North Tyneside Council

Working in partnership with CAPITA

Hartley Cove to the River Tyne Coastal Strategy

Technical Report 06:

# Options Development and Economic Assessment

August 2016

We | Listen Create Deliver

# Quality Management

| | | | |
|---|---|---|---|
| **Job No** | CS/062000 | | |
| **Project** | Hartley Cove to the River Tyne Coastal Strategy | | |
| **Location** | North Tyneside | | |
| **Title** | Options Development and Economic Assessment | | |
| **Document Ref** | CS062000-CAP-00-EGN-RP-V-0009 | **Issue / Revision** | P01.4 / S4 |
| **File reference** | \\Cslinffs02\znsh\CS062000 North Tyneside Coastal Strategy\Stage File\Work Packages\WP8_Strategy Documents\CS062000-CAP-00-EGN-RP-V-0008 TR06 Options Development Economic Assessment P01_4 S4.docx | | |
| **Date** | 09 September 2016 | | |
| **Prepared by 1** | Mark Ellis<br>*Principal Coastal Engineer* | **Signature (for file)** | M Ellis |
| **Prepared by 2** | Jane Tingay<br>*Principal Flood Risk Consultant* | **Signature (for file)** | J Tingay |
| **Checked by** | Peter Woods<br>*Project Manager* | **Signature (for file)** |  |
| **Authorised by** | Peter Woods<br>*Project Manager* | **Signature (for file)** |  |

# Revision Status / History

| Rev | Date | Issue / Purpose/ Comment | Prepared | Checked | Authorised |
|---|---|---|---|---|---|
| P01.1 | July 2015 | S0 - Preliminary Draft | M. Ellis & J. Tingay | N Shamier | - |
| P01.2 | October 2015 | S2 – Draft for internal review | M. Ellis & J. Tingay | N Shamier | - |
| P01.3 | August 2016 | S3 – Consultation draft for PM approval | M. Ellis | P Woods | P Woods |
| P01.4 | August 2016 | S4 –Consultation draft for client approval | M. Ellis | P Woods | P Woods |

# Contents

## Figures



## Tables

# 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 Development 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 |

**Technical Report 6: Options Development and Economic Assessment**

1.1.3 This technical report provides information on:

- Identification and appraisal of management options; and,
- Economic assessment of management options.

# 2. Introduction

## 2.1 General Setting

2.1.1 The study area covers the coastline between Hartley Cove in the north and the River Tyne in the south, a length of approximately 11km. The coastline is made up of rocky headlands interspersed with bays. The majority is defended, mainly with concrete seawalls, and where not defended consists of rock or soft cliffs. The foreshore consists of rock platforms and long sandy beaches.

2.1.2 The aim of the strategy is to provide an appropriate level of coast defence along the North Tyneside coastline for the next 100 years in accordance with technical, economic, environmental and social criteria. Subject to that aim the strategy objectives are:

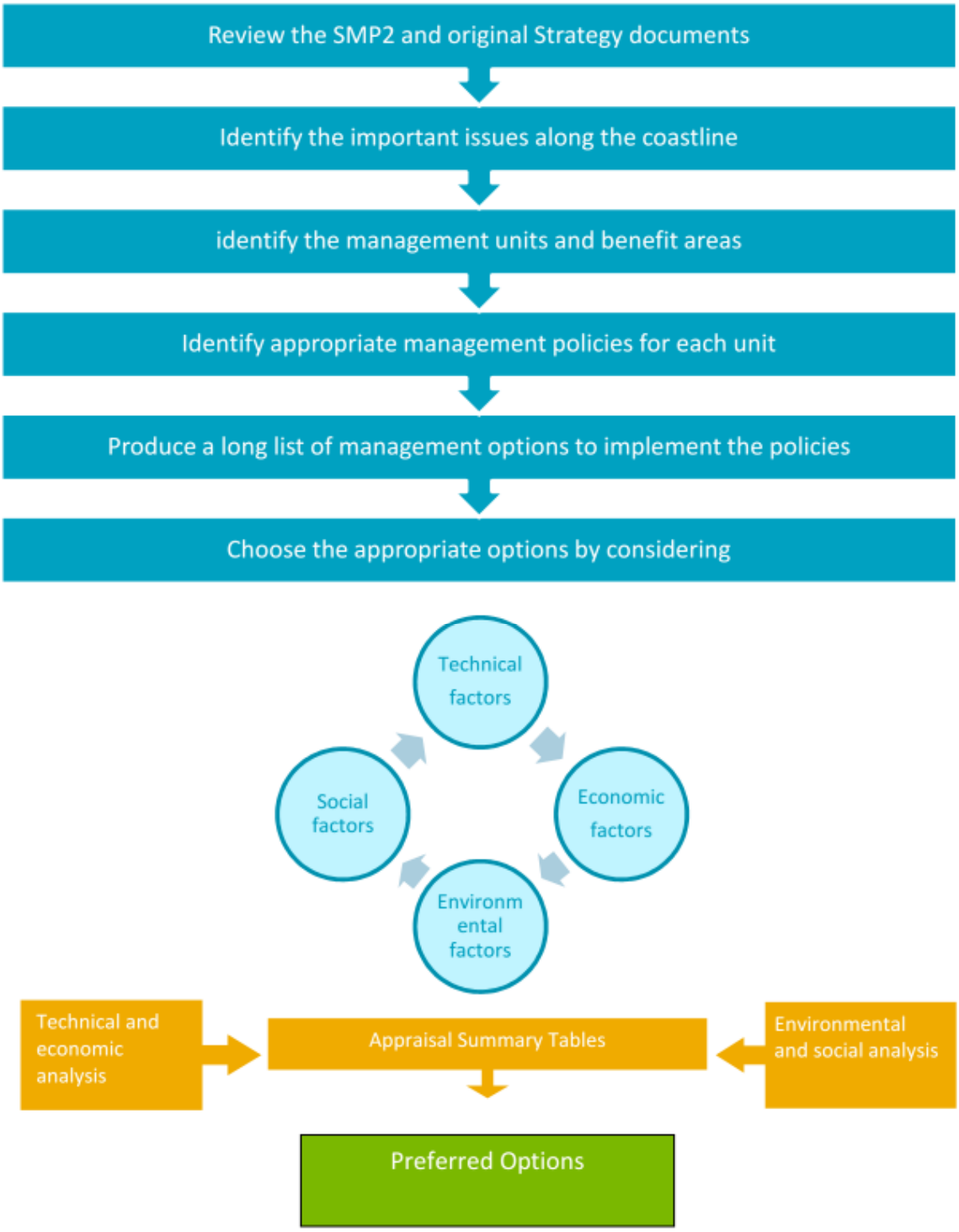
- To protect lives, homes and property from flooding and/or erosion
- To prevent loss, damage or disruption to infrastructure
- To maintain access to the coast for tourism and leisure, including access points, car parking, promenades and cycle networks
- To protect commercial assets and use of the coast
- To maintain or improve the quality of environmentally designated sites, including promoting biodiversity and maintaining conservation value
- To maintain the conservation value of and access to historic assets on the coast

2.1.3 This report contains the following sections:

| | |
|---|---|
| **Section 3** | Describes the generic policy options used in Shoreline Management Plans (SMP2) and summarises the SMP2 policies for the North Tyneside (NTC) coastline. |
| **Section 4** | Describes the management options considered in the appraisal and summarises various types of solutions that could be implemented to deliver the management options |
| **Section 5** | Presents the initial assessment of the management options and filters out those that are least likely to meet the strategy objectives. |
| **Section 6** | Considers the 'long list' of options, each of which is appraised against technical, economic, environmental and social factors. This appraisal allows a 'shortlist' of options to be identified and taken forward for more detailed appraisal. |
| **Section 7** | Summarises the shortlisted options for each management unit. |
| **Section 8** | Summarises the economic assessment for each management unit for each of the shortlisted options and identifies the preferred economic options. |

2.1.4 Figure 2.1 illustrates the appraisal process that has been followed.

**Figure 2-1 Options appraisal process**



# 3. Shoreline Management Plan Policies

## 3.1 Summary of Shoreline Management Plan Policies

3.1.1 In Shoreline Management Plans (SMP2) there are four generic policy options as shown in Table 3-1.

**Table 3.1 Generic shoreline management plan policies**

| Policy | Description |
|---|---|
| No Active Intervention (NAI) | This option, also known as do nothing, means that no maintenance or replacement of defences would be undertaken. Defences would deteriorate and eventually fail. Flood and erosion risks would rise |
| Hold the Line (HTL) | This involves maintaining existing defences in their current locations and either maintains or reduces flood and erosion risks |
| Managed Realignment (MR) | This involves either constructing new defences inland or retreating to higher ground and allowing either partial or complete removal of existing defences or tidal exchange. MR is generally gradually introduced and required careful monitoring to identify effects on the adjacent coastline |
| Advance the Line (ATL) | This policy involves constructing new defences seaward of the current position of the coastline and thus reclaiming land. |

## 3.2 Shoreline Management Plan 2 Policies for North Tyneside

3.2.1 The Shoreline Management Plan 2 for North Tyneside is the Northumberland and North Tyneside Shoreline Management Plan 2: Scottish Border to River Tyne produced by Royal Haskoning and published in May 2009. The management units in the previous strategy were based on those used in SMP1 and are slightly different to those used in SMP2. This strategy review has used the management units from SMP2 for consistency. Table 3-2 shows the correspondence of units between the SMP1, SMP2 and the original strategy.

**Table 3.2 Correspondence of management unit boundaries between SMP1, SMP2 and the original strategy**

| 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 |

* The northern boundary was moved from Seaton Sluice to North Tyneside Council's boundary at Hartley Cove and MU 44 was combined with MU 45 for purposes of policy selection.
** The boundary was extended upstream in the River Tyne to the Fish Quay.

3.2.2 Table 3-3 shows the SMP2 policies for each of the policy units, which are subdivisions of the management units (termed Management Areas (MAs) in SMP2) and which are subdivided into three epochs of 0-20 years, 20-50 years and 50-100 years. It should be noted that for all of the SMP2 policy units, except for PU26.4, Tynemouth Longsands, all of the policies are the same for all three epochs.

