule stage 3 applied	No	Yes/No
PAG Decision Rule stage 4 applied	No	Yes/No

## OTHER OUTCOME MEASURE SCORING DETAILS

Super Output Area No*:	E01011 996	Indicate if deprived:	No	Yes/No
(*as ranked by Indices of Multiple Deprivation)				
Risk:	Na	VH, H or N/A		
		Wetland	Saltmarsh/ Mudflat	
Net gain of BAP habitat:		0	0	Ha
SSSI protected:		0	ha	
Other Habitat:		0	ha	
Heritage Sites:		0	"I or II" , "II or other" or "N/A"	

## Exemption Details (if exempt from OM scoring system)

Exempt from Scoring:	No	Yes/No
Reason (max 100 chars):		

## Outcome Measure Prioritisation Priority Score

Stage 1 - Calculate individual scores							
Ref	Description	Project contributions (including adjustments)			Targets		Individual scores
OM1	Present value of Whole Life Benefits (£000s)	25,740		Divided by	3,700,000	Gives OM1 individual score	0.0696
		<b>o1</b>			<b>t1</b>		<b>s1</b>
OM2	Number of households moved from any flood / coastal erosion probability category to a lower one (households)	238	Minus o2b		100,000	Gives OM2 individual score	0.00238
		<b>o2</b>			<b>t2</b>		<b>s2</b>
OM2b	Number of households moved from the very significant or significant flood probability category to the moderate or low flood probability category; or equivalent coastal erosion probability categories (households)		Minus o3		36,000	Gives OM2b individual score	0
		<b>o2b</b>			<b>t2b</b>		<b>s2b</b>
OM3	Number of households in deprived communities at reduced flood risk (households)			Divided by	9,000	Gives OM3 individual score	0
		<b>o3</b>			<b>t3</b>		<b>s3</b>
OM5	The number of hectares Biodiversity Action Plan habitat created, net of compensatory habitat (Hectares)			Divided by	800	Gives OM5 individual score	0
		<b>o5</b>			<b>t5</b>		<b>s5</b>
Stage 2 - Calculate overall OM prioritisation score							
Score	Outcome Measure prioritisation score (total of individual scores divided by whole life cost)	0.009337		Divided by	2,205	Multiplied by 1,000,000	4.23
		<b>(s1 + s2 + s2b + s3 + s5)</b>			<b>Project whole life costs</b>		<b>OM prioritisation score</b>

## **Appendix B    List of Reports Produced**

*None*