Project Appraisal Report
(Sustain SoS Project)

Authority Scheme Reference	
Defra / WAG LDW Number	
Promoting Authority	Scarborough Borough Council
Scheme Name	North Bay Urgent Wall Improvements

Date	27/3/2012
Version	1

PAR for *(Project name)*

Version	Status	Signed off by:	Date signed	Date issued
1	Draft			

Template version – April 2011

CONTENTS

TABLES

APPENDICES

For technical approval of the business case

Scarborough Borough Council

Project name: North Bay Urgent Wall Improvements

Approval value: £ 446k

Sponsoring Director: Pauline Elliot (Head of Regeneration & Plannign Services)

Financial scheme of delegation

Section A3 of the Financial Scheme of Delegation states that, for a Flood Risk Management project outside of an agreed strategy the following officers are authorised to give approval:

LIMIT	AUTHORISED BODY OR OFFICER
Over £20m	Agency Board, Chief Executive in consultation with Director of Finance and Director of Operations
Up to £20m	Chief Executive in consultation with Director of FCRM
Up to £10m	Deputy Director of Operations
Up to £5m	Regional Director
Up to £1m	Regional FCRM Manager

Approval history sheet

APPROVAL HISTORY SHEET (AHS)			
1. Submission for review (to be completed by team)			
Project Title: North Bay Urgent Wall Improvements		**Project Code: YOS351C/000A/58CA**	
Project Manager: Robin Siddle		**Date of Submission:**	
Lead Authority: Scarborough Borough Council		**Version No: 1**	
Consultant Project Manager: Paul Knight		**Consultant: Royal Haskoning**	
The following confirm that the documentation is ready for submission to PAB or LPRG. The Project Executive has ensured that relevant parties have been consulted in the production of this submission.			
Position	**Name**	**Signature**	**Date**
Project Executive	Chris Bourne		
	Job Title:	Projects Manager	
2. Review by: ~~Large Projects Review Group (LPRG)~~ or Yorkshire & Northeast Region Project Assessment Board (PAB)			
Date of Meeting(s):		**Chairman: Graeme Warren**	
Recommended for approval: In the sum of £:446k		**Date:**	**Version No:**
3. Environment Agency FSoD approval *Officers in accordance with the FSoD.*			
Version No:		**Date:**	
Project Approval	**By:** In the sum of: £	**Date:**	
4. Defra or WAG approval *(Delete as appropriate)*			
Submitted to Defra / WAG or Not Applicable (as appropriate)		**Date:**	
Version No. (if different):			
Defra/ WAG Approval: or Not applicable (as appropriate)		**Date:**	
Comments:			

FINANCIAL SCHEME OF DELEGATION (FSoD) COVERSHEET

1.

Project name	North Bay Urgent Wall Improvements	**Start date**	Sept 2012
		End date	Aug 2014
Business unit		**Programme**	
Project ref.	**YOS351C/000A/58CA**	**FSoD ref & date**	-

2.

Role	Name	Post Title
Project Sponsor	Dean Hamblin	Yorkshire Area Coastal Engineer
Project Executive	Chris Bourne	Projects Manager
Project Manager	Robin Siddle	Senior Coastal Officer

3.

Risk Potential Assessment (RPA) Category	**Low**	☒	**Medium**	☐	**High**	☐

4.

FSoD schedule		Description	Delegation	
			Regional – up to	Environment Agency – up to
A1	☐	Projects (includes FCRM revenue)	£5m	£5m
A2	☐	FCRM capital project within approved strategy	£10m capital	£100m WLC Defra/£5m capital NAW
A3	☒	FCRM capital project outside of approved strategy	£5m capital	£100m WLC Defra/£5m capital NAW
A5	☐	Consultancy project	£300k	£500k
T2	☐	Purchase or lease of land and buildings	£1m purchase/£50k pa lease	£5m

5.

FSoD value	£k
Preparation costs for Form A/Business Case/PAR/FCRM Strategy	
Project costs	446
Whole Life Costs (WLC) of FCRM Project or Strategy	12,743

6.

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

7.

FSoD approver name	Post title				Signature	Date
FSoD consultee name	**Post title**				**Signature**	**Date**
	PAB/LPRG Chair	**RED** ☐	**AMBER** ☐	**GREEN** ☐		

8.

Form G	Form G value (£k)	Regional FSoD ref.	Head Office FSoD ref.	Latest FSoD authorised cost (£k)
1			-	
2				
3				

1 Executive Summary

1.1 Introduction and background

Background

1.1.1 The purpose of this report is to seek investment approval for an asset refurbishment scheme in North Bay, Scarborough. This report presents the business case for the most cost efficient way of sustaining the standard of service (SoS) of the existing assets.

1.1.2 The assets included in this project are located within North Bay in Scarborough, North Yorkshire. The assets are located along 1.5km of coastal frontage, and fall within two of the management units (MU) of the Scarborough Coastal Defence Strategy: Holbeck to Scalby Mills (2009); namely North Bay Cliffs (MU 20A/2-20A/7) and Clarence Gardens (MU 20B/1-20B/3). This frontage is also covered by the River Tyne to Flamborough Head Shoreline Management Plan 2 (2007).

1.1.3 This project will be carried out under the powers of the Coast Protection Act 1949.

Adopted approach to coastal erosion risk management

1.1.4 The coastal defence assets in North Bay are Victorian in age, dating back to 1890 and stretch right around the bay. There have been many developments and modifications to the structures over the last hundred years. The coastal defence assets consist of a variety of concrete and masonry near-vertical seawalls of varying heights and an assortment of access points (steps and slipways). The assets are in varying condition. Photographs of the assets can be found in Appendix C.

1.1.5 The SMP2 set the policy of Hold the Line for the North Bay frontage. The strategic preferred option is seawall repairs and slope stabilisation for the North Bay Cliffs MU, and rock revetment, seawall repairs, and slope stabilisation for the Clarence Gardens MU within 6-10 years in order to sustain the current erosion protection provided by the seawalls. The Strategy recognised that in the short term prior to any capital scheme being implemented for these two frontages that an option of ‘emergency coastal slope and defence works and repairs to defences and landslips as and when required’ would be essential.

1.1.6 This project falls within the threshold criteria for a sustain SoS project; it is supported by a current approved Strategy and it will not change the standard of service of the frontage.

1.2 Problem and objectives

1.2.1 The existing coastal defence assets originally date back to 1890 and are in a deteriorating condition. The Strategy (2009) assessed the structural stability of the assets as being at high risk of failure, with an annual probability of failure of 10% to 50%. Asset inspections undertaken in 2010 (Appendix O) identified assets within North Bay as being in need of ‘urgent’ repair, with the types of defects recorded including cracking, loss of mortar, expanding sealant, surface erosion, and undercutting at the toe.

1.2.2 Inspections of the assets made when beach levels were low, winter 2010, revealed sections of the defences where considerable undercutting and scour could be observed at the toe of the walls and access steps/slipways, which had not been previously observed during routine asset inspections. The extent of scour beneath some of these structures raises concerns regarding their short term structural stability.

1.2.3 Failure of the coast defence assets would lead to the onset of coastal erosion. The initial losses would be the promenade and road immediately behind the seawalls. This road is the main coastal route linking the north and south bays at Scarborough. Loss of this route would result in traffic disruption within the town. There are 240 residential properties, 137 commercial properties including several tourist amenities, and 136 beach chalets at risk of coastal erosion within 5 years should the walls fail.

1.2.4 Failure of the seawall and onset of coastal erosion would impact on tourism through a reduction in the value of enjoyment visitors would obtain from visiting the North Bay after the loss of the promenade, coastal link road to South Bay, tourist facilities and encroachment of landslides onto the foreshore.

1.2.5 Yorkshire Water is currently making a significant investment in the Scarborough area (>£50M) in advance of the Revised Bathing Water Directive which comes into effect in 2015. Part of the investment in their infrastructure is in the vicinity of the scheme proposed by this PAR, and some of their assets which are part of the critical infrastructure for the town are protected by the coast defence structures.

1.2.6 The key objectives of the project are to sustain the current standard of service provided by the existing coast defence assets in North Bay over the appraisal period of 100 years, whilst maximising the longevity of the previous investments.

1.3 Options considered for sustaining the SoS

1.3.1 The following three options were considered for sustaining the SoS. The baseline option for a Sustain SoS appraisal is the minimum amount of intervention that can be carried out whilst maintaining the current standard of service of the asset system in accordance with the FCRM appraisal guidance; this is Option 1: Phased Repair Scheme.

1.3.2 **Option 1: Phased Repair Scheme:** Repair works to the coastal defence assets would be carried out in phases according to urgency of works over a period of 15 years. This would result in the need for a capital scheme being delayed until year 30.

1.3.3 **Option 2: Full Repair Scheme:** Repair works and preventative works will be carried out in one phase without delay. A capital scheme to implement the strategic options would be delayed until year 30.

1.3.4 **Option 3: Capital Scheme:** No repair works are carried out, instead the capital scheme to implement the strategic options of rock revetment, seawall repairs and slope stabilisation is developed in line with the timescales proposed in the 2009 StAR and constructed in year 5 (2017).

1.3.5 Options 1 and 2 bring forward the seawall repair portion of the preferred strategic option in order to maximise the longevity of the previous investments. This results in a delayed investment in the capital scheme until year 30 for both options.

1.4 Preferred option

Description

1.4.1 The preferred option is Option 1: Phased Repair Scheme. This option was selected as it is the most cost efficient solution, and it reduces the likelihood of a breach in the seawalls occurring thereby avoiding additional costs and disruption.

1.4.2 Option 1 proposes to prioritise investment in repairs to target the most urgent issues first, whilst continuing to maintain those assets where repairs are less urgent and where improvement works can be programmed for a later date, in order to maximise the longevity of the existing investments and delay the need for a major capital scheme.