**Table 3.3 SMP2 polices for the North Tyneside coastline**

| Management Areas and Policy Units | | SMP2 Policy by epoch | | |
|---|---|---|---|---|
| | | **Short term 0-20 years** | **Medium term 20-50 years** | **Long term 50-100 years** |
| **MA24** | PU24.2 Crag Point to Curry's Point | NAI | NAI | NAI |
| **MA25** | PU25.1 Curry's Point to Trinity Road Car Park | HTL | HTL | HTL |
| | PU25.2 Trinity Road Car Park to Briardene Burn | MR | MR | MR |
| | PU25.3 Briardene Burn to Brown's Point | HTL | HTL | HTL |
| | PU25.4 Brown's Point to Table Rocks | HTL | HTL | HTL |
| **MA26** | PU26.1 Brown's Point | NAI | NAI | NAI |
| | PU26.2 Cullercoats Bay | HTL | HTL | HTL |
| | PU26.3 Tynemouth North Point | NAI | NAI | NAI |
| | PU26.4 Tynemouth Longsands | HTL | HTL | MR |
| | PU26.5 Sharpness Point | NAI | NAI | NAI |
| | PU26.6 Tynemouth Shortsands (King Edward's Bay) | HTL | HTL | HTL |
| | PU26.7 Tynemouth Headland | HTL | HTL | HTL |
| | PU26.8 Tynemouth North Pier | HTL | HTL | HTL |
| **MA27** | PU27.1 Prior's Haven | NAI | NAI | NAI |
| | PU27.2 Quayside | HTL | HTL | HTL |

# 4. Strategy Management Options

## 4.1 Management Options Considered in Strategies

4.1.1 At a strategic level there are further generic options to be considered in addition to those used at the SMP2 level. This section provides a brief description of those options and how they relate to the SMP2 options.

| | |
|---|---|
| **Do Nothing** | This option relates to the SMP2 option of NAI and basically means that no further actions will be taken to maintain existing defences. Over time defences will deteriorate and eventually fail leading to increases in flood and erosion risk. Natural coastal processes will be allowed to resume. The Do Nothing option is also used as a baseline against which other options are compared. |
| **Do Minimum** | This option involves reactive repairs to defences to maintain them, for example repairing damage to concrete sea walls following storms. This option can apply to both flood and erosion defences and relates to the SMP2 HTL policy. |
| **Maintain** | In this option repairs can be proactive and maintain or restore defences to preserve the protection they provide. This standard would be likely to reduce over time due to the effects of sea level rise, i.e. flood risk would increase. This option can apply to both flood and erosion protection and relates to the SMP2 HTL policy. |
| **Sustain** | This option takes into account possible changes due to sea level rise, climate change and land use in the future and sustains the current standard of protection provided by the defences by, for example increasing crest levels or constructing new defences. This option applies only to flood risk and relates to the SMP2 HTL policy. |
| **Improve** | This option allows for defences to be improved in the present by upgrading the standard of protection provided either by adding new elements to the existing structure or by replacement. Flood risk is reduced in the present. The option applies to flood risk only and relates to the SMP2 HTL policy. |
| **Managed Realignment** | This involves constructing new defences inland or retreating to higher ground. Existing defences may be partially breached or removed and natural processes allowed to resume. The option requires careful monitoring to study the effects on the adjacent coast. This applies to flood or erosion risks and relates the SMP2 MR policy. |
| **Advance The Line** | In this option new defences would be constructed to the seaward side of the existing coastline to reclaim land. This option is rarely used in the UK as it is only appropriate in a limited number of circumstances and generally requires more substantial and thus costly defences. This option applies to flood and erosion risk and relates to the SMP2 ATL policy. |

4.1.2 For each of the management options considered in the strategy there are a number of solutions that can be used to meet the options objectives. Brief descriptions of a range of solutions are given below.

| | |
|---|---|
| **Revetments** | these provide protection to slopes and can be permeable or impermeable and rigid or flexible. An example of a permeable flexible revetment is one constructed from rock armour. A rigid impermeable structure could be a concrete block revetment. In comparison with a vertical sea wall a revetment produces less wave reflection and consequently has less risk of scour at the toe of the structure. Due to the wide variety of designs and materials revetments can be used in varying locations. |
| **Sea wall** | these can be vertical or with a curved face to provide a wave return function and can be constructed from a variety of materials, such as concrete, masonry or blockwork. They are often used to support promenades. As they are generally vertical they will reflect more energy than a sloping revetment and may suffer from increased toe scour as a result. |
| **Wave wall** | this can be a vertical or curved wall that is constructed at the top of another structure, such as a sea wall, and acts to reduce overtopping and flooding behind the wall. For example a low wall may be constructed at the rear of a promenade rather than undertaking extensive works to raise the level of the promenade itself. |
| **Groynes** | these are structures that generally run across the shore and are designed to retain material as it makes its way along the shore. They are generally made of timber, but can also be made of rock armour. Groynes need to be used and designed carefully, as they can cause downdrift erosion if they retain too much material. Timber groynes will deteriorate faster in more abrasive environments, such as shingle beaches. |
| **Shore connected breakwaters** | sometimes known as fishtail groynes due to their shape, these create artificial headlands offshore to protect the beach and the shore link section helps to retain material as it moves along the shore in the same way as a groyne, thus helping to stabilise beach levels. Due to their size they have high initial construction costs, but do have a long design life. |
| **Detached breakwaters** | these are structures that are generally parallel to the beach and act to reduce wave energy and longshore sediment drift. Eventually a natural shorelink will form as material is deposited in the lee of the breakwater. These are called tombolos and act as groynes by reducing alongshore sediment movement. |
| **Beach nourishment** | this is a soft defence measure that acts to replenish material on a beach where sediment has been eroded. New material is brought onto the beach to produce a designed profile. However, as it is likely that the erosion originally occurred due to a lack of material coming onto the beach from updrift frontages it is often necessary to repeat beach nourishment on a regular basis. |

| | |
|---|---|
| **Beach recycling** | this is similar to beach nourishment, but the material is generally replenished from the downdrift end of the sediment cell, for example where it has been retained by a terminal groyne, and is transported back to the updrift end of the cell. |
| **Set back defences** | these are used in managed realignment and will be constructed to the landward side of existing defences that are to be removed or breached. This allows the previously protected area of land to be flooded and natural processes to occur. This requires careful design and management to ensure that no adverse effects occur on the adjacent coastline |
| **Secondary defences** | these can be an inland defence line, for example embankments, that provide protection in the event that the primary defence line is overtopped or breached. |
| **Earth embankment** | these are generally used to provide flood protection and where used in a coastal environment they usually have a revetment to protect the seaward face from erosion. |

# 5. Review of SMP2 Policies

## 5.1 Key Strategic Objectives

5.1.1 As noted in Section 2.1 above, a number of key objectives have been set for the strategy against which to appraise the policies and options. These are reproduced in Table 5-1 along with shortened versions that are used in the presentation of the assessment results in Table 5-2:

**Table 5.1 Summary of Strategy objectives**

| Strategy Objective | Summary Objective |
|---|---|
| To protect lives, homes and property from flooding and/or erosion | To protect lives and property |
| To prevent loss, damage or disruption to infrastructure | To protect infrastructure |
| To maintain access to the coast for tourism and leisure, including access points, car parking, promenades and cycle networks | To maintain access |
| To protect commercial assets and use of the coast | To protect commercial assets |
| To maintain or improve the quality of environmentally designated sites, including promoting biodiversity and maintaining conservation value | To protect environmental sites |
| To maintain the conservation value of and access to historic assets on the coast | To protect historic assets |

5.1.2 Table 5-2 presents a high level assessment of the SMP2 policies against these objectives and identifies where policies can be discounted at this stage as they do not meet the objectives. SMP2 preferred policies are shown with shaded cells.

**Table 5.2 Review of SMP2 policies**

| Policy Unit | Objective | SMP2 Policies | | | |
|---|---|---|---|---|---|
| | | **No Active Intervention** | **Hold The Line** | **Managed Realignment** | **Advance The Line** |
| PU24.2 Crag Point to Curry's Point | To protect lives and property | No properties are at risk | No properties are at risk | No properties are at risk | No properties are at risk |
| | To protect infrastructure | None at risk | None at risk | None at risk | None at risk |
| | To maintain access | No, steps at Hartley Cove will be lost | Yes, maintains the steps | Potentially, steps could be moved | Potentially, steps could be moved |
| | To protect commercial assets | None at risk | None at risk | None at risk | None at risk |
| | To protect environmental sites | Yes, maintains natural processes | Potentially, depending on solution | Yes, maintains natural processes | No, would have adverse effects |
| | To protect historic assets | None at risk | None at risk | None at risk | None at risk |
| PU25.1 Curry's Point to Trinity Road Car Park | To protect lives and property | No, properties on St. Mary's Island at risk | Yes | No, properties on St. Mary's Island at risk | Yes |
| | To protect infrastructure | No | Yes | No | Yes |
| | To maintain access | No, lose access to St. Mary's Island | Yes | No | Yes |
| | To protect commercial assets | No | Yes | No | Yes |
| | To protect | Yes, allows | Not completely, | Yes | No |

| Policy Unit | Objective | SMP2 Policies | | | |
|---|---|---|---|---|---|
| | | **No Active Intervention** | **Hold The Line** | **Managed Realignment** | **Advance The Line** |
| | environmental sites | natural processes | but reduces pressure on management units to the south | | |
| | To protect historic assets | No, lighthouse will be lost | Yes | No | Yes |
| PU25.2 Trinity Road Car Park to Briardene Burn | To protect lives and property | None at risk | None at risk | None at risk | None at risk |
| | To protect infrastructure | None at risk | None at risk | None at risk | None at risk |
| | To maintain access | None at risk | None at risk | None at risk | None at risk |
| | To protect commercial assets | No, boat yard would be lost | Yes, boatyard would be protected | Potentially, boatyard could be moved inland | Yes, boatyard would be protected |
| | To protect environmental sites | Yes, allows natural processes | No | Yes | No |
| | To protect historic assets | None at risk | None at risk | None at risk | None at risk |
| PU25.3 Briardene Burn to Brown' Point | To protect lives and property | No, isolated properties at risk | Yes | Potentially in parts | Yes |
| | To protect infrastructure | No, road at risk | Yes | Potentially in parts | Yes |
| | To maintain access | No, access points will be | Yes | Access points could be moved | Yes |

