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Hartley Cove to the River Tyne Coastal Strategy

Technical Report 1: Executive Summary

August 2016



Quality Management

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Date	August 2016		
Prepared by 1	Mark Ellis <i>Principal Coastal Engineer</i>	Signature (for file)	M Ellis
Checked by	Peter Woods <i>Project Manager</i>	Signature (for file)	
Authorised by	Peter Woods <i>Project Manager</i>	Signature (for file)	

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1. Structure of Technical Reports

- 1.1.1 The Coastal Strategy developed for the North Tyneside coastline, between Hartley Cove and the River Tyne, sets out the Council's defence management priorities for the coast.
- 1.1.2 The Strategy is presented as a series of reports, each dealing with a separate component of the plan along with a number of supporting Appendices

Technical Report No.	Title
1	Executive Summary
2	Background
3	Coastal Processes
4	Existing Defences and Historical Expenditure
5	Strategic Environmental Assessment - Environmental Report
6	Options and Economic Assessment
7	Monitoring
8	Risk Assessments
9	Public Consultation and Stakeholder Involvement
10	Glossary
Appendices	Title
Appendix A	Habitat Regulations Assessment
Appendix B	Water Framework Directive Assessment
Appendix C	Non-Technical Summary for the Strategic Environmental Assessment
Appendix D	Strategic Environmental Assessment Scoping Report

2. Introduction and Background

2.1 Introduction

2.1.1 The Hartley Cove to the River Tyne Coastal Management Strategy review (henceforth referred to as the Strategy) sets out the business case and implementation plan for the management of the coastline by North Tyneside Council. The Strategy examines the problems, identifies objectives, and identifies and appraises options to manage the coastline in line with current Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG).

2.2 Background

2.2.1 The original strategy was completed in 2007 (henceforth referred to as the 2007 Strategy), following the publication of the first round of Shoreline Management Plans (SMPs) and this Strategy forms a review and update of that original strategy.

2.2.2 The 2007 Strategy had the following objectives:

- Protection of developed land
- Maintenance of beach levels
- Maintenance of water quality
- Protection of geological and nature conservation interests

2.2.3 The Strategy coastline is approximately 9km long and stretches from Hartley Cove in the north to the Fish Quay on the north bank of the River Tyne. The shoreline is made up of embayments consisting of rocky headlands interspersed with sandy foreshore, the majority of which is currently defended. For the purposes of determining policies for coastal management, the coastline is sub-divided into shorter lengths termed Management Areas (MAs). The 2007 Strategy used five sub-lengths (termed management units), which were largely contiguous with the first round SMP units. However, in the second round SMP (termed SMP2) and in this Strategy four MAs are used. The correspondence between SMP/the 2007 Strategy and SMP2/this Strategy is shown in Table 2.1 below.

Table 2-1 Correspondence of SMP/2007 Strategy management units with SMP2 and this Strategy Management Areas (MAs)

SMP	Original Strategy	SMP2
Seaton Sluice to St May's Lighthouse MU 44	Hartley Cove to St Mary's Lighthouse MU 44*	MA24 - Seaton Sluice to Curry's Point

SMP	Original Strategy	SMP2
St Mary's Lighthouse to Whitley Sands MU 45	St Mary's Lighthouse to Whitley Sands MU 45	MA25 - Curry's Point to Brown's Point
Whitley Sands to Whitley Bay MU 46	Whitley Sands to Whitley Bay MU 46 Hold the Line	
Whitley Bay to Tynemouth North Pier MU 47	Cullercoats to Tynemouth North Pier MU 47	MA26 - Brown's Point to Tynemouth North Pier
Tynemouth North pier to Tynemouth North Bank MU 48	Tynemouth North Pier to Fish Quay MU 48**	MA27 - Tynemouth North Pier to Fish Quay

2.2.4 The MAs are described in general below:

- **MA24 – Hartley Cove to Curry's Point:** this is a cliffed frontage with a rock shore platform. Defences exist at Hartley Cove and St. Mary's Island with the remainder of the frontage being undefended and eroding.
- **MA25 – Curry's Point to Brown's Point:** this frontage is defended for most of its length by concrete or masonry seawalls and a short section of rock armour revetment. There is also one short section of undefended cliff.
- **MA26 – Brown's Point to Tynemouth North Pier:** this frontage consists of three bays; Cullercoats Bay, Tynemouth Longsands and King Edward's Bay. Cullercoats Bay is mainly defended. Tynemouth Longsands has defences to the north and south and managed dunes towards the centre. King Edward's Bay and the adjacent cliffs are heavily defended. Tynemouth North Pier is a massive masonry structure that is the outer navigation structure to the River Tyne and provides protection to both North and South Tyneside.
- **MA27 – Tynemouth North Pier to the Fish Quay:** this frontage extends from the landward end of the pier to the estuarine environment at Fish Quay. The frontage is defended by a number of different defences including concrete and masonry seawalls, a masonry groyne, rock armour and quay walls.