1.4.3 Option 1 consists of three phases of repair works, and a delayed capital scheme. Phase 1 consists of repair works to 540m of frontage (35%); this will be undertaken in year 1. Phase 2 will consist of repair works to 440m of frontage (28%); this will be undertaken in year 8. The remaining 570m of frontage (37%) will be repaired in year 15 as Phase 3 of Option 1. The delayed capital scheme will be carried out in year 30.

1.4.4 Phase 1 of the scheme, for which funding is being sought through this PAR, consists of repair works over 540m of the frontage. The repairs will consist of 400m of sea wall re-facing and 500m of toe protection works.

Environmental considerations

1.4.5 Following the detailed option appraisal, Option 1 was selected as the preferred option based upon economic viability. The similarities between Options 1 and 2, in terms of their potential environmental effects, are such that selecting the preferred option on economic grounds alone is considered appropriate. The principal positive effect of the repair options is the extension of the defences' residual lives by 30 years, thus delaying the requirement for the capital works

1.4.6 A screening opinion has been sought from the local planning authority and the Marine Management Organisation (MMO), and both have confirmed that an EIA is not required (Appendix L). A Baseline Environmental Report has been produced and can be found in Appendix M. An Indicative Landscape Plan has been produced and can be found in Appendix F.

1.4.7 The local planning authority has confirmed that planning permission is not required. A Marine Licence from the MMO will be required due to the slight extension, 0.5m, of the footprint of the structures through the toe protection works along 346m of the frontage.

Benefits

1.4.8 The economic assessment for this project is based on the economic assessment carried out for the 2009 Strategic Appraisal Report (StAR) for the Scarborough Coastal Defence Strategy: Holbeck to Scalby Mills. The updated present value benefits over 100 year appraisal period for this scheme are £78,529k (£33,868k North Bay Cliffs MU and £44,661k Clarence Gardens MU).

1.4.9 There is no difference in the monetarised present value benefits between the options. There is little difference between the options in terms of non-monetarised benefits. The key difference is in the timing of the capital scheme and therefore when the wave overtopping is reduced through the rock revetment.

Costs

1.4.10 The construction costs for the repair works have been developed by Scarborough Borough Council's framework maintenance contractor (Transcore Ltd), to a March 2012 price date. These costs are based on framework rates and as such there is a high level of certainty. The design of the works and the site supervision will be undertaken by SBC's in-house technical team.

1.4.11 Due to the type of works involved in the repair works, including re-pointing, re-surfacing and toe works it is not anticipated that further site investigation or surveys will be required. Similarly there is little opportunity for any environmental enhancements and the mitigation proposed can be accomplished by following construction related best practices. Compensation will not be required for the repair works as the assets are owned by SBC and no privately owned land or assets will be affected.

1.4.12 Ongoing maintenance costs have been based on the annual maintenance budget that SBC has for the North Bay coast defence assets of £30k a year.

Table 1-1 Project costs (£k)

	Cost for economic appraisal (PV)	Whole life cash cost	EA FSoD approval project cost
Costs to PAR:	Sunk Costs	88	88
PAR to Construction:			
Local Authority staff	19	19	19
Consultant fees	0	0	0
Early Contractor Involvement (ECI)	0	0	0
Cost consultant fees	0	0	0
Site investigation & survey	0	0	0
Construction costs	478	478	478
Environmental enhancements	0	0	0
Environmental mitigation	0	0	0
Site supervision	29	29	29
Compensation	0	0	0
Risk Contingency:			
20% Optimism Bias	105	105	105
Inflation	n/a	n/a	0
Future Costs:	8,128	22,663	
Other (risk contingency @ 60%)	3,984	3,984	
Contributions			185
TOTAL	**12,743**	**27,366**	**446**

Economic summary, outcome measures and priority

1.4.13 The economics from the Strategy for the two management units covered by this scheme have been updated with the results of this PAR. The revised present value benefits are £78,529k, with a revised present value cost of £12,743k, giving an updated benefit-cost ratio of 6.16.

1.4.14 The outcome measures (OM) under the FDGiA Partnership Funding system are shown in Table 1.2. The next phase of the scheme has an adjusted OM score of 100%.

Table 1-2 Outcome measures

Outcome Measures		Number	Qualifying Benefits	FDGiA Contribution
OM1 (Economic Benefit)			£26,294k	£1,461k
OM2 (Households better protected against flooding)	20% most deprived areas	0	£0	£0
	21-40% most deprived areas	0	£0	£0
	60% least deprived areas	0	£0	£0
OM3 (Households better protected against coastal erosion)	20% most deprived areas	128	£7,466k	£3,360k
	21-40% most deprived areas	14	£844k	£253k
	60% least deprived areas	1	£15k	£3k
OM4 (Statutory Environmental Obligations Met)			£0	£0
TOTAL FDGiA Contribution				**£5,077k**
Raw OM Score				70.82%
Cost saving and/or external contribution required				£185k
Scheme Contributions Secured				£185k
Adjusted OM Score				100.12%
FDGiA required for next phase				**£446k**

Funding and contributions

1.4.15 The scheme will be funded under the Partnership Funding approach, with a combination of FDGiA funding and contribution from SBC as asset owners and Coast Protection Authority. Phase 1 will require FDGiA funding of £446k and a SBC contribution of £185k. SBC will be responsible for and fund the ongoing routine maintenance of the seawalls in North Bay from their annual maintenance budget.

1.4.16 There are no commercial properties which contribute greater than 2% of the value of the property related benefits. Yorkshire Water (YW) is a beneficiary (less than 5% of benefits) and they will be carrying out repairs to approximately 40m of seawall as part of their current investment in their infrastructure in North Bay. Therefore no further contributions from YW or other commercial beneficiaries have been sought for the Phase 1 Repair works.

Key delivery risks (economic, social and environmental)

Table 1-3 Risks and mitigation

Risk	Key Mitigation
Unforeseen ground conditions	• Trial pits were carried out in 2010 to assess the depth of the rock head, the overlying material and the location and extent of undercutting. • The design for the scour protection, apron and facing repairs is simple and can be adapted easily on site to accommodate unforeseen conditions. • A 20% contingency for Phase 1 of the works has been identified within the funding application to allow for unforeseen scope changes.
Extent of repairs required is greater than anticipated	• Repairs required are based on visual inspections carried out in 2010 when beach levels were very low. • A 20% contingency for Phase 1 of the works has been identified within the funding application to allow for unforeseen scope changes.

1.5 Recommendation

1.5.1 We recommend that the Environment Agency gives technical and financial approval to the North Bay Urgent Wall Improvement Scheme in the sum of £631k which includes a contingency of £105k at the 95% confidence level, for the design and construction of Phase 1 (seawall re-facing and toe protection installation works) of the preferred option which is Option 1: Phased Repair Scheme with a delayed capital scheme. The sum of £631k will be funded by a combination of £446k from Flood Defence Grant in Aid and a £185k contribution from Scarborough Borough Council.