| Policy Unit | Objective | SMP2 Policies | | | |
|---|---|---|---|---|---|
| | | **No Active Intervention** | **Hold The Line** | **Managed Realignment** | **Advance The Line** |
| | | lost | | | |
| | To protect commercial assets | No | Yes | Potentially in parts | Yes |
| | To protect environmental sites | Yes, allows natural processes | No | Potentially in parts | No |
| | To protect historic assets | No | Yes | Potentially in parts | No |
| PU25.4 Brown's Point to Table Rocks | To protect lives and property | No | Yes | No | Yes |
| | To protect infrastructure | No | Yes | No | Yes |
| | To maintain access | No | Yes | No | Yes |
| | To protect commercial assets | No | Yes | No | Yes |
| | To protect environmental sites | Yes | No | Yes | No |
| | To protect historic assets | No | Yes | No | Yes |
| PU26.1 Brown's Point | To protect lives and property | None at risk | None at risk | None at risk | None at risk |
| | To protect | None at risk | None at risk | None at risk | None at risk |

| Policy Unit | Objective | SMP2 Policies | | | |
|---|---|---|---|---|---|
| | | **No Active Intervention** | **Hold The Line** | **Managed Realignment** | **Advance The Line** |
| | infrastructure | | | | |
| | To maintain access | None at risk | None at risk | None at risk | None at risk |
| | To protect commercial assets | None at risk | None at risk | None at risk | None at risk |
| | To protect environmental sites | Yes, allows natural processes | No | Yes | No |
| | To protect historic assets | None at risk | None at risk | None at risk | None at risk |
| PU26.2 Cullercoats Bay | To protect lives and property | No, properties at risk | Yes | No | Yes |
| | To protect infrastructure | No, road at risk | Yes | No | Yes |
| | To maintain access | No | Yes | No | Yes |
| | To protect commercial assets | No | Yes | No | Yes |
| | To protect environmental sites | Yes, allows natural processes | No | Yes | No |
| | To protect historic assets | No | Yes | No | Yes |
| PU26.3 | To protect lives | None at risk | None at risk | None at risk | None at risk |

| Policy Unit | Objective | SMP2 Policies | | | |
|---|---|---|---|---|---|
| | | **No Active Intervention** | **Hold The Line** | **Managed Realignment** | **Advance The Line** |
| Tynemouth North Point | and property | | | | |
| | To protect infrastructure | None at risk | None at risk | None at risk | None at risk |
| | To maintain access | None at risk | None at risk | None at risk | None at risk |
| | To protect commercial assets | None at risk | None at risk | None at risk | None at risk |
| | To protect environmental sites | Yes, allows natural processes | No | Yes, allows natural processes | No |
| | To protect historic assets | None at risk | None at risk | None at risk | None at risk |
| PU26.4 Tynemouth Longsands | To protect lives and property | No | Yes | No | Yes |
| | To protect infrastructure | No | Yes | No | Yes |
| | To maintain access | No | Yes | No | Yes |
| | To protect commercial assets | No | Yes | No | Yes |
| | To protect environmental sites | Yes, allows natural processes | No | Yes | No |
| | To protect | No | Yes | No | Yes |

| Policy Unit | Objective | SMP2 Policies | | | |
|---|---|---|---|---|---|
| | | **No Active Intervention** | **Hold The Line** | **Managed Realignment** | **Advance The Line** |
| | historic assets | | | | |
| PU26.5 Sharpness Point | To protect lives and property | None at risk | None at risk | None at risk | None at risk |
| | To protect infrastructure | None at risk | None at risk | None at risk | None at risk |
| | To maintain access | None at risk | None at risk | None at risk | None at risk |
| | To protect commercial assets | None at risk | None at risk | None at risk | None at risk |
| | To protect environmental sites | Yes, allows natural processes | No | Yes | No |
| | To protect historic assets | None at risk | None at risk | None at risk | None at risk |
| PU26.6 Tynemouth Shortsands (King Edward's Bay) | To protect lives and property | No | Yes | No | Yes |
| | To protect infrastructure | No | Yes | No | Yes |
| | To maintain access | No | Yes | No | Yes |
| | To protect commercial assets | No | Yes | No | Yes |

| Policy Unit | Objective | SMP2 Policies | | | |
|---|---|---|---|---|---|
| | | **No Active Intervention** | **Hold The Line** | **Managed Realignment** | **Advance The Line** |
| | To protect environmental sites | Yes, allows natural processes | No | Yes | No |
| | To protect historic assets | No | Yes | No | Yes |
| PU26.7 Tynemouth Headland | To protect lives and property | None at risk | None at risk | None at risk | None at risk |
| | To protect infrastructure | None at risk | None at risk | None at risk | None at risk |
| | To maintain access | None at risk | None at risk | None at risk | None at risk |
| | To protect commercial assets | None at risk | None at risk | None at risk | None at risk |
| | To protect environmental sites | Yes, allows natural processes | No | Yes | No |
| | To protect historic assets | No | Yes | No | Yes |
| PU26.8 Tynemouth North Pier | To protect lives and property | None at risk | None at risk | None at risk | None at risk |
| | To protect infrastructure | No | Yes, maintains pier and protection to the Tyne | No | Yes, maintains pier and protection to the Tyne |
| | To maintain | No | Yes | No | Yes |

| Policy Unit | Objective | SMP2 Policies | | | |
|---|---|---|---|---|---|
| | | No Active Intervention | Hold The Line | Managed Realignment | Advance The Line |
| | access | | | | |
| | To protect commercial assets | No | Yes, maintains pier and protection to the Tyne | No | Yes, maintains pier and protection to the Tyne |
| | To protect environmental sites | Yes, allows natural processes | No | Yes | No |
| | To protect historic assets | No | Yes, maintains pier and protection to the Tyne | No | Yes, maintains pier and protection to the Tyne |
| PU27.1 Prior's Haven | To protect lives and property | No | Yes | No | Yes |
| | To protect infrastructure | No | Yes | No | Yes |
| | To maintain access | No | Yes | No | Yes |
| | To protect commercial assets | No | Yes | No | Yes |
| | To protect environmental sites | Yes, allows natural processes | No | Yes | No |
| | To protect historic assets | No | Yes | No | Yes |
| PU27.2 Quayside | To protect lives and property | No | Yes | No | Yes |

| Policy Unit | Objective | SMP2 Policies | | | |
|---|---|---|---|---|---|
| | | **No Active Intervention** | **Hold The Line** | **Managed Realignment** | **Advance The Line** |
| | To protect infrastructure | No | Yes | No | Yes |
| | To maintain access | No | Yes | No | Yes |
| | To protect commercial assets | No | Yes | No | Yes |
| | To protect environmental sites | Yes, allows natural processes | No | Yes | No |
| | To protect historic assets | No | Yes | No | yes |

5.1.3 The potential adverse effects on the environmentally designated features means that the Advance The Line policy can be discounted for all management units. For many of the management units where the coastal roads and properties are immediately behind the sea walls/promenades a policy of Managed Realignment is not practicable and so has been discounted in those units.

5.1.4 The SMP2 policies (shaded) appear to be still viable. For PU26.4 Tynemouth Longsands, the SMP2 policy is Hold The Line for the first two epochs and Managed Realignment for the third epoch. This policy allows for the stabilisation and engineering of the dune system to improve the natural protection that this provides, followed by managed realignment as the beach and dunes are allowed to evolve naturally.

# 6. Long List of Management Options

## 6.1 Introduction

6.1.1 Following the appraisal of the generic SMP2 policies, Table 5-2, the strategic management options for each policy unit have been assessed. These are based on the generic list of options identified in Section 4, the list from the original strategy and issues identified during consultation.

6.1.2 For all of the policy units a policy of Do Nothing has been assessed as this provides a baseline against which other options can be compared.

6.1.3 Where the Do Nothing option is not viable, Do Minimum (Option 1) is considered. This provides for the minimum action to be taken, for example, maintenance of existing structures, but this will not improve the protection provided by the structures in the long term. This also does not allow for replacement of defences once they are life-expired.

6.1.4 All of the options have been assessed against high level economic, technical, environmental and social factors. Whether any of the options are taken forward for detailed assessment depends on how they perform against these factors. The factors include assessment in the following areas:

- Technical factors include: whether the option provides appropriate erosion or flood protection and an assessment of buildability, i.e. access, material availability etc;
- Economic factors include: whether the option is likely to be more expensive to build than the assets that it protects; whether it will be prohibitively expensive to maintain in the long term;
- Environmental factors include: whether the option will significantly adversely affect the designated sites; whether it is likely to create long term changes to site integrity; whether it interferes with coastal processes;
- Social factors include: whether the option could have a negative impact on amenity value of the coast, the effects on the cohesion of local communities, whether emergency access routes could be compromised and health and safety impacts

6.1.5 The long list of options is considered below for each policy unit and those options considered to be appropriate are taken forward to the shortlist. Those options not appropriate are discarded and the reasons why are given.

## 6.2 Policy Unit 24.2: Crag Point to Curry's Point

6.2.1 This unit consists of undefended cliffs and the only existing structure is the access steps at Hartley Cove. The steps are used to gain access to the beach to view the exposed coal measures and also form emergency access. There are no properties or other assets at risk within this unit. Erosion rates are low in this area and mainly occur due to slumping of softer cliff material.