2.2.5 The main urban areas along the frontage are Tynemouth, Cullercoats and Whitley Bay. The beaches are popular for leisure and tourism activities, including water sports, walking and entertainment. The beach at Longsands is particularly used for sporting activities including local, national and international events. Brown's Bay is a popular location for scuba diving. Tourism accounts for more than 20% of all employment in the coastal zone.

- 2.2.6 The coastline falls within the Northumbria Coast Ramsar Site and Special Protection Area (SPA), the Northumberland Shore Site of Special Scientific Interest (SSSI) and the Tynemouth to Seaton Sluice SSSI. The sites are designated for both nature conservation and earth science heritage values. There are number of Biodiversity Action Plan (BAP) habitats within the area including, rocky shore and island, maritime cliffs and slopes, saltmarsh and mudflat and sand dunes.
- 2.2.7 There are four conservation areas within the strategy area: St Mary's Island, Whitley Bay; Cullercoats; Tynemouth; and North Shields Fish Quay. There is a number of Grade I and II listed buildings within the area. The Priory at Tynemouth is a Scheduled Ancient Monument.
- 2.2.8 The River Tyne is used commercially for shipbuilding, offshore fabrication, fishing and port related industries, as well as regular passenger services and exports to northern Europe.
- 2.2.9 Strategic objectives for the Strategy were set following consultation and are:
- To protect live, homes and property from flooding and/or erosion;
 - To prevent loss, damage or disruption to infrastructure;
 - To maintain access to the coast for tourism and leisure, including access points, car parking, promenades and cycle networks;
 - To protect commercial assets and use of the coast;
 - To maintain or improve the quality of environmentally designated sites, including promoting biodiversity and maintaining conservation value; and,
 - To maintain the conservation value of and access to historic assets on the coast.

3. The Problem

- 3.1.1 The plan shape of the shoreline is maintained by the rocky headlands and shore platforms in conjunction with the extensive hard defences. There is little volume of sediment transport alongshore due both to limited supply and the barriers to sediment movement posed by the rocky headlands. In an undefended scenario erosion of the bays would likely continue, with the headlands remaining relatively stable, i.e. the bays would become more pronounced and extend further inland.
- 3.1.2 Issues identified in the 2007 Strategy and SMP2 include:
- Outflanking of existing defences caused by erosion of the undefended adjacent coastline, for example at the causeway leading to St. Mary's Island and at the southern end of the Trinity Road seawall;
 - Some existing defences are in poor condition and are suffering from toe scour and need to be reconstructed/replaced, for example Bear's Back seawall;
 - The historic bathing pool at Tynemouth could be removed and defences reconstructed;
 - Beaches may be narrowing and coastal squeeze occurring in front of hard defences, which will need to be managed;
 - The geological features at Hartley Cove and St. Mary's Island are being eroded; and,
 - Flooding occurs in the Fish Quay area.

4. Coastal Processes

4.1.1 Erosion rates for the Strategy coastline were derived from a review of Ordnance Survey (OS) mapping and aerial photography. High and low water marks and cliff lines were digitised and comparisons made using Geographic Information System (GIS) software to calculate historic erosion rates. These were then used to produce estimated erosion contours for the Strategy timeline utilising the methodology from the 2007 Strategy. Additionally, topographic surveys and beach profiles were analysed to assess changes in beach cross-sectional shape, volume, contour positions and sediment movement.

4.1.2 The predicted erosion rates for the Strategy are shown in Table 4-1 below. The 0.3m erosion rate is applicable to lengths of coastline with softer geology, e.g. Whitley Bay cliffs and the 0.15m rate is applicable to lengths with harder geology, which are more resistant to erosion.

Table 4-1 Predicted erosion rates

Years from now	Total erosion distance (m) based on historical erosion rate of 0.3m/yr	Total erosion distance (m) based on historical erosion rate of 0.15m/yr
10	3	2
20	9	4
30	17	8
40	27	14
50	40	20
60	56	28
70	74	37
80	95	48
90	119	59
100	145	72

4.1.3 Tide levels and extreme water levels were assessed for the Strategy and updated levels were produced as shown in Tables 4-2 and 4-3 below.