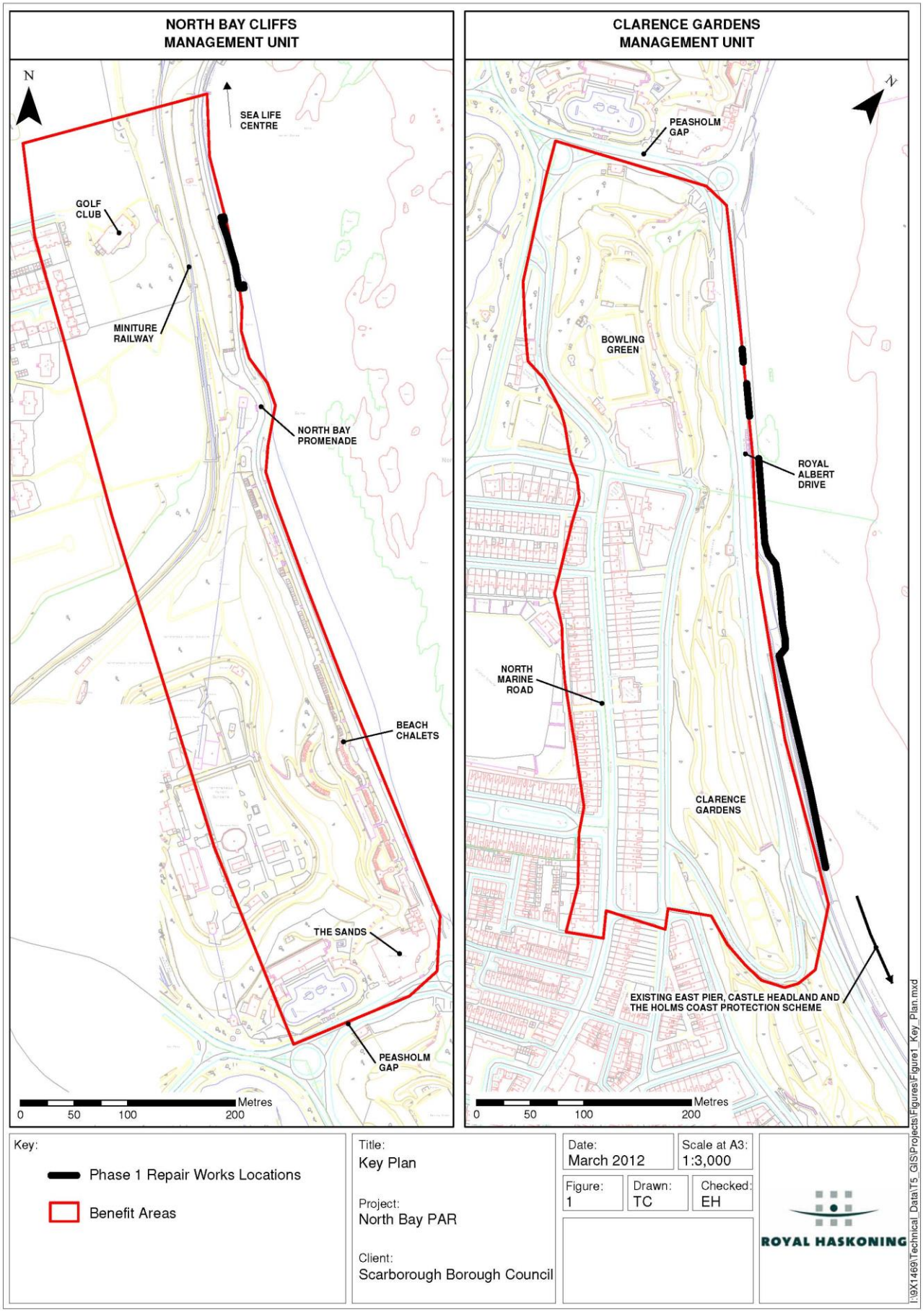
1.6 Director's briefing paper

Region:	Yorkshire & Northeast		**Project Executive:**	Chris Bourne	
Function:	FCERM		**Project Manager:**	Robin Siddle	
Project Title:	North Bay Urgent Wall Improvements		**Code:**	**YOS351C/000A/58CA**	
NEECA Consultant:	Royal Haskoning	**NCF Contractor:**		**Cost Consultant:**	
The Problem:	The existing coastal defence assets in Scarborough's North Bay date back to 1890 and are in a deteriorating condition. Asset inspections have identified a range of defects. The Scarborough Coastal Defence Strategy assessed the structural stability as having 95% probability of failure within 10 years under a No Active Intervention scenario.				
Assets at risk from erosion:	240 residential properties, 270 commercial properties, Royal Albert Drive (main link road between North and South Bay), and Yorkshire Water critical infrastructure for the town.				
Existing standard of flood protection:	No residential properties at risk of flooding		**Proposed standard of flood protection:**	n/a	
Description of proposed scheme:	The aim of the works is to sustain the current standard of service provided by the existing coast defence assets in North Bay, whilst maximising the longevity of the previous investments. Repair works to the coastal defence assets would be carried out in phases according to urgency of works over a period of 15 years. This would result in the need for a capital scheme being delayed until year 30.				

Costs (PVc): (100 year life inc. maintenance)	£12,743k	**Benefits: (PVb)**	£ 78,259k	**Ave. B: C ratio: (PVb/PVc)**	6.16
NPV:	£ 65,786k	**Incremental B: C ratio:**	n/a	**Whole life cost (cash value):**	£27,366k

Choice of Preferred Option:	Option 1: Phased Repair Scheme
Total cost for which approval is sought:	**£ 446k (incl. £0 inflation & £105k contingency)**
Delivery programme:	Planning Approval: Not required Award Construction Contract: August 2012 Construction Start: September 2012 Construction end: August 2014 End of Project: August 2014
Are funds available for the delivery of this project?	Yes
External approvals:	
Outcome measures	Raw OM Score: 70.82% Adjusted OM Score: 100.12%

1.7 Key plan(s)


NORTH BAY CLIFFS MANAGEMENT UNIT
CLARENCE GARDENS MANAGEMENT UNIT
N
SEA LIFE CENTRE
GOLF CLUB
MINITURE RAILWAY
NORTH BAY PROMENADE
BEACH CHALETS
THE SANDS
PEASHOLM GAP
BOWLING GREEN
ROYAL ALBERT DRIVE
NORTH MARINE ROAD
CLARENCE GARDENS
EXISTING EAST PIER, CASTLE HEADLAND AND THE HOLMS COAST PROTECTION SCHEME
Metres
0 50 100 200
Key:
Phase 1 Repair Works Locations
Benefit Areas
Title: Key Plan
Project: North Bay PAR
Client: Scarborough Borough Council
Date: March 2012
Scale at A3: 1:3,000
Figure: 1
Drawn: TC
Checked: EH
ROYAL HASKONING
I:\9X1469\Technical_Data\T5_GIS\Projects\Figures\Figure1_Key_Plan.mxd

2 Introduction and background

2.1 Purpose of this report

2.1.1 The purpose of this report is to seek investment approval in an asset refurbishment scheme in North Bay, Scarborough, to extend the residual lives of the existing coast defence assets, and thereby delaying the requirement for a capital scheme.

2.1.2 This report presents the business case for the most cost-efficient way of sustaining the standard of service (SoS) of the existing assets. This project falls within the threshold criteria for a sustain SoS project; it is supported by a current approved Strategy and it will not change the standard of service for the frontage.

2.1.3 The appraisal has been carried out in accordance with the Defra Flood and Coastal Erosion Risk Management Appraisal Guidance and associated Environment Agency procedures and policies.

2.1.4 This project will be carried out under the powers of the Coast Protection Act 1949.

2.2 Background

Location and designations

2.2.1 The assets to be refurbished by this project are located within North Bay in Scarborough, North Yorkshire. The assets are located along 1.5km of coastal frontage, running from the Sea Life Centre in the north to the start of the East Pier, Castle Headland and the Holms coast protection scheme completed in 2005.

2.2.2 The assets are located within two of the management units (MU) of the Scarborough Coast Defence Strategy: Holbeck to Scalby Mills; namely North Bay Cliffs (MU 20A/2-20A/7) and Clarence Gardens (MU 20B/1-20B/3) as shown in the Key Plan.

2.2.3 The Castle Ground recommended Marine Conservation Zone (rMCZ) extends from Filey Brigg in the south to approximately 1km north of North Bay; whilst the southern part of North Bay, from Peasholm Gap southwards, is within the Scarborough Conservation Area. In addition, there are two geological Sites of Special Scientific Interest (SSSIs) to the north and south of North Bay. See Appendix F for the Indicative Landscape Plan.

2.2.4 The assets are located along a key tourist area for the resort of Scarborough, running along a popular amenity beach, with the promenade behind the assets.

Previous studies

2.2.5 This area is covered by the River Tyne to Flamborough Head Shoreline Management Plan 2 (SMP2) produced in 2007. The adopted policy for North Bay is to hold the line in the short, medium and long term.

2.2.6 The Scarborough Coastal Defence Strategy: Holbeck to Scalby Mills (StAR) covers this area and was approved in 2009. The preferred option for the North Bay Cliffs MU is ‘seawall repairs and slope stabilisation’, and for Clarence Gardens MU is ‘rock revetment in front of existing seawall, seawall repairs and slope stabilisation’.

2.2.7 Excerpts from the SMP2 and the StAR can be found in Appendix E.

2.2.8 The assets are inspected as part of the Cell 1 Regional Coastal Monitoring Programme, with the most recent inspections being carried out in 2010 and 2011 (see Appendix O for the asset inspection reports).

Social and political background

2.2.9 Yorkshire Water is investing in the region of £110million along the north-east coast in advance of the Revised Bathing Water Directive which comes into effect in 2015, with a significant proportion in the Scarborough area (>£50M). Part of the investment in their infrastructure is in the vicinity of the scheme proposed by this PAR, and some of their assets are protected by the coast defence structures. Should the coastal defence assets fail then the Yorkshire Water services would be at risk of erosion. This would have a major impact as they are part of the critical infrastructure for the town, and may also result in pollution in the North Bay.

2.3 Consequences of coastal erosion

2.3.1 Failure of the coast defence assets would lead to the onset of coastal erosion. The initial losses would be the promenade immediately behind the seawalls, and the loss of Royal Albert Drive in the Clarence Gardens MU. Royal Albert Drive links in to Marine Drive which was protected by the 2005 East Pier, Castle Headland and the Holms scheme, and is the main coastal route linking the north and south bays at Scarborough. Loss of this route would result in traffic disruption within the town, and impact on the value of enjoyment for visitors to the town.

2.3.2 The resumption of active toe erosion and removal of support to the steep coastal slopes behind the promenade and road would result in reactivation of pre-existing landslides and instigation of new landslides. The cliff-top would consequently collapse and recede resulting in the loss of assets, services and property.

2.3.3 In the North Bay Cliffs MU there are 136 beach chalets, a new beach management centre, café, and crazy golf course behind the promenade at the toe of the coastal slope. There is a miniature railway which runs along a bench in the coastal slope in the northern section of the North Bay Cliffs MU which would be lost through landsliding following erosion at the toe of the slope. At the top of the coastal slope the properties are generally set back, however our assessments have shown that within a 100 year appraisal period the golf club and the 13 residential properties would be at risk.

2.3.4 The Sands development was completed in 2008 and is part of an ongoing long term redevelopment of the North Bay tourist facilities. It is located close behind the seawall at the boundary between the two MUs; it contains 100 apartments and a range of 6 commercial units.

2.3.5 In the Clarence Gardens MU there are only a small number of commercial properties at the toe of the coastal slope, however there are significant numbers of properties, both residential (187) and commercial (61), that would be at risk within 5 years at the top of the coastal slope if the seawall was to fail and erosion commence.

2.3.6 Failure of the seawall and onset of coastal erosion would impact on tourism through a reduction in the value of enjoyment visitors would obtain from visiting the North Bay after the loss of the promenade, coastal link road to South Bay, tourist facilities and encroachment of landslides onto the foreshore.

2.3.7 There are no residential properties at risk of flooding in either management unit.

2.4 Adopted approach to coastal erosion risk management

2.4.1 The coastal defence assets in North Bay are Victorian in age, dating back to 1890 and stretch right around the bay from the Sea Life Centre in the north to the Castle headland and around into South Bay. There have been many structural developments and modifications to the structures, including in the 1930s, 1950s, 1960s and 1970s. The coastal defence assets consist of a variety of concrete and masonry near-vertical seawalls of varying heights and an assortment of access points (steps and slipways). The assets are in varying condition. The Strategy assessed the structural stability of the assets as being at high risk of failure, with an annual probability of failure of 10% to 50% in any one year.

2.4.2 This area is covered by the River Tyne to Flamborough Head Shoreline Management Plan 2 produced in 2007. The adopted policy for North Bay is to hold the line in the short, medium and long term (Appendix E).