6.2.2 The long list options considered for management unit 24.2 are detailed in Table 6-1.

**Table 6.1 Long list of options for PU24.2**

| **Policy Unit 24.2 Crag Point to Curry's Point** | |
|---|---|
| Baseline – Do Nothing<br>*No further work or repairs would be undertaken and the steps would be allowed to deteriorate and the access closed once it was no longer safe to be used.* | |
| **Technical Factors** | Technically feasible, but access steps would be lost, removing emergency access |
| **Environmental Factors** | Allows natural processes to continue, eventual loss of cliff-top footpath |
| **Economic Factors** | Least cost option, but may have implications as access step location is leased by NTC from the landowner |
| **Social Factors** | Health and safety risk due to loss of emergency access and loss of amenity |
| **Consider Option Further** | ✓ |
| Option 1 – Do Minimum<br>*Maintain the existing steps until erosion has reached a position where they are no longer viable at which time they will be replaced.* | |
| **Technical Factors** | Maintains access and allows erosion to continue in the rest of the unit |
| **Environmental Factors** | No adverse effects |
| **Economic Factors** | Costs for maintenance of steps |
| **Social Factors** | Maintains access |
| **Consider Option Further** | ✓ |

6.2.3 As this unit has no assets at risk the main issue revolves around maintenance of the steps to continue emergency access to the beach. Do Nothing is taken forward as the baseline and Option 1 Do Minimum is taken forward to consider maintenance of the access steps and their replacement once erosion has reached a position where they are no longer viable at their current location. Hold The Line options would involve undertaking more extensive works to provide erosion protection to the cliffs and as there are no assets to be protected these have been discounted. Managed realignment has been discounted as there are no existing defences.

## 6.3 Policy Unit 25.1: Curry's Point to Trinity Road Car Park

6.3.1 Assets at risk in this unit are the isolated properties and the lighthouse on St. Mary's Island and the Trinity Road Car Park. There are defences at the landward end of the causeway to St. Mary's Island, around the Island and southwards from the causeway to the end of Trinity Road Car Park. There is a small area of erosion at the end of the Trinity Road sea wall where it meets the soft cliffs, but at the time of writing a scheme is programmed to construct new defences to provide end protection, utilising concrete blocks known as T Blocks.

**Table 6.2 Long list of options for PU25.1**

| **Policy Unit 25.1 Curry's Point to Trinity Road Car Park** | |
|---|---|
| Do Nothing baseline<br>*No repairs would be undertaken on the existing defences and they would be allowed to deteriorate and eventually fail.* | |
| **Technical Factors** | Technically feasible, but would not manage erosion risk to St. Mary's Island, the causeway and the car park |
| **Environmental Factors** | Allows natural processes to continue, but increases risk to inland habitats. Loss of Curry's Point would put greater pressure on Whitley Bay |
| **Economic Factors** | Least cost option, but could increase costs for maintaining assets in Whitley Bay |
| **Social Factors** | Loss of amenity value and health and safety risks from collapsing defences |
| **Consider Option Further** | ✓ |
| Option 1 – Do Minimum<br>*Reactive repair to existing defences* | |

| | |
|---|---|
| **Technical Factors** | Maintains erosion protection |
| **Environmental Factors** | Possible coastal squeeze, but does protect inland habitats |
| **Economic Factors** | Less costly in the short term |
| **Social Factors** | Maintains amenity value |
| **Consider Option Further** | ✓ |
| Option 2 – Maintain<br>*Repair defences to extend their lifespan and then replace them when necessary.* | |
| **Technical Factors** | Maintains erosion protection |
| **Environmental Factors** | Possible coastal squeeze, but does protect inland habitats |
| **Economic Factors** | More costly in the short term |
| **Social Factors** | Maintains amenity value |
| **Consider Option Further** | ✓ |
| Option 3 – Managed Realignment<br>*Maintain defences on St. Mary's Island but allow erosion to occur on the mainland and progressively move the access ramp inland and extend the causeway as erosion occurs.* | |
| **Technical Factors** | Feasible technically, but would require access to St. Mary's Island to be reconstructed regularly |
| **Environmental Factors** | Allows natural processes to occur on the mainland, but landward habitats would be lost and erosion rates to the south could increase as the protection afforded by the headland decreases |
| **Economic Factors** | Low cost for implementation, but likely to increase costs for Whitley Bay as headland erodes |
| **Social Factors** | Loss of inland habitats |
| **Consider Option Further** | X |

6.3.2 For this unit Do Nothing is taken forward, along with two Hold the Line options: Option 1 Do Minimum and Option 2 Maintain. Option 3 Managed Realignment is not taken forward as it would lead to the reduction of the headland and increased pressure on the defences further south in Whitley Bay, which would outweigh any benefits, as well as the loss of amenity value and habitats on the mainland.

## 6.4 Policy Unit 25.2: Trinity Road Car Park to Briardene Burn

6.4.1 This section is characterised by undefended soft cliffs which are actively eroding. As noted for PU25.1 there is some erosion at the southern end of the Trinity Road sea wall, which is planned to be protected in Autumn 2014. Continuing erosion would eventually threaten the car park at Briardene Burn as well as the golf course. The only other asset at risk in this unit is the boatyard which is at the top of the beach and would be at risk of flooding and erosion in the future.

**Table 6.3 Long list of options for PU25.2**

| **Policy Unit 25.2 Trinity Road Car Park to Briardene Burn** | |
|---|---|
| Do Nothing baseline<br>*Allow natural processes to continue.* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to continue, eventual loss of cliff-top footpath |
| **Economic Factors** | Least cost option |
| **Social Factors** | Loss of amenity as car park and golf course are eroded. Eventual loss of boat yard. |
| **Consider Option Further** | ✓ |
| Option 1 – Managed Realignment<br>*Allow natural processes to continue, but manage the transitions at the northern and southern ends of the unit where hard defences exist, to minimise outflanking risks* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Allows natural processes to continue |
| **Economic Factors** | Low cost but will need works to manage possible outflanking of existing defences at the |

| | |
|---|---|
| | northern and southern ends |
| **Social Factors** | Loss of golf course and partial loss of car park. Eventual loss of boat yard. |
| **Consider Option Further** | ✓ |

6.4.2 Do Nothing is taken forward as the baseline. Option 1 Managed Realignment is considered as the transitions between the defences at the northern and southern end of the unit would need to be managed as erosion continues to cut back the soft cliffs.

## 6.5 Policy Unit 25.3: Briardene Burn to Table Rocks

6.5.1 This unit is almost entirely defended and covers the main area of Whitley Bay, including the promenades. There is a rock revetment on the southern side of Briardene Burn. To the northern end of the unit the assets protected are mainly recreational open space and isolated properties. To the southern end of the unit the assets protected include properties and the infrastructure such as the coastal road and the main sewer that serves Whitley Bay and towns to the north.

**Table 6.4 Long list of options for PU25.3**

| **Policy Unit 25.3 Briardene Burn to Table Rocks** | |
|---|---|
| Do Nothing baseline<br>*No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur* | |
| **Technical Factors** | Technically feasible, but would lead to the eventual loss of the main sewer that serves Whitley Bay and towns to the north |
| **Environmental Factors** | Allows natural processes to continue |
| **Economic Factors** | Least cost option. Significant damages in southern section of the unit, especially of NWL sewerage infrastructure |
| **Social Factors** | Loss of amenity, open space and promenades. Loss of properties and disruption to social cohesion |
| **Consider Option Further** | ✓ |

| | |
|---|---|
| Option 1 – Do Minimum<br>*Reactive maintenance to existing defences as required.* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Coastal squeeze may be a problem, but historic buildings will be protected |
| **Economic Factors** | Lower cost in short term, but will eventually require replacement of defences |
| **Social Factors** | Maintains amenity and protects property |
| **Consider Option Further** | ✓ |
| Option 2 – Maintain<br>*Maintain defences to extend their lifespan and replace them when necessary.* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Coastal squeeze may be a problem, but historic buildings will be protected |
| **Economic Factors** | More expensive than Do Minimum in short term |
| **Social Factors** | Maintains amenity and protects property |
| **Consider Option Further** | ✓ |
| Option 3 – Managed Realignment<br>*Maintain defences to the south to protect properties but allow erosion to occur to the north where the defences protect open space land. The transition between the newly eroding section and the existing defences would be managed to reduce risks of outflanking.* | |
| **Technical Factors** | Possibly feasible in the northern section where properties are set back behind open space land |
| **Environmental Factors** | Natural processes would be allowed to occur in the northern section |
| **Economic Factors** | Damages for isolated properties in the northern section and loss of amenity. Costs to manage protection to southern section |

| | |
|---|---|
| **Social Factors** | Loss of amenity, open space and promenade |
| **Consider Option Further** | X |

6.5.2 Do Nothing is taken forward as the baseline. The two Hold the Line options are taken forward. Option 3 Managed Realignment is not taken forward as the loss of amenity, i.e. the promenade, open space and tourism benefits would outweigh the small environmental benefits that may be gained.

## 6.6 Policy Unit 25.4: Table Rocks to Brown's Point

6.6.1 The northern section of Brown's Bay consists of rock cliffs which are protected by the substantial rock platform of Table Rocks. Brown's Bay has two sections of sea wall that are in fair condition. The defences protect the coastal road and properties inland.

**Table 6.5 Long list of options for PU25.4**

| **Policy Unit 25.4 Table Rocks to Brown's Point** | |
|---|---|
| Do Nothing baseline<br>*No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | No cost but high damages |
| **Social Factors** | Loss of amenity and properties |
| **Consider Option Further** | ✓ |
| Option 1 – Do Minimum<br>*Maintain existing defences on a reactive basis* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Coastal squeeze may be a problem |
| **Economic Factors** | Low cost to maintain existing defences |

| | |
|---|---|
| **Social Factors** | Maintains protection to properties and amenity value of promenade |
| **Consider Option Further** | ✓ |
| Option 2 – Maintain<br>*Maintain existing defences and replace them when necessary* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Coastal squeeze may be a problem |
| **Economic Factors** | Higher cost than Do Minimum |
| **Social Factors** | Maintains protection to properties and amenity value of promenade |
| **Consider Option Further** | ✓ |
| Option 3 – Managed Realignment<br>*Allow natural processes to occur at Table Rocks and manage resumption of erosion in Brown's Bay as defences fail* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | High damages due to loss of properties |
| **Social Factors** | Loss of amenity and properties |
| **Consider Option Further** | X |

6.6.2 Do Nothing is taken forward as the baseline. Of the Hold the Line options only Option 1 Do Minimum and Option 2 Maintain are considered as the Sustain and Improve options are not applicable as there are no flood defences. Option 3 Managed Realignment is not taken forward due to the anticipated loss of properties and the amenity loss of the promenade.