Table 4-2 Comparison of extreme water levels at North Shields

Return Periods (years)	Sunderland Coastal Monitoring (Scott Wilson 2003)	EA CFB Study (2011)	NTSLF (2014)
1	-	3.20	3.16
2	-	3.27	3.25

Return Periods (years)	Sunderland Coastal Monitoring (Scott Wilson 2003)	EA CFB Study (2011)	NTSLF (2014)
5	3.32	3.38	3.37
10	3.38	3.46	3.46
20	3.44	3.55	-
25	-	3.58	3.55
50	3.51	3.67	-
75	-	3.72	3.67
100	3.57	3.76	-
150	-	3.82	3.76
200	3.62	3.87	-
250	3.64	3.90	3.85
300	-	3.92	3.91
500	-	4.00	-
1000	3.79	4.11	3.97

Table 4-3 Comparison of predicted tide levels at North Shields

Tidal States	Coastal Strategy Plan (2007)	NTLSF (2014)
HAT	3.1	3.13
MHWS	2.4	2.52
MHWN	1.3	1.48
Mean Sea Level	0.3	-
MLWN	-0.8	-0.70
MLWS	-1.9	-1.87
LAT	-2.7	-2.60

- 4.1.4 Further analysis of offshore and nearshore wave climate was undertaken and results from various studies were assessed to provide estimates of joint probability of waves and water levels for use in the Strategy.
- 4.1.5 Results for water levels, waves and flood risk assessments were also updated by taking into account the conditions that prevailed during the December 2013 storm surge events.

5. Options Considered

- 5.1.1 A long list of options considered technically suitable for providing flood and erosion risk management for the Strategy frontage was drawn up by the Project Team. This utilised information from both the 2007 Strategy and SMP2. The long list options were appraised to high level economic, technical, social and environmental factors to select a shortlist of options for each Management Area. Whether an option was considered further or not was dependent on its performance against these factors and whether or not there were any immediately obvious reasons why an option would not be practicable.
- 5.1.2 The options considered fall under four generic categories of No Active Intervention (NAI), Hold The Line (HTL), Managed Realignment (MR) and Advance The Line (ATL). Within the HTL category options were identified as:
- **Do Nothing** – i.e. undertake no maintenance of existing defences and construct no new defences,
 - **Do Minimum** – i.e. undertake the minimum work necessary to maintain existing defences and,
 - **Do Something** – all other options.
- 5.1.3 Assessment of the shortlisted options considered detailed technical, economic and environmental issues and led to the identification of preferred option for each MA.

6. Recommended Strategy

6.1.1 Within each of the four Management Areas the lengths of coastline have been further sub-divided into policy units to give a total of fifteen different units. The preferred strategic approach for the Strategy differs for the various policy units depending on economic, technical, social and environmental factors. In many cases the economic case does not support policies other than Do Nothing as the estimated cost for undertaking works is higher than the calculated benefits for the area. However, in some areas the policy may be driven by other reasons, such as protection of environmental sites. Tables 6-1 and 6-2 summarise the analysis of costs and benefits for each of the policy units.

Table 6-1 Analysis of costs and benefits for Do Nothing and Do Minimum policies

Policy Unit	Do Nothing	Do Minimum			
	Total PV Damage	Option Cost	Total PV Benefits	Net Present Value (NPV)	Average Benefit Cost Ratio (ABCR)
24.2	0	£376,759	0	-£376,759	0
25.1	£15,391	£815,728	£11,794	-£803,934	0.01
25.2	£26,037	NO DO MINIMUM			
25.3	£7,670,340	£1,611,766	£5,983,095	£4,371,329	3.7
25.4	£17,374	£271,199	£17,374	-£253,824	0.1
26.1		DO NOTHING			
26.2	£36,310	£1,564,247	£36,310	-£1,527,937	0.02
26.3		DO NOTHING			
26.4	£290,751	£911,332	£244,151	-£667,182	0.3
26.5	0	£371,894	0	-£371,894	0
26.6	0	£531,015	0	-£531,015	0
26.7	0	£451,290	0	-£451,290	0
26.8	0	£509,709	0	-£509,709	0
27.1	£161,536	£64,623	£127,566	£62,943	2.0
27.2	£156,073	£1,643,269	£156,073	-£1,487,196	0.1

Table 6-2 Analysis of costs and benefits for Do Nothing and Maintain policies

Policy Unit	Do Nothing	Maintain				
	Total PV Damage	Option Cost	Total PV Benefits	Net Present Value (NPV)	Average Benefit Cost Ratio (ABCR)	Incremental Benefit Cost Ratio (ICBR)
25.1	£15,391	£2,022,966	0	-£2,022,966	0	0
25.3	£7,670,340	£5,941,789	£7,670,340	£1,728,551	1.3	0.4
25.4	£17,734	£513,362	£17,374	-£495,988	0	0
26.2	£36,310	£2,915,698	£36,310	-£2,879,388	0	0
26.4	£290,751	£1,922,726	£290,751	-£1,631,975	0.2	0.1
		£1,884,367	£290,751	-£1,593,616	0.2	0.1
		£1,927,107	£290,751	-£1,636,356	0.2	0.0
26.6	0	£1,126,127	0	-£1,126,127	0	0
27.2	£156,073	£2,843,523	£156,073	-£2,687,449	0.1	-

6.1.2 In the final assessment of policy options the breakdown of preferred policies for each of the units is summarised below:

- **Do Nothing** – 6 units
- **Do Minimum** – 4 units
- **Maintain** – 4 units
- **Managed Realignment** – 1 unit.