2.4.3 The Scarborough Coastal Defence Strategy: Holbeck to Scalby Mills covers this area and was approved in 2009 (Appendix E). The preferred option for the North Bay Cliffs MU is 'seawall repairs and slope stabilisation', and for Clarence Gardens MU is 'rock revetment in front of existing seawall, seawall repairs and slope stabilisation'. The Strategy recognised that in the short term prior to any capital scheme being implemented for these two frontages that an option of 'emergency coastal slope and defence works and repairs to defences and landslips as and when required' would be essential. This would involve infilling of breaches, re-building of failed or poor condition sections of defences to extend their effective life and reduce the chance of failure. The works that are the subject of this business case fit within this short term option to prolong the residual life of the assets.

2.4.4 The existing coastal defence assets are maintained by Scarborough Borough Council, with a regular inspection regime carried out under the Cell1 Regional Coastal Monitoring Programme (Appendix O).

2.4.5 During storm events when overtopping of the seawalls is deemed to be a risk to public safety North Yorkshire County Council close Royal Albert Drive. A variety of temporary methods are used such as signs, road blocks, physical barriers, or personnel with vehicles to block the road and warn the public. The road is closed at either the Sands development or the roundabout at the end of Peasholm Gap.

3 Problem definition and objectives

3.1 Outline of the problem

3.1.1 The existing coastal defence assets originally date back to 1890 and are in a deteriorating condition. The walls have a range of defects including cracking, loss of mortar, expanding sealant, surface erosion, and undercutting at the toe.

3.1.2 The Strategy assessed the structural stability of the assets as being at high risk of failure, with an annual probability of failure of 10% to 50% in any one year. The Strategy estimated that there was a 95% probability that the seawalls would fail within 10 years under a No Active Intervention policy.

3.1.3 Asset inspections undertaken in 2010 identified assets within North Bay as being in need of 'urgent' repair (Appendix O). The types of defects recorded included large vertical cracks running the full height of the wall, missing blockwork, eroded faces of blockwork, undercutting at the toe of the walls with accompanying lateral cracking along the promenade behind the wall, development of voids and seepage, and loss of joint material. Photographs of the defects are included in Appendix C.

3.1.4 Inspections of the assets made when beach levels were low as a result of storms in winter 2010, revealed sections of the defences where considerable undercutting and scour could be observed. Scouring which had not been previously observed during routine asset inspections, was evident at the toe of the walls and access steps/slipways. The extent of scour beneath some of these structures raises concerns as their short term structural stability.

3.1.5 A first-order assessment of the beach response to future sea level rise in North Bay, Scarborough, was carried out in 2010. The results of this study show that the beach will become narrower overall, and lower at the seawalls. In addition to the clear loss of amenity beach, such reductions in beach width and increases in water depth at high tide would be accompanied by larger waves at the seawalls. These would intensify wave impact pressures, which would increase the likelihood of structural damage. Structure vulnerability would also be increased by the potential for undermining associated with the lower beach levels. In addition greater wave uprush velocities and overtopping volumes would occur.

3.1.6 Scarborough Borough Council are currently progressing a range of projects for coastal defence issues along their frontages. These include two major multi-million pound coast protection schemes. Under the FDGiA Partnership Funding SBC will be making significant contributions to these high priority capital schemes. There are therefore constraints on potential contributions to the funding of capital works for North Bay and programming to ensure disruption to the residents, businesses and economy of Scarborough is minimised and sufficient resources are available to deliver all the projects.

3.2 Key constraints

- Tourism – the beach in North Bay is a popular amenity beach and during the peak tourist season is extremely busy. Disruption from construction during the peak tourist season could have an adverse impact on local businesses and Scarborough's reputation as a premier seaside resort, therefore works should be programmed

outside of the peak tourism season (school summer holidays July-August) as far as possible;

- Yorkshire Water's (YW) construction period for their current investment programme is 2012-2014, the programme for the works proposed in this PAR therefore needs to be planned carefully to avoid any conflicts with the YW programme and to try to minimise disruption to local residents, businesses and tourists. SBC are working closely with YW on their project and are therefore well placed to minimise disruption from any potential clashes of programme;
- Weather – as the works will be taking place on the foreshore in a tidal area the works will need to be programmed outside of the winter months (December-February) due to the severe and unpredictable wave and weather conditions;
- Access – access down to the foreshore from the promenade for vehicles and machinery is limited. To avoid having to track machinery long distances along the foreshore from the slipway at the Sands development it may be possible to temporarily re-open the slipway halfway along the Clarence Gardens frontage for the duration of the works;
- Funding and resources – due to other high priority schemes that are currently being developed by SBC the availability of funding and the resources required to manage another large capital scheme are limited, and opportunities to maximise the longevity of the previous investments should be explored;
- Designated areas – Scarborough Conservation area is located to the south of the bay and includes the defences from Peasholm Gap southwards; whilst Castle Ground rMCZ is located adjacent to the proposed works. In addition, there are two geological Sites of Special Scientific Interest (SSSIs) to the north and south of North Bay; and
- Water - there are four WFD waterbodies that could be affected by the proposed works (see Section 5.3 for WFD Compliance Assessment). North Bay is a designated bathing beach and currently holds Blue Flag status.

3.3 Objectives

3.3.1 The aim of the works is to sustain the current standard of service provided by the existing coast defence assets in North Bay, whilst maximising the longevity of the previous investments.

3.3.2 The StAR set out a series of environmental objectives for the strategy as a whole as follows:

- Maintain an appropriate level of coastal defence protection for people and their property, in partnership with opportunities identified in other Strategies and Plans and through consideration within the context of PPS25;
- Maintain and, where possible, improve tourism, amenity and recreational value of beaches ad associated coastal features;
- Protect designated features, such as geological SSSIs;
- Protect ecologically valuable inter-tidal rocky shore habitats;
- Maintain Conservation Area's character and appearance;
- Prevent disturbance to sea birds;
- Maintain and, where possible, improve access to seafront;

- Conserve visual appearance of coastline;
- Prevent damage to fisheries;
- Maintain water quality in order to achieve the requirement for all coastal waters to reach “good status” by 2015 under the Water Framework Directive; and
- Ensure that the Coastal Defence Strategy takes account of Climate Change.

4 Options to sustain SoS

4.1 Options considered for detailed appraisal

4.1.1 The baseline option for a sustain standard of service appraisal is the Do Minimum, defined as the minimum action or intervention needed to ensure that the legal requirements or performance of an asset is met. Option 1 Phased Repair Scheme is the minimum amount of intervention that can be carried out whilst maintaining the current standard of service of the asset system in North Bay. Therefore Option 1 is the baseline for this option appraisal.

Option 1: Phased Repair Scheme

4.1.2 Repair works to the coastal defence assets would be carried out in phases according to urgency of works. Phased approach would involve repair works being carried out over the full length of the coastal defence assets in both management units periodically as required over a period of 15 years. This brings forward the seawall repair portion of the preferred strategic option and would result in the need for a capital scheme being delayed until year 30. The capital scheme to implement the strategic options would consist of rock revetment, further seawall repairs and slope stabilisation.

Option 2: Full Repair Scheme

4.1.3 Repair works and preventative works to delay/avoid damage to full length of assets from Sea Life Centre to East Pier, Castle Headland and the Holms scheme will be carried out in one phase without delay. This brings forward the seawall repair portion of the preferred strategic option. A capital scheme to implement the strategic options of rock revetment, further seawall repairs and slope stabilisation would be delayed until year 30.

Option 3: Capital Scheme

4.1.4 No repair works are carried out, instead routine maintenance is continued until a capital scheme to implement the strategy is developed in line with the timescales proposed in the 2009 StAR and constructed in year 5 (2017). Capital scheme would incorporate seawall repairs along full length of coastal defence assets in both management units, along with the rock revetment and slope stabilisation.

4.2 Technical details

4.2.1 Options 1 and 2 both propose the same technical solutions in terms of repairing the existing assets to prolong the asset life and delay the need for a capital scheme. The capital scheme implemented is as described as Option 3 below. A programme comparing the relative intervention points of all 3 options can be found in Appendix J.

4.2.2 Option 1 proposes to prioritise investment in repairs to target the most urgent issues first, whilst continuing to maintain those assets where repairs are less urgent and where improvement works can be programmed for funding (contributions) for a later date. The urgent works identified within Phase 1 (35% of the total frontage) are proposed to be carried out commencing in 2012 and to be delivered over a two year period thereafter. Phase 2 (15% of the total frontage) is proposed to be delivered in 2020 within a one year construction programme. Phase 3 (remaining 50% of total frontage) is proposed for delivery in 2027 over an anticipated two year construction programme.

4.2.3 The repair works programme proposed for Option 1 results in the delay of the capital project until 2042.

4.2.4 Option 2 proposes to carry all repairs commencing 2012, with an anticipated construction programme of four years.

4.2.5 The repair works programme proposed for Option 2 results in the delay of the capital project until 2042.

4.2.6 For Options 1 and 2 the works include;

- Installation of mass concrete scour protection at locations where undercutting of the wall has occurred due to erosion of the bed rock and/or lowering of beach levels.
- Replacement of eroded masonry sets with new mass concrete apron.
- Breaking out and reinstatement of eroded concrete edging at the toe of existing masonry block aprons.
- Re-facing of eroded stepped masonry seawall with new mass concrete stepped facing.

4.2.7 The phasing of the above works is what differentiates Options 1 and 2.

4.2.8 Option 3 proposes to carry out capital works to deliver the preferred option solution from the 2009 StAR, with construction commencing in 2017.

4.2.9 This capital scheme would consist of the following elements;

- Unit 20A/2 – 20A/7- North Bay Cliffs; sea wall repairs and slope stabilisation
- Unit 20B/1 – 20B/3 – Clarence Gardens (N); rock revetment, seawall repairs & slope stabilisation.