## 6.7 Policy Unit 26.1: Brown's Point

6.7.1 Brown's Point consists of hard rocky cliffs and is undefended. Occasional rock falls occur but there are no assets at risk on the cliff top.

**Table 6.6 Long list of options for PU26.1**

| **Management Unit 26.1 Brown's Point** | |
|---|---|
| Do Nothing baseline<br>*Allow natural processes to occur* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | No cost |
| **Social Factors** | Not applicable |
| **Consider Option Further** | ✓ |

6.7.2 Due to the fact that there are no assets at risk and the cliffs have very low erosion risk the only option taken forward is Do Nothing.

## 6.8 Policy Unit 26.2: Cullercoats Bay

6.8.1 The northern section of this unit is defended by sea walls which extend from Brown's Point to the north pier. There are low concrete walls around the lifeboat station and a stepped concrete apron, known as the Brae, adjacent to the lifeboat station and the access ramp. There are concrete walls around Dove Marine Laboratory and then undefended cliffs leading to further sea walls that continue round the bay to the South Pier.

**Table 6.7 Long list of options for PU26.2**

| **Policy Unit 26.2 Cullercoats Bay** | |
|---|---|
| Do Nothing baseline<br>*No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | No cost but high damages |

| | |
|---|---|
| **Social Factors** | Loss of amenity and properties |
| **Consider Option Further** | ✓ |
| Option 1 – Do Minimum<br>*Maintain existing defences on a reactive basis* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | No features within the bay |
| **Economic Factors** | Low cost to maintain existing defences, but does not provide protection to fishermen's boats stored on the Brae |
| **Social Factors** | Protects lifeboat station and helps to maintain fishing industry |
| **Consider Option Further** | ✓ |
| Option 2 – Maintain<br>*Maintain existing defences and replace them when necessary* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | No features within the bay |
| **Economic Factors** | Higher cost than Do Minimum but does not provide protection to fishing boats |
| **Social Factors** | Maintains protection to the lifeboat station |
| **Consider Option Further** | ✓ |
| Option 3 – Improve<br>*Improve flood protection to the lifeboat station, The Brae and Dove Marine Laboratory by raising the north pier and reconstructing The Brae at a higher level. Continue to maintain all defences* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | No features within the bay |
| **Economic Factors** | Initially very high costs but would provide protection to fishing boats |

| | |
|---|---|
| **Social Factors** | Maintains protection to the lifeboat station |
| **Consider Option Further** | ✓ |
| Option 4 – Managed Realignment<br>*Manage the removal of defences and allow natural processes to occur* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | No features within the bay |
| **Economic Factors** | Low cost to implement but high damages |
| **Social Factors** | Loss of lifeboat station, laboratory and beach access |
| **Consider Option Further** | X |

6.8.2 Do Nothing is taken forward as the baseline. All of the Hold The Line options are taken forward as the main difference between them will be in the long term costs and they will therefore, require further consideration. Option 4 Managed Realignment is not taken forward as the damages would be high and the lifeboat station would be lost.

## 6.9 Policy Unit 26.3: Tynemouth North Point

6.9.1 Tynemouth North Point consists of hard cliffs with caves and an arch formation. The unit is undefended and there are no assets at risk.

**Table 6.8 Long list of options for PU26.3**

| **Policy Unit 26.3 Tynemouth North Point** | |
|---|---|
| Do Nothing baseline<br>*Allow natural processes to continue* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | No cost |
| **Social Factors** | Not applicable |

| | |
|---|---|
| **Consider Option Further** | ✓ |

6.9.2 Because there are no assets at risk and the cliffs are only eroding slowly the only option taken forward for this unit is Do Nothing.

## 6.10 Policy Unit 26.4: Tynemouth Longsands

6.10.1 At the northern end of Tynemouth Longsands is a masonry wall which leads to the Promenade. The centre section of the unit is undefended dunes that are presently managed to improve their condition and prevent further erosion of the dune system. There is a cafe at the end of the access ramp towards the southern end of the unit, which is at risk of flooding. A sea wall extends to the southern end of the unit and includes Tynemouth Pool, a derelict outdoor swimming pool, at the southern end of the unit.

**Table 6.9 Long list of options for PU26.4**

| **Policy Unit 26.4 Tynemouth Longsands** | |
|---|---|
| Do Nothing baseline<br>*No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to occur, but coastal squeeze likely to dune system |
| **Economic Factors** | No cost but high damages |
| **Social Factors** | Loss of amenity |
| **Consider Option Further** | ✓ |
| Option 1 – Do Minimum<br>*Undertake reactive maintenance of defences and continue dune management* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Coastal squeeze likely to dunes |
| **Economic Factors** | Low cost in the short term, but sea walls will need to be replaced at some point |

| | |
|---|---|
| **Social Factors** | Maintains amenity value |
| **Consider Option Further** | ✓ |
| Option 2 – Maintain<br>*Maintain and replace defences as necessary. Continue dune management.* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Coastal squeeze likely to dunes |
| **Economic Factors** | Higher cost than Do Minimum |
| **Social Factors** | Maintains amenity value |
| **Consider Option Further** | ✓ |
| Option 3 – Maintain<br>*Maintain and replace defences as necessary. Construct groyne field to provide protection to the beach and dunes* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Groynes will interfere with natural sediment movement along the coastline |
| **Economic Factors** | Higher initial cost to install groyne field |
| **Social Factors** | Maintains amenity value, though groynes may interfere with use of the beach |
| **Consider Option Further** | ✓ |
| Option 4 – Maintain<br>*Maintain and replace defences as necessary. Construct offshore reef to provide protection to beach and dune system* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Coastal squeeze likely to dunes |
| **Economic Factors** | High initial cost to construct reef |
| **Social Factors** | Maintains amenity value |

| | |
|---|---|
| **Consider Option Further** | ✓ |
| Option 5 – Managed Realignment<br>*Maintain defences where they provide protection to assets, stabilise and expand the dunes seaward through management activities and then allow natural processes to occur in the third epoch* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Coastal squeeze likely to occur at the dunes |
| **Economic Factors** | Low cost to implement but high damages |
| **Social Factors** | Loss of cafe and Tynemouth Pool |
| **Consider Option Further** | ✓ |

6.10.2 Do Nothing is taken forward as the baseline. The two Hold The Line options are taken forward as the main difference between them is cost and this needs to be considered in more detail. Protection could be provided to the beach and dune system by means of a groyne field or offshore reef and these options will require further appraisal. Option 5 Managed Realignment is taken forward as it accords with the SMP2 policy for the unit, which is Hold The Line for the first epoch followed by Managed Realignment.

## 6.11 Policy Unit 26.5: Sharpness Point

6.11.1 This unit is made up of hard cliffs that are undefended. The cliffs are highly fractured and experience regular rockfalls and slippage. There are access steps to the beach which are heavily abraded. There are no other assets at risk within this unit.

**Table 6.10 Long list of options for PU26.5**

| **Policy Unit 26.5 Sharpness Point** | |
|---|---|
| Option 0 – Do Nothing<br>*Allow natural processes to continue* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | No cost |

| | |
|---|---|
| **Social Factors** | Loss of access steps |
| **Consider Option Further** | ✓ |
| Option 1 – Do Minimum<br>*Maintain access steps* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Little impact as maintains access steps only |
| **Economic Factors** | Low cost |
| **Social Factors** | Maintains amenity value |
| **Consider Option Further** | ✓ |

6.11.2 Do Nothing is taken forward as the baseline case. Option 1 Do Minimum would involve maintenance of the steps only and is taken forward for further consideration. Managed Realignment is not considered as there are no existing defences.

## 6.12 Policy Unit 26.6 Tynemouth Shortsands (King Edward's Bay)

6.12.1 King Edward's Bay is protected by a number of sea walls forming a promenade around the bay. Above the defences are slopes and cliffs. The coastal road runs along the top of the cliff and would be the main asset at risk.

**Table 6.11 Long list of options for PU26.6**

| **Policy Unit 26.6 Tynemouth Shortsands (King Edward's Bay)** | |
|---|---|
| Do Nothing baseline<br>*No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | No cost, damages due to loss of coastal road |
| **Social Factors** | Loss of access steps, and coastal cycle route |

| | |
|---|---|
| **Consider Option Further** | ✓ |
| Option 1 – Do Minimum<br>*Maintain defences on a reactive basis* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Only minor impacts on designated sites as only maintains existing defences |
| **Economic Factors** | Low initial cost but defences will eventually need to be replaced |
| **Social Factors** | Maintains amenity value and access |
| **Consider Option Further** | ✓ |
| Option 2 – Maintain<br>*Maintain defences and replace them when necessary* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | More impacts than Do Minimum |
| **Economic Factors** | Higher cost than Do Minimum |
| **Social Factors** | Maintains amenity value and access |
| **Consider Option Further** | ✓ |
| Option 3 – Managed Realignment<br>*Manage the removal of defences as they fail and natural erosion occurs* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | Costs to manage transitions as erosion occurs |
| **Social Factors** | Loses amenity value and access |
| **Consider Option Further** | X |

6.12.2 Do Nothing is taken forward as the baseline case. Option 1 Do Minimum and Option 2 Maintain are taken forward. Option 3 Managed Realignment is not considered further as loss of the coastal highway and promenade would not be acceptable.

## 6.13 Policy Unit 26.7: Tynemouth Headland

6.13.1 Tynemouth Headland consists of rock cliffs that are fractured and suffers from regular rockfalls. Tynemouth Priory sits above the cliffs and cliff stabilisation works have been undertaken to stabilise sections of the headland.