7. Strategy Delivery Plan

- 7.1.1 To deliver the preferred options in line with the Strategy a suggested Strategy plan is set forth for the first ten years. These are suggestions only because, as noted previously, schemes may not have a positive cost benefit ratio and are likely to require sources of partnership funding if they are to be implemented. If sufficient funding is not secured then some schemes may not be implemented.
- 7.1.2 Possible schemes are identified for policy units where the preferred option is either Maintain or Managed Realignment. Where the preferred option is Do Minimum this refers to ongoing maintenance works rather than a standalone scheme.
- 7.1.3 Possible schemes are described briefly below:
- PU25.2 Trinity Road to Briardene Burn (Managed Realignment) – this PU is largely undefended, except for a short length of defences adjacent to Trinity Road seawall and defences at the mouth of the Burn. Therefore, the suggested works in this PU are for the existing defences to be re-configured as the cliffs erode, to avoid the defences being outflanked.
 - PU25.3 Briardene Burn to Table Rocks (Maintain) – this PU includes the Central Promenade scheme that is being constructed at the time of writing and which is planned to be completed in 2018. Therefore, the anticipated cost for 2017 and 2018 are included in the Strategy plan. There is also a scheme suggested for the replacement of the Southern Promenade defences.
 - PU26.2 Cullercoats (Maintain) – this PU includes the piers and the defences around the bay including the lifeboat station and The Brae. Works include for replacement of existing defences at the expiry of their useful lifespan, but does not include for construction of any new or upgraded defences.
 - PU26.6 King Edward's Bay (Maintain) – this PU includes the Sea Banks seawall and includes for replacement of the existing defences, but not construction of any new defences.
 - PU27.2 Tynemouth (Maintain) – this PU includes the defences along the north bank of the Tyne and the Fish Quay. Existing defences will be maintained and replaced as necessary.
- 7.1.4 Table 7-1 sets out the proposed Strategy Plan, including estimated expenditure for each PU for each of the ten years.

Table 7-1 Strategy Plan Summary

PU	Scheme	Year 1 2018	Year 2 2019	Year 3 2020	Year 4 2021	Year 5 2022	Year 6 2023	Year 7 2024	Year 8 2025	Year 9 2026	Year 10 2027	10-year Total
25.1 Curry's Point to Trinity Road	Do Minimum – maintenance of existing defences	£21,000	£21,000	£21,000	£21,000	£21,000	£21,000	£21,000	£21,000	£21,000	£21,000	£210,000
25.2 Trinity Road to Briardene Burn	Managed Realignment	Nil	Nil*									
25.3 Briardene Burn to Table Rocks	Maintain	£1,339,200	£516,000	£70,000	£70,000	£70,000	£70,000	£70,000	£70,000	£70,000	£70,000	£2,415,200
25.4 Table Rocks to Brown's Point	Do Minimum – maintenance of existing defences	£6,500	£6,500	£6,500	£6,500	£6,500	£6,500	£6,500	£6,500	£6,500	£6,500	£65,000
26.2 Cullercoats Bay	Maintain	£36,000	£36,000	£36,000	£36,000	£36,000	£36,000	£36,000	£36,000	£36,000	£36,000	£360,000
26.4 Tynemouth Longsands	Do Minimum – maintenance of existing defences	£24,000	£24,000	£24,000	£24,000	£24,000	£24,000	£24,000	£24,000	£24,000	£24,000	£240,000
26.6 King Edward's Bay	Maintain	£13,000	£13,000	£13,000	£13,000	£13,000	£13,000	£13,000	£13,000	£13,000	£13,000	£130,000
26.8 Tynemouth North Pier	Do Minimum – maintenance of existing defences	£11,000	£11,000	£11,000	£11,000	£11,000	£11,000	£11,000	£11,000	£11,000	£11,000	£110,000
27.2 Tynemouth	Maintain	£31,000	£31,000	£31,000	£31,000	£31,000	£31,000	£31,000	£31,000	£31,000	£31,000	£310,000
											Total	£3,840,200

*No expenditure anticipated in the first ten years of the Strategy

Capita Property and Infrastructure Ltd

The Capita Building
Kingmoor Business Park
Carlisle
Cumbria
CA6 4SJ

Tel +44 (0)1228 673000
Fax+44 (0)1228 673111