4.2.10 The preferred strategic option is compatible with the adjacent frontages, and will create a continuation of the East Pier, Castle Headland and the Holms coast protection scheme completed in 2005.

4.2.11 Options 1 and 2 would be delivered using contractors on an existing SBC framework, who are experienced in carrying out seawall repairs, have good local knowledge and local resource availability. In addition, the framework contract proposed does not allow costs for standing time or weather delays and therefore the construction phase cost risks are significantly reduced.

4.2.12 Options 1 and 2 involve simple scour protection and re-facing repairs which are relatively easy to install, but are constrained by tidal working and the need to minimise disruption to tourist use of the beach. Initial trial pits were excavated in 2010 to identify rock head location and verify the extent of scour at the toe and therefore the risk of uncertainty relating to ground conditions is reduced, but not eliminated.

4.2.13 Option 3 will be a more complex design and construction project that will involve slope stabilisation and the construction of a rock revetment, in addition to far more extensive wall repairs than proposed in Options 1 and 2.

4.2.14 The non-capital scheme elements of Options 1 and 2 do not require planning permission and are unlikely to be controversial in terms of their impact on the seafront, therefore

there is little risk of delays, objections or changes to the design as a result of licences, consents or application processes. The capital scheme element of all three options is likely to be more controversial and will require extensive consultation within the council, stakeholders and the general public.

4.2.15 All of the options are in line with the objectives identified within the Strategy for these units and the early implementation of repairs as identified in Options 1 and 2 does not constrain the achievement of the wider strategy objectives.

4.2.16 The initial short and medium term delivery activities of Options 1 and 2 only include elements of erosion protection, therefore climate change consequences are not a significant factor for these initial phases. Climate change considerations will form a critical part of the design development process for the capital scheme proposed in the latter stages of Options 1 and 2 and for the short term capital scheme delivery proposed in Option 3. The climate change impacts on achieving the required overtopping performance will be a significant factor in the design development.

4.3 Environmental assessment

4.3.1 The potential key positive and negative environmental impacts of the detailed options being considered are presented in Table 4.1. Only the potential impacts that differ between the options are presented here allowing for a comparison of each option's positive and negative impacts against each other. Mitigation measures and enhancement opportunities have also been proposed, where required. A complete appraisal of the positive and negative effects of the preferred option is presented in Section 5.3.

Table 4-1 Comparison of key environmental impacts of the alternative options

Key Positive Impacts	Key Negative Impacts	Mitigation/ Enhancement Opportunity
Option 1 – Phased Repair Scheme		
Smaller, more localised, works with lower effects, due to shorter duration, on the surrounding environment.	Repeated disturbance associated with the repair works, extending over a period of 15 years (1, 8 and 15 years).	Works to the north of the bay, northwards of Peasholm Gap, should be undertaken outside of the over-wintering bird period (October to March).
A phased approach allows for the works to be more easily undertaken around sensitive tourism and bird periods.	Wave overtopping issue not resolved until the capital works have been completed.	Construction works should follow industry best practice guidance (i.e. PPG and CIRIA).
Repair works would extend the residual life of the defences, delaying the time for capital works by 30 years.		Works should be undertaken outside of peak tourism period.
		Production of a construction method statement will ensure suitable mitigation for construction works (e.g. materials to be used, timing of works, prevention of pollution, etc.)
Option 2 – Full Repair Scheme		
Repair works would extend the residual life of the defences, delaying the time for capital works by 30 years.	Wave overtopping issue not resolved until the capital works have been completed.	Works should be undertaken outside of peak tourism period.

Key Positive Impacts	Key Negative Impacts	Mitigation/ Enhancement Opportunity
Repair works undertaken once. Thus, fewer disturbances than Option 1.		Works to the north of the bay, northwards of Peasholm Gap, should be undertaken outside of the over-wintering bird period (October to March).
Fewer disturbances and the extension to the residual life of the defences means that this option is considered to be the most sustainable.		Construction works should follow industry best practice guidance (i.e. PPG and CIRIA).
		Production of a construction method statement will ensure suitable mitigation for construction works (e.g. materials to be used, timing of works, prevention of pollution, etc.)
		A SWMP will be produced and implemented prior to the commencement of works.
Option 3 – Capital Scheme		
Lowest disturbance to the surrounding environment as no repair works are required.	Residual life of the defences not extended to their full potential, thus reducing the period for when capital works will be required in the future.	Construction works should follow industry best practice guidance (i.e. PPG and CIRIA).
Wave overtopping issue resolved sooner.	Potential for assets requiring urgent work to deteriorate further and collapse during the five year capital works period, leading to significant health and safety dangers to the public using the promenade, beach and road.	Works should be undertaken outside of peak tourism period.
		Works to the north of the bay, northwards of Peasholm Gap, should be undertaken outside of the over-wintering bird period (October to March).
		Production of a construction method statement will ensure suitable mitigation for construction works (e.g. materials to be used, timing of works, prevention of pollution, prevention etc.)
		A SWMP will be produced and implemented prior to the commencement of works.

4.4 Option costs

4.4.1 The costs for developing and constructing the capital scheme from the preferred strategic option have been taken from the 2009 StAR and updated to a December 2011 base date. These costs have then been applied to all three options and discounted to the appropriate investment year.

4.4.2 The construction costs for the repair works have been developed by Scarborough Borough Council's framework maintenance contractor (Transcore Ltd), to a March 2012 price date, these are based on framework rates and as such there is a high level of

certainty. The design of the works and the site supervision will be undertaken by SBC's in-house technical team.

4.4.3 Due to the type of works involved in the repair works, primarily re-pointing, re-surfacing and toe works, for Options 1 and 2 it is not anticipated that significant site investigation or further surveys will be required. The site investigation and survey costs included in the Strategy for the capital scheme have been included at the appropriate year for all options.

4.4.4 Due to the type of works proposed for the repair works there is little opportunity for any environmental enhancement works, as the works will repair the existing assets to the same appearance and form. The environmental mitigation measures outlined in Table 4.1 can be accomplished within construction best practice methodologies and therefore there is not expected to be any additional costs over and above the construction costs required for mitigation measures.

4.4.5 Compensation will not be required for the repair works as the assets are owned by SBC and no privately owned land or assets will be affected. The work will be carried out outside of the peak tourist season and therefore there will be minimal impact on the tourism trade in the North Bay.

4.4.6 Ongoing maintenance costs have been based on the annual maintenance budget that SBC have for the North Bay coast defence assets of £30k a year.

4.4.7 The risk contingency at the option appraisal stage has been based on the 60% optimism bias included within the Strategy. This is due to the largest proportion of the cash costs for all 3 options being associated with the capital scheme which has not been further developed from the preferred strategic option at this stage. The risk contingency for the preferred option has been reassessed in Section 5.3 to reflect the additional option development work carried out.

Table 4-2 Summary of option present value costs (£k)

	Estimated costs from Scarborough Coastal Defence Strategy*	**Option 1**	**Option 2**	**Option 3**
Local Authority Staff		19	69	130
Consultant Fees	651	0	0	456
Early Contractor Involvement (ECI)		0	0	65
Cost consultant fees		0	0	59
Site investigation & survey	416	0	0	416
Construction	11,749	478	1,647	11,279
Environmental mitigation		0	0	117
Environmental enhancement		0	0	59
Site supervision	1,057	29	105	1,057
Compensation		0	0	235
Risk contingency	9,882	316	1,093	9,882
Other				
Sub Total	**23,755**	**842**	**2,914**	**23,755**
Present Value of future costs	2,596	13,004	11,433	2,596

	Estimated costs from Scarborough Coastal Defence Strategy*	Option 1	Option 2	Option 3
(capital + maintenance)				
Total Present Value Cost (PVc)	**26,352**	**13,846**	**14,347**	**26,352**

*Note: Cost breakdown from the Strategy is replicated in categories as presented in the Strategy.
**Note 2: Breakdown of costs are for first investments for all options, the costs for future investments including the capital scheme and further repair phases for Option 1 are included in the Future Costs.

4.5 Options benefits

4.5.1 The economic assessment for this project builds up on the economic assessment carried out for the 2009 Strategic Appraisal Report (StAR) for the Scarborough Coastal Defence Strategy: Holbeck to Scalby Mills. The economic assessment for the PAR takes the strategic assessment probabilistic methodology and updates the input data for the various types of damage receptor based on the most up to date information available. No changes to the assumed probabilities have been made.

4.5.2 Damages have been calculated using the Multi Coloured Manual (MCM) and the Green Book (HM Treasury, 2003). These documents have been used in combination with the Defra FCERM-AG series and Supplementary Guidance Notes. Figures in the Multi Coloured Manual have been updated to 3rd Quarter (December) 2011 using the Consumer Price Index (CPI).

4.5.3 Damages have been calculated for the 100 year appraisal period and discount rates starting at 3.5% and reducing to 2.5% have been applied.

4.5.4 The updated benefits for this scheme are £78,529k (£33,868k North Bay Cliffs MU and £44,661k Clarence Gardens MU).

4.5.5 There is no difference in the monetarised present value benefits between the options.

4.5.6 There is little difference between the options in terms of non-monetarised benefits. The key difference is in the timing of the capital scheme and therefore when the wave overtopping is reduced through the rock revetment. Option 3 would deal with the wave overtopping the earliest, with options 1 and 2 delaying the capital investment by 25 years. It is difficult to quantify the damages related to wave overtopping. The impacts are health and safety related and would include temporary road closures and risk to life of pedestrians using the promenade. In comparison to the direct damages associated with coastal erosion that have been quantified, the wave overtopping damages would not be significant and they would have little influence on the benefit-cost ratios of the options.

Table 4-3 Summary of benefits between options

	Monetarised present value benefits (PVb)	Key non-monetarised benefits
Option 1	£78,529k	
Option 2	£78,529k	Less interventions required than Option 1, therefore less disruption
Option 3	£78,529k	Wave overtopping dealt with sooner.