**Table 6.12 Long list of options for PU26.7**

| **Policy Unit 26.7 Tynemouth Headland** | |
|---|---|
| Option 0 – Do Nothing<br>*No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | No cost, damages to Tynemouth Priory |
| **Social Factors** | Loss of amenity and risk to Priory |
| **Consider Option Further** | ✓ |
| Option 1 – Do Minimum<br>*Reactive maintenance to existing defences with possible additional cliff stabilisation in future* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Little impact as works are cliff stabilisation rather than erosion protection |
| **Economic Factors** | Ongoing costs to maintain existing stabilisation works and may require further work in future |
| **Social Factors** | Maintains amenity value and protects Priory |
| **Consider Option Further** | ✓ |
| Option 2 – Managed Realignment | |

| *Management of failure of existing defences followed by retreat of cliffs* | |
|---|---|
| **Technical Factors** | Feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | Costs to manage transitions as erosion occurs |
| **Social Factors** | Loses amenity value and access, possible risk to Tynemouth Priory |
| **Consider Option Further** | X |

6.13.2 Do Nothing is taken forward as the baseline option. Option 1 Do Minimum is considered further is it allows for the existing cliff stabilisation works to be maintained. The other Hold The Line options are not appropriate for this unit as the structures are not erosion or flood protection. Option 2 Managed Realignment is not taken forward as the risks to the Priory and the historic and heritage value would outweigh any benefits.

## 6.14 Policy Unit 26.8: Tynemouth North Pier

6.14.1 Tynemouth North Pier is approximately 1.7km long and provides shelter to the mouth of the Tyne. The structure is in good condition and while it does not directly protect any assets it does provide protection to areas upriver.

**Table 6.13 Long list of options for PU26.8**

| **Policy Unit 26.8 Tynemouth North Pier** | |
|---|---|
| Do Nothing baseline<br>*No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | No cost, very high damages to upriver areas and disruption to shipping |
| **Social Factors** | Amenity loss |

| | |
|---|---|
| **Consider Option Further** | ✓ |
| Option 1 – Do Minimum<br>*Reactive maintenance of the pier* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Little impact as the pier has very little influence on designated features |
| **Economic Factors** | Ongoing costs to maintain the pier |
| **Social Factors** | Maintains amenity value |
| **Consider Option Further** | ✓ |
| Option 2 – Sustain<br>*Raise crest levels of the pier to increase flood protection by reducing overtopping* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Little impact as the pier has very little influence on designated features |
| **Economic Factors** | Higher initial cost to raise crest levels and minimise overtopping of pier during storms |
| **Social Factors** | Maintains amenity value |
| **Consider Option Further** | X |

6.14.2 Do nothing is considered further as the baseline case. Option 1 Do Minimum is taken forward as it maintains the structure. Option 2 Sustain is not considered further as the costs to raise the crest level of the structure to minimise overtopping would be prohibitively high when compared to the benefits.

## 6.15 Policy Unit 27.1: Prior's Haven

6.15.1 Prior's Haven is mainly undefended with only a revetment on the northern side that runs along the access track to Tynemouth North Pier. Within the bay are the sailing and rowing clubs. The beach is sandy and backed by coastal slopes that show some signs of slippage.

**Table 6.14 Long list of options for PU27.1**

| **Policy Unit 27.1 Prior's Haven** | |
|---|---|
| Do Nothing baseline<br>*No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | No cost, damages to sailing and rowing clubs |
| **Social Factors** | Amenity loss |
| **Consider Option Further** | ✓ |
| Option 1 – Do Minimum<br>*Reactive maintenance of existing defences* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Little impact as only maintains the revetment and leaves the bay |
| **Economic Factors** | Ongoing maintenance costs |
| **Social Factors** | Maintains amenity value as it protects the access to the Pier |
| **Consider Option Further** | ✓ |
| Option 2 – Maintain<br>*Maintain existing defences and provide new defences to the sailing and rowing clubs* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Negative impacts as it would likely create coastal squeeze as beach rolls back |
| **Economic Factors** | High costs in comparison with benefits |
| **Social Factors** | Maintains amenity value |

| | |
|---|---|
| **Consider Option Further** | X |

6.15.2 Do Nothing is considered as the baseline case. Option 1 Do Minimum is taken forward as it maintains the revetment and thus access to the Pier. Of the other Hold The Line options only Maintain is appropriate, however this is not considered further as there are few assets to be protected and there are negative environmental impacts.

## 6.16 Policy Unit 27.2: Tynemouth

6.16.1 This unit covers the coastline from the headland adjacent to Prior's Haven into the Tyne and includes the quays up to Fish Quay. There are defences in poor condition at the headland. Other structures include sea walls, a rock revetment and the quays. The main risks are flooding of the commercial assets and erosion of the coastal slopes on the north bank of the Tyne.

| **Policy Unit 27.2 Tynemouth** | |
|---|---|
| Do Nothing baseline<br>*No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur* | |
| **Technical Factors** | Technically feasible |
| **Environmental Factors** | Allows natural processes to occur |
| **Economic Factors** | No cost, ongoing flood risk to commercial assets |
| **Social Factors** | Amenity loss, possible risk to the Collingwood Monument and other listed structures |
| **Consider Option Further** | ✓ |
| Option 1 – Do Minimum<br>*Reactive maintenance to existing defences* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | No change from existing situation as only maintains defences |
| **Economic Factors** | Ongoing maintenance costs |

| | |
|---|---|
| **Social Factors** | Maintains amenity value and protection to listed structures |
| **Consider Option Further** | ✓ |
| Option 2 – Maintain<br>*Maintain existing defences and replace them as necessary* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Little change to the existing situation as no new defences proposed |
| **Economic Factors** | Higher costs than Do Minimum |
| **Social Factors** | Maintains amenity value and protection to listed structures |
| **Consider Option Further** | ✓ |
| Option 3 – Sustain<br>*Maintain existing defences and replace them as necessary with new defences that provide a similar standard of flood protection to take account of sea level rise* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Little change to the existing situation as no new defences proposed |
| **Economic Factors** | Higher cost in the longer term to keep standard of protection |
| **Social Factors** | Maintains amenity value and protection to listed structures and improves flood protection to commercial assets |
| **Consider Option Further** | ✓ |
| Option 4 – Improve<br>*Maintain existing erosion defences and provide new flood defences to provide a higher standard of protection in anticipation of sea level rise* | |
| **Technical Factors** | Feasible |
| **Environmental Factors** | Little change to the existing situation as no |

| | |
|---|---|
| | new defences proposed |
| **Economic Factors** | High initial cost to increase standard of protection especially for flood risk at quays |
| **Social Factors** | Maintains amenity value and protection to listed structures and improves flood protection to commercial assets |
| **Consider Option Further** | ✓ |

6.16.2 Do Nothing is taken forward as the baseline case. Option 1 Do Minimum is considered as it consists of reactive maintenance of the existing structures. The other three Hold The Line options are all taken forward as they need further appraisal of lifetime costs and benefits. Managed Realignment is not considered as it is not feasible due to the heritage and commercial assets.

# 7. Shortlist of Management Options

## 7.1 Summary of Management Options

7.1.1 This section provides a summary of the options that have been taken forward for further consideration from the long list, as described in Section 6. Table 7-1 presents the summary for each Policy Unit.

| Policy Unit | Option | Description |
|---|---|---|
| **PU24.2: Crag Point to Curry's Point** | Do Nothing baseline | No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur |
| | 1 – Do Minimum | Maintain the existing access steps until erosion has reached a position where they are no longer viable at which time they will be replaced |
| **PU25.1: Curry's Point to Trinity Road Car Park** | Do Nothing baseline | No repairs would be undertaken on the existing defences and they would be allowed to deteriorate and eventually fail |
| | 1 – Do Minimum | Reactive repair to existing defences |
| | 2 – Maintain | Repair defences to extend their lifespan and replace them when necessary |
| **PU25.2: Trinity Road Car Park to Briardene Burn** | Do Nothing baseline | Allow natural processes to continue |
| | 1 – Managed Realignment | Allow natural processes to occur but manage the transitions at the northern and southern ends of the unit where hard defences exist to minimise outflanking risks |

| Policy Unit | Option | Description |
|---|---|---|
| **PU25.3: Briardene Burn to Table Rocks** | Do Nothing baseline | No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur |
| | 1 – Do Minimum | Reactive maintenance to existing defences |
| | 2 – Maintain | Maintain defences to extend their lifespan and replace them when necessary |
| **PU25.4: Table Rocks to Brown's Point** | Do Nothing baseline | No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur |
| | 1 – Do Minimum | Maintain existing defences on a reactive basis |
| | 2 – Maintain | Maintain existing defences and replace them when necessary |
| **PU26.1: Brown's Point** | Do Nothing baseline | Allow natural processes to occur |
| **PU26.2: Cullercoats Bay** | Do Nothing baseline | No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur |
| | 1 – Do Minimum | Maintain defences on a reactive basis |
| | 2 – Maintain | Maintain existing defences and replace them when necessary |
| | 3 – Improve | Improve flood protection to the lifeboat station, Dove Marine Laboratory and The Brae by raising the north pier and reconstructing The Brae at a higher level |

| Policy Unit | Option | Description |
|---|---|---|
| **PU26.3: Tynemouth North Point** | Do Nothing baseline | Allow natural processes to occur |
| **PU26.4: Tynemouth Longsands** | Do Nothing baseline | No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur. Dune management would cease. |
| | 1 – Do Minimum | Undertake reactive maintenance of defences and continue dune management |
| | 2 – Maintain | Maintain and replace defences as necessary. Continue active dune management |
| | 3 – Maintain | Maintain and replace defences as necessary. Construct groyne field to provide protection to the beach and dunes |
| | 4 – Maintain | Maintain and replace defences as necessary. Construct offshore reef to provide protection to the beach and dunes |
| | 5 – Managed Realignment | Maintain defences where they provide protection to assets, stabilise and expand the dunes seaward through management activities and then allow natural processes to occur in the third epoch |
| **PU26.5: Sharpness Point** | Do Nothing baseline | No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur |
| | 1 – Do Minimum | Maintain access steps |

| Policy Unit | Option | Description |
|---|---|---|
| **PU26.6 Tynemouth Shortsands (King Edward's Bay)** | Do Nothing baseline | No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur |
| | 1 – Do Minimum | Maintain defences on a reactive basis |
| | 2 – Maintain | Maintain defences and replace them when necessary |
| **PU26.7: Tynemouth Headland** | Do Nothing baseline | No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur |
| | 1 – Do Minimum | Reactive maintenance to existing defences with possible additional cliff stabilisation works in future |
| **PU26.8: Tynemouth North Pier** | 0 – Do Minimum | No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur |
| | 1 – Do Minimum | Reactive maintenance of the pier |
| **PU27.1: Prior's Haven** | Do Nothing baseline | No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur |
| | 1 – Do Minimum | Reactive maintenance of existing defences |
| **PU27.2: Tynemouth** | Do Nothing baseline | No maintenance of existing defences which would be allowed to deteriorate and eventually fail, after which natural processes would occur |

| Policy Unit | Option | Description |
|---|---|---|
| | 1 – Do Minimum | Reactive maintenance of existing defences |
| | 2 – Maintain | Maintain existing defences and replace them as necessary |
| | 3 – Sustain | Maintain existing defences and then replace them with new defences when necessary with new structures that maintain the current level of flood protection taking into account sea level rise |
| | 4 – Improve | Maintain existing erosion protection defences and replace flood protection defences with new structures that provide increased flood protection including for anticipated sea level rise |

# 8. Economic Appraisal

## 8.1 Introduction

8.1.1 This section of the report sets out the economic appraisal for the strategy coastline. In order to justify future expenditure in coastal risk management the valuation of damages that would occur in the absence of any management action being undertaken – the Do Nothing baseline – and the damages that would likely occur under each of the intervention options have been appraised. The damages avoided compared to the Do Nothing baseline has been compared against the costs of implementing each of the options across each of the frontages over the 100 year period of the strategy plan. Where possible a ratio of benefits to costs, the Benefit Cost Ratio (BCR), is presented for each of the options.