	Monetarised present value benefits (PVb)	Key non-monetarised benefits
		Less interventions required than Options 1 & 2, therefore less disruption

5 Selection and details of the preferred option

5.1 Selecting the preferred option

5.1.1 A cost-effective assessment (CEA) has been carried out for this Sustain Standard of Service scheme in accordance with the Flood and Coastal Erosion Risk Management Appraisal Guidance (see Appendix G). A summary of the results are shown in Table 5.1.

5.1.2 The baseline for a CEA is the Do Minimum; Option 1 Phased Repair Scheme is the minimum amount of intervention that can be carried out whilst maintaining the current standard of service of the asset system in North Bay and is therefore the baseline for this CEA.

Table 5-1 Options benefit-cost assessment

	Option	PV Benefits (£k)	PV Costs (£k)	Incremental PV Cost (£k)	BCR
1	Phased Repair Scheme	£78,529k	£13,846k	-	5.67
2	Full Repair Scheme	£78,529k	£14,347k	£501k	5.47
3	Capital Scheme	£78,529k	£26,352k	£11,733k	2.98

5.1.3 From Table 5.1 it can be seen that Option 1 Phased Repair Scheme has the highest benefit-cost ratio.

5.1.4 The incremental PV cost to the next option is significant at £501k but there are no significant additional non-monetarised benefits from Option 2. Although Option 3 offers the additional non-monetarised benefits of reducing the wave overtopping sooner and requires less interventions and therefore disruption, the incremental PV cost is very high at £11,733k and is therefore not justified.

5.1.5 The economic evaluation has compared the effectiveness of carrying out short term repair works (through a phased programme) and a delayed capital programme, against carrying out a capital scheme in the short term. This has shown that the former proposal is better economic option.

5.1.6 Technically all three options are suitable for achieving the Strategy objectives. A short term capital scheme has the risk however that assets that have been identified as requiring urgent works will continue to deteriorate during the five year period prior to construction commencing. This may result in a potential collapse and breach of a section of the sea wall. This would result in additional costs for delivering the capital scheme and would pose significant health and safety dangers to the public using the promenade, beach and road.

5.1.7 The information presented within Table 4.1 illustrates the similarities between the three options, as shown by the lack of potential positive and negative impacts when compared to each other. The principal positive effect of Options 1 and 2 over Option 3 is the extension of the defences' residual lives by 30 years, thus delaying the requirement for the capital works. For this reason, Options 1 and 2 are preferred, environmentally, over Option 3. The potential environmental effects of Options 1 and 2 are very similar; however, the lower number of disturbances that would result through the implementation of Option 2 means that this is the environmentally preferred option.

5.1.8 Following the detailed option appraisal, Option 1 was considered to be the preferred option based upon economic viability. The similarities between Options 1 and 2, in terms of their potential environmental effects, are such that selecting the preferred option on economic grounds is considered acceptable. Option 1 Phased Repair Scheme is therefore the preferred option (highlighted in Table 5.1).

5.2 Sensitivity testing

5.2.1 Sensitivity tests for the preferred option have been carried out looking at the impact of changing the timings of the different stages of interventions.

5.2.2 The sensitivity of the timing of the capital scheme has been investigated. If the phased repair works are not able to delay the need for the capital scheme by the duration estimated, and the works are instead required in year 20 then the PV costs would increase by 28% to £17,716k. Conversely, if the repair works are more successful in delaying the need for a capital scheme by a further 10 years to year 40, then the PV costs would reduce by 17% to £11,430k. As the repair works in Option 1 and 2 are essentially the same but with different timings then any change to the estimated delay for the capital scheme intervention would affect both options similarly. Therefore there would be no change to the preferred option.

5.2.3 The sensitivity of the preferred option to the timings of the different phases of the repair works has also been carried out. The preferred option assumes the repair phases are carried out in year 1 (35% of frontage), year 8 (15% of frontage) and year 15 (50% of frontage) based on urgency and priority of works. If this changed to years 1, 5 and 10 then the PV costs would only increase by 1% to £13,976k. This would not change the preferred option.

5.2.4 The capital scheme of rock revetment, seawall repairs and slope stabilisation which is the preferred strategic option is an acceptable solution for this location. It will provide a continuation of the East Pier, Castle Headland and the Holms coast protection scheme completed in 2005. The choice of preferred strategic option can be reviewed and updated if required during the next review of the Scarborough Coastal Defence Strategy: Holbeck to Scalby Mills. As the costs for the capital scheme are included in all three options, just at different intervention points, then a change in the type of capital scheme would not affect the choice of option for this PAR. Option 1 maximises the longevity of the previous investments through phasing and prioritising the repair works. This option therefore is the most flexible in terms of future investment, and does not preclude any potential changes to the preferred strategic option.

5.3 Details of the preferred option

Technical aspects

5.3.1 The preferred option, Option 1 Phased Repair Scheme, is as described in Section 4.2 above. Option 1 proposes to prioritise investment in repairs to target the most urgent issues first, whilst continuing to maintain those assets where repairs are less urgent and where improvement works can be programmed for a later date, in order to maximise the existing investments and delay the need for a major capital scheme.

5.3.2 Option 1 consists of three phases of repair works, and a delayed capital scheme:

- Phase 1: repair works to 15m in North Bay Cliffs MU (2% of the MU frontage) and 525m in Clarence Gardens MU (76% of the MU frontage) undertaken in year 1;

- Phase 2: repair works to 275m in North Bay Cliffs MU (32% of the MU frontage) and 165m in Clarence Gardens MU (24% of the MU frontage) undertaken in year 8;
- Phase 3: repair works to remaining 570m of the North Bay Cliffs MU (66% of the MU frontage) undertaken in year 15; and
- Capital Scheme: the delayed capital scheme will be carried out in year 30.

5.3.3 Phase 1 of the scheme consists of repair works to 540m of seawall, as shown in Table 5.2. Plans of the works included within Phase 1 of the preferred option can be found in Appendix D.

Table 5-2 Preferred Option – Phase 1 Works

Management Unit	NFCDD Asset Reference	Re-Facing (m)	Toe Protection (m)
North Bay Cliffs	1221D901D1201C24		15
Clarence Gardens	1221D901D1201C07	45	35
	1221D901D1201C21	153	190
	1221D901D1201C08	202	260

5.3.4 The sea wall re-facing replacement involves the removal and subsequent replacement of the existing eroded mass concrete frontage, and includes the installation of connecting dowels between the interface of the new and the existing structure. It is anticipated that the thickness of the wall to be replaced is 0.3m.

5.3.5 The toe protection involves the placement of mass concrete in the order of 0.5m in thickness which will encapsulate the base of the existing sea wall and the founding bed rock.

5.3.6 SBC planning authority officers have confirmed that no planning application is required.

5.3.7 MMO have confirmed that a Marine Licence will be required for the works as the footprint will be extended as a result of the scour protection works. A Screening Opinion has been requested from the MMO and it has been confirmed that an EIA is not required (Appendix L).

5.3.8 The key residual risks and mitigation measures are identified in Table 6.3

Environmental aspects

5.3.9 Given the nature and location of the scheme, the following aspects are considered relevant:

- Coastal processes;
- Biodiversity, flora and fauna;
- Noise and vibration;
- Water;
- Archaeology and cultural heritage;
- Landscape, seascape and visual amenity value; and,
- Tourism and recreation.

5.3.10 All works will adhere to best practice guidance, in particular:

- Pollution Prevention Guidelines - Works in, near or liable to affect watercourses: PPG 5; and,
- CIRIA Coastal and Marine Environmental Management Site Guide (CIRIA report C584).

5.3.11 The preferred option is considered to have a negligible effect on the existing coastal processes due to the small changes to the existing defences. The proposed works have the potential to disturb overwintering foraging birds, in particular to the north of the bay; however, any disturbed birds would be able to re-locate to the immediate north. In addition, to no works being undertaken from December to February and the recommended measures to minimise any adverse noise and vibration impacts (see below), the proposed works are considered to have a negligible effect on overwintering birds. All works will avoid damaging rocky shore habitat, where ever possible.

5.3.12 The most significant noise and vibration impacts would result from the breaking out of the existing defences and / or bedrock, where required. Other sources of airborne noise would result from the transportation of material and plant machinery. In order to minimise potential noise and vibration impacts to sensitive receptors, the following best practice measures are recommended:

- ensure plant machinery is switched off when not in use;
- ensure that covers and hatches are properly secured and that there are no loose fixings causing rattling;
- ensure equipment is properly maintained and operated by trained staff;
- use silenced equipment where possible, in particular silenced generators; and,
- provide local residents with contact details of a site representative in the event that noise or vibration nuisance is perceived, and that any complaints are dealt with pro-actively and resolutions communicated to the complainant.

5.3.13 The construction works will temporarily affect the local landscape / seascape character and amenity value. In addition to adhering to best practice guidance, the following measures are proposed to minimise any adverse effects:

- locally advertising the proposed works;
- conducting the works outside of the peak tourism period; and,
- informing local residents of the proposed works.

5.3.14 No adverse effects are anticipated to water, archaeology and cultural heritage, and tourism and recreation. The latter due to no works being proposed during the peak tourism period (July and August).

WFD compliance assessment

5.3.15 The proposed scheme comprises repair works to existing structures, with no new defence structures being proposed. The proposed toe protection and re-facing works would extend the existing defence line by approximately 0.5m and 0.7m seawards, respectively. This change to the coastal waterbody's geomorphology is considered to be negligible.

5.3.16 Potential adverse effects to the coastal and river waterbodies could result through accidental spills and leakages and through the release of contaminates used for the repair works. Only material approved for use in the marine environment will be used for the repair works. In addition to this, best practice and pollution prevention guidance will be adhered to throughout the duration of the scheme. As such, no adverse effects are anticipated to the status of the WFD waterbodies present.

Costs for the preferred option

5.3.17 The costs for the preferred option have been developed further from the option appraisal stage based on the work carried out during the outline design development of the preferred option and are shown in Table 5.3.