8.1.2 The aim of the economic assessment is to identify the most cost beneficial option to minimise the expected damages from coastal erosion. Flooding has not been included in the assessment as there is only a small area at risk of flooding in the study area, which is within Fish Quay. The assessment provides a transparent approach to the decisions made in selecting the preferred options and ensures the best use of public money.

## 8.2 Methodology

8.2.1 The appraisal follows the recommendation set out in the Environment Agency's Flood and Coastal Erosion Risk Management Guidance (FCERM-AG) (EA, 2010), The Benefits of Flood and Coastal Risk Management: A Handbook of Assessment Techniques (Middlesex University Press, 2005) and the Multi-Coloured Handbook (Flood Hazard Research Centre, 2014).

8.2.2 A Do Nothing (or No Active Intervention) scenario has been developed as a baseline case against which other options are compared. The damages that are expected to occur for each of the active intervention options are compared to the baseline damages to understand the benefits.

8.2.3 Damages are calculated by scaling up unit values outlined within the Multi-Coloured Handbook for residential properties, commercial properties, emergency services, roads and utilities. These expected values were scheduled over the 100 year appraisal period and discounted using the Treasury Green Book discount rate of 3.5% for years 0-29, 3% for years 30-74 and 2.5% for years 75-100. The discount rate is an adjustment used in appraisals to reflect the preference to receive benefits sooner and pay for costs later. Discounted damages of intervention options were compared to the Do Nothing baseline to provide an indication of Present Value Benefits.

8.2.4 The base date for calculating costs and damages is January 2015[1] and this is taken as Year 0 of the strategy. Inflation is not included within the appraisal. The economic appraisal is split into Policy Units, as shown in Table 8-1.

**Table 8.1 North Tyneside Coastal Strategy Policy Units**

| Management Units | Policy Units |
|---|---|
| **Management Unit 24:** | Policy Unit 24.2 - Hartley Cove to Curry's Point |
| **Management Unit 25** | Policy Unit 25.1 - Curry's Point to Trinity Road Car Park (including St Mary's Island) |
| | Policy Unit 25.2 Trinity Road car park to Briardene Burn |
| | Policy Unit 25.3 Briardene Burn to Table Rocks |
| | Policy Unit 25.4 Table Rocks to Brown's Point |
| **Management Unit 26** | Policy Unit 26.1 Brown's Point |
| | Policy Unit 26.2 Cullercoats Bay |
| | Policy Unit 26.3 Tynemouth North Point |
| | Policy Unit 26.4 Tynemouth Longsands |
| | Policy Unit 26.5 Sharpness Point |
| | Policy Unit 26.6 Tynemouth Shortsands (King Edward's Bay) |
| | Policy Unit 26.7 Tynemouth Head |
| | Policy Unit 26.8 Tynemouth North Pier |
| **Management Unit 27** | Policy Unit 27.1 Prior's Haven |
| | Policy Unit 27.2 Tynemouth (The Flatts) |

[1] GDP deflator information from the Office of National Statistics is collated at the end of each year. As inflation information for 2015 is not collated until 2015 is complete, where we have had to uplift values into current prices, we have usied 2014 information (the latest year where information is available). This is unlikely to have any bearing on results and recommendations and the index rarely differs dramatically between years.

8.2.5 As noted above, public funding needs to be utilised in the most cost efficient manner and the method used to determine whether an investment is worthwhile is termed cost benefit analysis (CBA). This method provides a systematic framework for assessing the advantages and disadvantages of alternative options. CBA translates these advantages and disadvantages into monetary terms to allow direct comparison of options. In economic terms the most efficient option is that which provides the greatest level of well-being to society as a whole. An option is considered to be justified if the benefits outweigh the costs. For example, an option where the present value benefits were twice the present value damages would have a benefit cost ratio (BCR) of 2 (calculated as benefits divided by costs) and would thus be a viable option.

### Asset Deterioration

8.2.6 The Guidance on determining asset deterioration and the use of condition grade deterioration curves (Product Code: SCHO0509BQAT-E-P) provides a table to determine the residual life of a flood defence asset. The values determined from these table are delay (years) in erosion due the Do Something option, which is inputted into the Appraisal Sheets, Erosion tab.

8.2.7 The types of assets included in the guide are:

- vertical walls
- embankments
- culverts
- dunes and shingle beaches.

8.2.8 These assets are further classified depending on the type of environment (fluvial or coastal), type of material, width of the asset (narrow or wide), whether maintenance is being carried out and whether there is any crest or rear protection.

8.2.9 For each classification three categories of deterioration rates are provided in Table 2.1 of the report, reflecting estimates of the most likely (best estimate), fastest and slowest deterioration rates. In choosing the most appropriate rate category, account should be taken of:

- the loading and environmental conditions acting upon the asset;
- the degree of difference from the assumed ‘standard’ conditions (which the asset was designed for).

8.2.10 The ‘best estimate’ in the table assumes ‘standard’ conditions. The table provides a generalised or “usual” maintenance regime has been considered for the ‘with maintenance’ curves; no distinction has been made between proactive and reactive types of maintenance, though deterioration rates are likely to be different for different maintenance types. The type of maintenance is therefore another factor that needs to be taken into account when choosing between slow, best estimate and fast rates (as well as exposure to deterioration agents). For each defences a best estimate has been chosen.

## 8.3 Valuation of Damages

8.3.1 The Do Nothing or No Active Intervention (NAI) scenario involves a completely hands-off approach to the coastline. No maintenance or replacement of defences would be undertaken and coastal processes would be allowed to progress naturally. Following reviews of coastal processes (Technical Report 03) and existing defences (Technical Report 04), the Do Nothing baseline was developed using the recession rates derived in TR03. From this the numbers of properties, areas of land, infrastructure etc. was identified and total damages calculated for each management area.

8.3.2 This section details the types of assets that would be affect by erosion in each of the policy units.

8.3.3 The method used for determining erosion losses in the Do nothing options was:

- Survey existing defences.
- Determine residual life of existing defences
- Assess coastal processes
- Determine when defences will fail (taking into account effect of adjacent defences)
- Project coastline evolution following failure in 20, 50 and 100 year intervals.

8.3.4 For all 'Do Something' options taken forward to the economic analysis, erosion was assumed to be prevented.

### Residential Properties

8.3.5 For the residential properties that were lost to erosion, the average market values for residential properties for the North East regions were extracted from the Land Registry website (http://landregistry.data.gov.uk/app/hpi). Values were extracted for different property types – Detached, Semi-detached, Terrace and Flats, detailed in Table 8.2.

**Table 8.2 North East Region Average Property Values (Land Registry, 2015)**

| Property Type | Market Value (February 2015) |
|---|---|
| Detached | £189,777 |
| Semi-detached | £100,384 |
| Terraced | £68,657 |
| Flats | £70,184 |

8.3.6 Expected value of each commercial property was entered into the Defra Appraisal spreadsheet[2] alongside the expected year of erosion. It has been assumed that the property value reduces to zero when the property boundary falls within the midpoint of the erosion epoch. Detailed below are the number of residential properties that would be lost in each erosion epoch; 0-20, 20-50 and 50-100 years. The location of the residential properties were determined using, National Receptor Database (GIS layer), OS Mastermap and Google Map and Streetview.

**Table 8.3 Summary of Residential Property Counts**

| Policy Unit | Description of Policy Units | Number of Residential Properties | | |
|---|---|---|---|---|
| | | 0 - 20 year | 20 - 50 year | 50 - 100 year |
| 24.2 | Hartley Cove to Curry's Point | 0 | 0 | 0 |
| 25.1 | Curry's Point to Trinity Road Car Park (inlcuding St Mary's Island) | 0 | 0 | 0 |
| 25.2 | Trinity Road car park to Briardene Burn | 0 | 0 | 0 |
| 25.3 | Briardene Burn to Table Rocks | 0 | 0 | 34 |
| 25.4 | Table Rocks to Brown's Point | 0 | 0 | 4 |
| 26.1 | Brown's Point | 0 | 0 | 0 |
| 26.2 | Cullercoats Bay | 0 | 0 | 6 |
| 26.3 | Tynemouth North Point | 0 | 0 | 0 |
| 26.4 | Tynemouth Longsands | 0 | 0 | 0 |
| 26.5 | Sharpness Point | 0 | 0 | 0 |
| 26.6 | Tynemouth Shortsands (King Edward's Bay) | 0 | 0 | 0 |
| 26.7 | Tynemouth Head | 0 | 0 | 0 |
| 26.8 | Tynemouth North Pier | 0 | 0 | 0 |
| 27.1 | Prior's Haven | 0 | 0 | 0 |
| 27.2 | Tynemouth (The Flatts) | 0 | 0 | 6 |

[2] https://www.gov.uk/flood-and-coastal-defence-appraisal-of-projects

### Commercial Properties

8.3.7 For commercial properties lost to erosion, the value for each commercial property was taken from Valuation Office Agency (VOA) business rate valuations website (http://www.2010.voa.gov.uk/rli/en/basic). The rate was extracted for each business identified using a combination of Google and NRD (National Receptor Database) GIS information. The VOA business rate is multiplied by 12 to reflect a standard rateable to market value multiplier. The Business rates provided on the VOA website reflect the typical value of the property. Business rates are based on the rateable value of the building, which is linked to the rental value. Rental rates are usually designed to provide the owner a return of around 6-8% of a property's value, such that it pays for itself (excluding interest) in around 12 years. Therefore, the business rate is multiplied by 12 to give an estimate of the market value of the building. Applying a bespoke VOA value related to each property was used, as opposed to an average value per property type, to provide greater accuracy in results. Expected value of each commercial property was entered into the Defra Appraisal spreadsheet[3] alongside the expected year of erosion.