5.3.18 The construction costs for the repair works have been checked by Scarborough Borough Council's framework maintenance contractor (Transcore Ltd), to a March 2012 price date, these are based on framework rates and as such there is a high level of certainty. The breakdown of the Phase 1 repair works is included within Appendix H. The design of the works and the site supervision will be undertaken by SBC's in-house technical team.

5.3.19 The assumptions on the costs for further SI and survey, compensation, environmental mitigation and enhancement, and maintenance are as outlined in Section 4.4.

5.3.20 An optimism bias of 60% was used at option appraisal stage to compare the option costs. The risk components of the optimism bias have been reassessed for the preferred option and adjusted accordingly, based on the likely risks and scope of the repair works. The revised optimism bias estimate is included in Appendix H. This revised optimism bias of 20% has been applied to all three phases of the repair works. The original optimism bias of 60% from the Strategy has been retained for the delayed capital scheme, as this component of the preferred option has not been developed further at this stage in order to reduce risks due to the timing of its intervention being so far into the future (30 years).

Table 5-3 Project costs for preferred option 1 (£k)

	Cost for economic appraisal (PV)	Whole life cash cost	EA FSoD approval project cost
Costs to PAR:			
Local Authority Staff	Sunk Costs	51	
Site investigation & survey	Sunk Costs	7	
Consultant fees	Sunk Costs	30	
Early Contractor Involvement (ECI)	Sunk Costs	0	
Cost consultant fees	Sunk Costs	0	
Sub-total	Sunk Costs	88	88
PAR to Construction:			
Local Authority staff	10	10	10
Site investigation & survey	0	0	0
Consultant fees	0	0	0
Early Contractor Involvement (ECI)	0	0	0
Cost consultant fees	0	0	0
Other costs	0	0	0
Sub-total	10	10	10
Construction:			
Construction costs	478	478	478
Inflation allowance for * months			0
Environmental enhancements	0	0	0
Environmental mitigation	0	0	0
Local Authority staff	9	9	9
Consultant fees	0	0	0
Site supervision	29	29	29
Cost consultant fees	0	0	0
Compensation	0	0	0
Other costs	0	0	0
Sub-total	516	516	516
Future Costs:			
Maintenance	2,690	7,283	
Future construction	9,422	19,364	
Risk Contingency:			
20% Optimism Bias			105
Optimism Bias	105	105	
Contributions			185
TOTAL	12,743*	27,366	446

* Note: this is the revised cost of the preferred option following outline design development and the reassessment of the risk contingency, and is therefore reduced from the cost presented in Table 4.2 for Option 1 for the option appraisal comparison.

Contributions and funding

5.3.21 The scheme will be funded under the Partnership Funding approach, with a combination of Flood Defence Grant in Aid (FDGiA) funding and a contribution from Scarborough Borough Council (SBC) as asset owners and Coast Protection Authority.

5.3.22 SBC will contribute £185k to the design and construction of the first phase of the repair works. SBC will be responsible for and fund the ongoing routine maintenance of the seawalls in North Bay from their annual maintenance budget.

5.3.23 Yorkshire Water (YW) is a beneficiary of the investments in coast defence structures in North Bay. They will be carrying out repairs to approximately 40m of seawall at the northern end of the Clarence Gardens Management Unit as part of their current investment in their infrastructure in North Bay, where their works interface with the existing seawall. This will minimise disruption to the area, and provide efficiencies. Further contributions to the future phases of the repair works and the delayed capital scheme will be sought at the time of investment.

5.3.24 There are no commercial properties which contribute greater than 2% of the value of the property related benefits. As there are no major commercial beneficiaries of the scheme no contributions have been sought.

Outcome measures and funding priority

5.3.25 The profile of outcome measure delivery and contributions is shown in Table 5.4, as calculated using the FDGiA Partnership funding Calculator (see Appendix G).

5.3.26 The Phase 1 repair works of the preferred Option 1 are shown in 2012/13, with the outcome measures and contributions for the remaining Phase 2 and 3 of the repair works and the delayed capital scheme shown in the future years, to be delivered in years 8, 15 and 30 respectively.

5.3.27 The Phase 1 repair works do not cover the full length of the frontage in the two management units. Therefore in order to calculate the Outcome Measure score the benefits have been factored according to the proportion of the frontage being included in the scheme. The scheme will carry out improvement works to 76% of the Clarence Gardens frontage and 2% of the North Bay Cliffs frontage. Therefore the PV benefits and number of properties protected by the scheme have been factored accordingly, resulting in a revised PV benefit of £34,620k.

5.3.28 The whole life costs have also been factored, with all future costs (capital scheme, ongoing routine maintenance of asset system, and strategic costs) factored according to proportion of frontage included within the scheme. The initial costs for the repair works within the PAR have not been factored as these just cover the sections of frontage within the scheme. This gives a revised PV whole life cost of £7,169k.

5.3.29 The raw OM score for the Phase 1 repair works is 70.82%, with the SBC contribution of £185k the adjusted OM score is 100.12%.

5.3.30 To achieve an adjusted OM score of 120% a contribution of £311k would be required, and a contribution of £437k would be required to achieve 140%. However a contribution greater than the £185k already agreed by SBC would not be viable due to current financial savings that the council has to make in line with government policy.

Table 5-4 Outcome measures contributions

		OM1 (Economic Benefit)	OM2 (Households better protected against flooding)			OM3 (Households better protected against coastal erosion)			OM4 (Statutory Environment Obligations)	TOTAL FDGiA Contribution (£k)	Raw OM Score	Cost saving and/or external contribution required (£k)
			20% most	21-40% most	60% least	20% most	21-40% most	60% least				
2012/2013	Number					128	14	0.25		£5,077	70.82%	£185
	Qualifying Benefits (£k)	£26,294				£7,466	£844	£15				
	FDGiA Contribution (£k)	£1,461				£3,360	£253	£3				
2013/2014	Number									£0	0.00%	
	Qualifying Benefits (£k)											
	FDGiA Contribution (£k)											
2014/2015	Number									£0	0.00%	
	Qualifying Benefits (£k)											
	FDGiA Contribution (£k)											
2015/2016	Number									£0	0.00%	
	Qualifying Benefits (£k)											
	FDGiA Contribution (£k)											
2016/2017	Number									£0	0.00%	
	Qualifying Benefits (£k)											
	FDGiA Contribution (£k)											
Future Years	Number					168	59	13		£15,355	66.51%	£5,829
	Qualifying Benefits (£k)	£96,712				£16,354	£7,521	£1,828				
	FDGiA Contribution (£k)	£5,373				£7,359	£2,257	£366				
TOTAL	**Number**		**0**	**0**	**0**	**296**	**73**	**13.25**		**£20,432**	**67.53%**	**£6,014**
	Qualifying Benefits (£k)	**£123,006**	**£0**	**£0**	**£0**	**£23,820**	**£8,365**	**£1,843**	**£0**			
	FDGiA Contribution (£k)	**£6,834**	**£0**	**£0**	**£0**	**£10,719**	**£2,510**	**£369**	**£0**			

As calculated using the FDGiA Partnership funding Calculator (see Appendix G).

5.4 Updated economic appraisal

5.4.1 The Strategy economics for the North Bay Cliffs and Clarence Gardens Management Units have been updated and are presented in Table 5.4.

5.4.2 The PV benefits have increased by 15%, this is largely due to the Sands development and base dates update.

5.4.3 The PV costs have decreased by 43%, this is due to the preferred option maximising previous investments by prolonging the residual life of the existing assets and delaying the need for a major capital scheme.

5.4.4 As a result the benefit-cost ratio has increased from 2.81 to 6.16.

Table 5-5 Updated strategy/PAR economics for whole cell/frontage

	Present value		Benefit/Cost ratio
	Costs (£k)	**Benefits (£k)**	
Latest Approved Strategy			
Capital	£16,565k		
Non-capital	£7,760k		
Total	£24,325k	£68,424k	2.81
Revised Forecast of Strategy Implementation			
Capital	£8,700k		
Non-capital	£5,146k		
Total	**£12,743k***	**£78,529k**	**6.16**

* Note: this is the revised cost of the preferred option following outline design development and the reassessment of the risk contingency (as shown in Table 5.3), and is therefore reduced from the cost presented in Table 4.2 for Option 1 for the option appraisal comparison.

6 Implementation

6.1 Project planning

Phasing and approach

6.1.1 The preferred option will be delivered in four phases. Phases 1 to 3 are repair works phases to be carried out in years 1, 8 and 15 respectively. The last phase is the delayed capital scheme in year 30.

6.1.2 Phase 1 of the repair works is the phase for which the funding is being requested by this PAR, and will be constructed over a two year construction period. Within this construction window the works will be carried out in four stages to avoid the winter months to avoid when the weather will make working on the foreshore impractical, this will coincide with peak overwintering foraging bird season and so reduce any potential disturbance, and avoiding the summer months when peak tourist season would create issues with disruption and interaction with the public. Therefore construction is programmed to be carried out from September to November and from March to June, over a two year period (2012 to 2014). The construction will be constrained by tidal working as high tide reaches the seawall.

6.1.3 Each piece of work, whether it is sea wall re-facing or toe protection will be disaggregated into four distinct activities. Site setup and demobilisation will be considered as a daily activity whereby equipment and plant will either be taken to the location of the works via the slipway access and trafficked across the beach or positioned on the promenade.

1 Demolition –Once in position existing concrete structures will be broken out with the spoil placed in a Dumper for removal to a local site compound. The material will be stockpiled at the compound until such a time when it will be removed and taken for crushing, in order to be recycled.

2 Dowel Bar Installation – Holes are to be drilled into the existing structure at regular centres to receive steel dowel bars. The holes will be cleaned of all dust and debris allowing the dowel to be resin bonded into the drilled hole.

3 Concreting Works – Timber shuttering will be installed and mass concrete poured in the gap between the shutter and the existing sea wall. In the case of the toe protection and sea wall re-facing works, localised excavation of beach material down to bedrock level is required together with removal of marine growth on the exposed faces of the existing structures. All beach material excavated will be stockpiled directly adjacent to the works and replaced on completion of the concrete pour.

4 Remove Shuttering – Timber shutters will be stripped and re-used once the concrete has reached a satisfactory hardened state.

Programme and spend profile

6.1.4 SBC planning authority officers have confirmed that no planning application is required.

6.1.5 Construction is programmed to be carried out from September to November and from March to June, over a two year period (2012 to 2014). The construction programme is constrained by having to avoid the winter months due to adverse weather conditions and peak overwintering bird period, and the summer months due to peak tourist season.

6.1.6 The programme key dates are shown in Table 6.1 and the spend profile for the cash costs (including optimism bias) is in Table 6.2. The annualised spend profile is compatible with the indicative allocations in the Medium Term Plan for the North Bay Urgent Wall Improvements Scheme.

Table 6-1 Key dates

Activity	Date
Risk workshop/value engineering completed by	During PAR stage
Works information finalised by	10/8/2012
Planning permission received	Not required
Target price agreed by	17/8/2012
Works start on site on	3/9/2012
Works substantially complete by	1/8/2014

Table 6-2 Annualised spend profile

	2012/13	2013/14	2014/15	2015/16	2016/17	Future Years	Total
Local Authority Staff	15	4	0	0	0	394	413
Fees	19	10	0	0	0	2,293	2,322
Construction	315	163	0	0	0	14,931	15,409
Environmental mitigation	0	0	0	0	0	141	141
Environmental enhancement	0	0	0	0	0	71	71
Compensation	0	0	0	0	0	282	282
Other (maintenance and strategic costs)	3	33	33	33	33	4,415	4,550
Risk contingency (50% risk)	69	36	0	0	0	3,984	4,089
Total*	421	246	33	33	33	26,511	27,277*

Notes: Fees includes site investigation, surveys and site supervision.
Figures include inflation at 0% as the construction will be carried out by SBC's framework contractor on already agreed framework rates

6.2 Procurement strategy

6.2.1 The repair works for Phase 1 of Option 1 will be carried out by Scarborough Borough Council's framework maintenance contractor.

6.2.2 The design and site supervision of Phase 1 of the works will be carried out in-house by SBC's technical team.

6.2.3 The procurement for phase 2 and 3 of the repair works will be determined when the phases are required to be implemented. It is expected that these will also be carried out by SBC's framework maintenance contractor if there is one currently under contract at the time.

6.3 Delivery risks

High level risk register

Table 6-3 High level risk schedule and mitigation

Key project risk	Adopted mitigation measure
Unforeseen ground conditions	• Trial pits were carried out in 2010 to assess the depth of the rock head, the overlying material and the location and extent of undercutting. • The design for the scour protection, apron and facing repairs is simple and can be adapted easily on site to accommodate unforeseen conditions. • A 20% contingency for Phase 1 of the works has been identified within the funding application to allow for unforeseen scope changes.
Extent of repairs required is greater than anticipated	• Repairs required are based on visual inspections carried out in 2010 when beach levels were very low. • A 20% contingency for Phase 1 of the works has been identified within the funding application to allow for unforeseen scope changes.

Safety plan

6.3.1 The key roles under CDM are as follows:

CDM-Co-ordinator	Turner & Townsend
Client	Scarborough Borough Council
Principal Contractor	Transcore Ltd

6.3.2 Public safety will be assessed in line with Scarborough Borough Council's procedures prior to the start of construction of the phase 1 works.

Appendix A **Project report data sheet**

Entries required in clear boxes, as appropriate.

GENERAL DETAILS

Authority Project Ref. (as in forward plan):	**YOS351C/000A/58CA**
Project Name (60 characters max.):	North Bay Urgent Wall Improvements
Promoting Authority: Defra ref (if known)	
Name	Scarborough Borough Council
Emergency Works:	No (Yes/No)
Strategy Plan Reference:	Scarborough Coastal Defence Strategy: Holbeck to Scalby Mills
River Basin Management Plan	n/a
System Asset Management Plan	n/a
Shoreline Management Plan:	River Tyne to Flamborough Head
Project Type:	Sustain SoS

Shoreline Management Study/ Preliminary Study/ Strategy Plan/Prelim. Works to Strategy/ Project within Strategy/Stand-alone Project/ Strategy Implementation/Sustain SOS. 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:	September 2012
Estimated duration in months:	24
Contract type*	Framework

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

COSTS

	APPLICATION (£000's)
Appraisal:	20
Costs for Agency approval:	446
Total Whole Life Costs (cash):	27,366

For breakdown of costs see Table in Section 2.4

CONTRIBUTIONS

Windfall Contributions:	
Deductible Contributions:	185
ERDF Grant:	
Other Ineligible Items:	

LOCATION - to be completed for all projects

EA Region/Area of project site (all projects):	North-East Region
Name of watercourse (fluvial projects only):	n/a
District Council Area of project (all projects):	Scarborough Borough Council
EA Asset Management System Reference:	n/a
Grid Reference (all projects):	TA037897

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

DESCRIPTION

Specific town/district to benefit:	Scarborough

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

Repair works to the coastal defence assets would be carried out in phases according to urgency of works over a period of 15 years. This would result in the need for a capital scheme being delayed until year 30.

The aim of the works is to sustain the current standard of service provided by the existing coast defence assets in North Bay, whilst maximising the longevity of the previous investments.

DETAILS

Design standard (chance per year):	Sustain SoS		yrs
Existing standard of protection (chance per year)	n/a		yrs
Design life of project:	30		yrs
Fluvial design flow (fluvial projects only):	n/a		m3/s
Tidal design level (coastal/tidal projects only):	n/a		m
Length of river bank or shoreline improved:	540		m
Number of groynes (coastal projects only):	0		
Total length of groynes* (coastal projects only):	0		m
Beach Management Project?	No	Yes/No	
Water Level Management (Env) Project?	No	Yes/No	
Defence type (embankment, walls, storage etc)	Seawalls		

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

ADDITIONAL AGREEMENTS:

Maintenance Agreement(s):	Received	Not Applicable/Received/Awaited
EA Region Consent (LA Projects only):		Not Applicable/Received/Awaited
Non Statutory Objectors:	No	Yes/No
Date Objections Cleared:		
Other:		Not Applicable/Received/Awaited

ENVIRONMENTAL CONSIDERATIONS

Natural England (or equivalent) letter:	Received	Not Applicable/Received/Awaited
Date received	29/3/2012	

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):	Yes	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	No	Yes/No
Scheduled Ancient Monument	No	Yes/No
Other designated heritage sites	No	Yes/No

OTHER ENVIRONMENTAL CONSIDERATIONS

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

COMPATIBILITY WITH OTHER PLANS

Shoreline Management Plan	Yes	Yes/No/Not Applicable
River Basin Management Plan	n/a	Yes/No/Not Applicable
Catchment Flood Management Plan	n/a	Yes/No/Not Applicable
Water Level Management Plan	n/a	Yes/No/Not Applicable
Local Environment Agency Plan	n/a	Yes/No/Not Applicable

SEA/ENVIRONMENTAL IMPACT ASSESSMENT

SEA	n/a	Statutory required/Agency voluntary/not applicable
EIA	no	Yes (schedule 1); Yes (schedule 2); SI1217; not applicable
SEA/EIA status	n/a	Scoping report prepared/draft/draft advertised/final

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

Detail	Result

Costs, benefits and 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)

LAND AREA

Total area of land to benefit:	25		Ha
of which present use is:	FRM	CERM	
Agricultural:	0	0	Ha
Developed:	0	4.6	Ha
Environmental/Amenity:	0	17.7	Ha
Scheduled for development	0	2.7	Ha

PROPERTY & INFRASTRUCTURE PROTECTED

	Number		Value (£'000s)	
	FRM	CERM	FRM	CERM
[1]Residential	0	240	0	34,200
Commercial/industrial	0	271	0	22,082
Critical Infrastructure	0	1	0	5,000
Key Civic Sites	0	0	0	
Other (description below):	0	1	0	20,874
Description:	Road			

costs and Benefits

[1]Present value of total project whole life costs (£'000s):		12,743
Project to meet statutory requirement?	*Y/N*	N

	Value (£'000s)	
	FRM	CERM
Present value of residential benefits:	0	18,574
Present value of commercial/industrial benefits:	0	16,809
Present value of public infrastructure benefits:	0	21,472
Present value of agricultural benefits:	0	0
Present value of environmental/amenity benefits:	0	21,674
[1]Present value of total benefits (FRM & CERM)	78,529	
Net present value:	65,786	
Benefit/cost ratio:	6.16	

Base date for estimate:	2012	
FCERM-AGDecision Rule stage 3 applied	No	Yes/No
FCERM-AGDecision Rule stage 4 applied	No	Yes/No

OTHER OUTCOME MEASURE SCORING DETAILS

Super Output Area No*: **2.725%** Indicate if deprived: Yes Yes/No

(*as ranked by Indices of Multiple Deprivation)

Risk: 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:	n/a		"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):

Appendix B
List of Reports Produced

The following reports previously produced for other projects support the business case presented in this PAR:

- River Tyne to Flamborough Head Shoreline Management Plan 2. 2007.
- Scarborough Coastal Defence Strategy: Holbeck to Scalby Mills. 2005. High Point Rendel.
- Scarborough Coastal Defence Strategy: Holbeck to Scalby Mills. Strategic Appraisal Report. October 2009.
- Scarborough Climate Change Review: Beach response to sea level rise. April 2010. Royal Haskoning.
- Cell 1 Monitoring: Scarborough Asset Inspection. September 2010. Royal Haskoning
- Coast Protection Assets and Coastal Slope Condition Analysis. March 2010. Royal Haskoning and Halcrow.