8.3.8 It has been assumed, similar to the residential properties that the property value falls to zero as the property boundary falls within the midpoint of the erosion epoch. For example, a property expected to erode between years 50 and 100 was given an expected year of erosion as year 75. The location of the commercial properties were determined using, National Receptor Database (GIS layer), OS Mastermap and Google Map and Streetview. Detailed below are the number of commercial properties that would be lost in each erosion epoch, 0-20, 20-50 and 50-100 years.

[3] https://www.gov.uk/flood-and-coastal-defence-appraisal-of-projects

**Table 8.4 Summary of Commercial Property Counts**

| Policy Unit | Description of Policy Units | Number of Commercial Properties | | |
|---|---|---|---|---|
| | | 0 - 20 year | 20 - 50 year | 50 - 100 year |
| 24.2 | Hartley Cove to Curry's Point | 0 | **0** | **0** |
| 25.1 | Curry's Point to Trinity Road Car Park (inlcuding St Mary's Island) | 0 | **1** | 0 |
| 25.2 | Trinity Road car park to Briardene Burn | 0 | 0 | **3** |
| 25.3 | Briardene Burn to Table Rocks | 0 | 0 | **15** |
| 25.4 | Table Rocks to Brown's Point | 0 | 0 | 0 |
| 26.1 | Brown's Point | 0 | 0 | 0 |
| 26.2 | Cullercoats Bay | 0 | 0 | **5** |
| 26.3 | Tynemouth North Point | 0 | 0 | 0 |
| 26.4 | Tynemouth Longsands | **7** | 0 | **2** |
| 26.5 | Sharpness Point | 0 | 0 | 0 |
| 26.6 | Tynemouth Shortsands (King Edward's Bay) | 0 | 0 | 0 |
| 26.7 | Tynemouth Head | 0 | 0 | 0 |
| 26.8 | Tynemouth North Pier | 0 | 0 | 0 |
| 27.1 | Prior's Haven | **5** | 0 | 0 |
| 27.2 | Tynemouth (The Flatts) | 0 | 0 | **26** |

### Utilities

8.3.9 The Multicoloured Manual (Middlesex, 2014) guidance has been used in this study to estimate impacts on utilities from coastal erosion.

8.3.10 In order to estimate expected erosion damages, the study required data on the location of assets, the location and probability of erosion damages, and the cost of the disconnection or alteration of service. Data availability varied by utility. A summary of the data available within the study area at the time of writing is as follows.

**Table 8.5 Utility Data Available**

| | Northern Gas Network | Northern Power Grid | British Telecom Group (BT) | Northumbrian Water |
|---|---|---|---|---|
| Spatial data (location of assets) | Yes | No | Yes | Yes |
| Cost of disconnection or alteration of service | Yes | Yes | Partial | No |
| Impact valuation possible? | Yes | No | Partial | No |

8.3.11 As a result of data availability, impacts to telecommunications and the water network were quantitatively described. Only impacts to the gas network were monetised. As a result, the total monetised impacts to utilities assets should be considered an underestimate of total expected value.

8.3.12 The initial step required the identification of assets at risk of erosion. Spatial data on drainage, telecommunications and gas assets, provided by Northumbrian Water Group, British Telecom and National Gas Networks respectively, were overlaid with coastal erosion spatial layers. These maps were used to count numbers of assets (and length, where applicable) at risk between years 0-20, 20-50 or 50-100. Where an asset was at risk of erosion, details of the asset, its relevant policy unit location and the year in which it was expected to fail were noted[4].

8.3.13 Some of these assets provide infrastructure services at the end of a line, for example, where the end of a gas line services a single cliff top home. Where this is the case, we have assumed that these assets are no longer required as the properties they service will also be subject to coastal erosion.

8.3.14 Other assets connect points on a wider network. For the network to continue these assets will need to be altered and moved inland.

8.3.15 The following sections describe cost data associated with disconnection and alteration activities.

*Damage Valuation to Gas Network*

8.3.16 Northern Gas Networks outline their connection charges in a statement published in January 2015[5].

[4] The midpoint year of the range was used as the year of failure. For example, if the asset was expected to fail subject to erosion in years 50-100, the year of failure was recorded as 75.

[5] http://www.northerngasnetworks.co.uk/wp-content/uploads/2013/12/NGN-Connections-Charges-Statement-Effective-01-January-20151.pdf

8.3.17 Domestic service alteration charges include a standard service alteration, trench excavation and reinstatement. The charges are applied on the basis of the length of the required service pipe alteration (i.e. from the point at which the existing service pipe needs to be cut back, via the desired new route to the required meter location point). The charges are excluding VAT.

**Table 8.6 Northern Gas Network Domestic Service Alteration**

| Alteration | £ | £/km | |
|---|---|---|---|
| 32mm domestic service alteration requiring up to and including three metres of external pipe work | £596 | £198,667 | first 3 metres |
| additional metre charge for any additional external pipe work over three metres | £76 | **£76,000** | thereafter |

8.3.18 For ease of calculation and to take into account economies of scale, the additional charge of £76 per metre or £76,000 per km has been used. This makes the estimate of gas alteration charges potentially conservative.

**Table 8.7 Domestic gas disconnection charges (excluding VAT), Northern Gas Networks**

| Disconnection | | |
|---|---|---|
| **Length** | **£/20m** | **£/km equivalent** |
| <63mm PE/2" met | £871 | £43,550 |
| 90mm PE/3" met | £1,582 | **£79,100** |
| 125mm/4" met | £1,838 | £91,900 |
| 180mm/6" met | £1,879 | £93,950 |
| PE = yellow plastic service pipe; met = metallic service pipe | | |

8.3.19 These one off charges are for disconnections up to 20 metres. We have divided the one-off charge by 20 metres to get a per metre equivalent. A mid range per metre value has been selected to represent a central value. This is £79 per metre or £79,000 per km.

*Damage Valuation to Electricity Services*

8.3.20 At the time of writing, Northern Power Grid had not provided information on the spatial location of their assets. However, as electricity substations are included in the National Receptor Database, these were valued as part of the commercial damages section. Information on the number of properties which require disconnection because they are at risk of coastal erosion is also available.

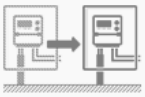
8.3.21 Northern Powergrid noted that disconnections cost on average £495 per home and £6,918 per small business in the North East[6]. These values were applied to residential and non-residential properties directly damaged by erosion (with the exception of car parks, groynes and public conveniences) to estimate the expected monetary cost of disconnection.

**Table 8.8 Northern Powergrid Disconnection Costs**

| | Average time to receive a quotation | Prices from (ex. VAT) | Average price (ex.VAT) |
|---|---|---|---|
|  Unmetered disconnections | 17 days | £ 370 | £ 489 |
|  1 Standard disconnection | 4 days | £ 495 | £ 495 |
|  Up to 4 standard disconnections | 11 days | £ 1,500 | £ 1,500 |
|  Typical small business disconnection | 15 days | £ 1,162 | £ 6,918 |
|  Typical large business disconnections | 22 days | £ 3,064 | £ 7,760 |

[6] Northern Powergrid http://www.northernpowergrid.com/guide-prices-and-timescales/standard-connection

**Table 8.9 Northern Powergrid Charge for Infrastructure Supply Line**

| | Guaranteed Standard | Average time to receive a quotation | Prices from (ex. VAT) | Average price (ex.VAT) |
|---|---|---|---|---|
|  Service Alterations | 5 days | 4 days | £ 555 | £ 856 |
|  1 Standard connection | 5 days | 5 days | £ 615 | £ 1,055 |
|  Up to 4 standard connections | 15 days | 12 days | £ 2,880 | £ 4,220 |

*Damage Valuation to Telecommunication*

8.3.22 British Telecom states that disconnection charges are £30 per residential property (BT, 2015[7]).

8.3.23 These charges represent the financial cost charged to customers but are unlikely to represent the full economic cost of physical modifications to the telecommunication line. This is because in many cases where BT connects or disconnects customers, the line already exists and is maintained respectively. In the case where coastal erosion damages assets, it is likely that disconnection costs will be higher.

8.3.24 Information regarding new Openreach connections to developments is outlined online[8]. Costs are charged where a network reinforcement exceeds a £3,400 (excluding VAT) per plot/unit exemption. Full cost information is also outlined online[9]. This cost information refers to unit costs for infrastructure products. Unfortunately, it is unclear what products and labour would be needed to cease or relocate a telecommunication line, telephone box or pole and therefore these charges are difficult to apply accurately within the appraisal with any certainty. Values are available for excess construction charges, but the magnitude depends upon the scenario.

[7] http://www.productsandservices.bt.com/consumer/terms/contracts-early-termination.html
[8] https://www.openreach.co.uk/orpg/home/contactus/connectingyourdevelopment/newsitesfaqs/qanda.do
[9] https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPrices.do?data=kKE%2F%2FCftg8LAZY%2B8EUaz9dpyYOJW58IELJ3a1hFsXScqDWVqEbA2PDIT5Y2OhxKv

8.3.25 A £30 charge has been applied to properties which disconnect as a result of erosion. These should be treated as underestimates.

*Damage Valuation to Water Network*

8.3.26 There are not significant numbers of mains pipes which would be affected in the study area. A water supply pipe, a raw sewage pipe and a fire hydrant pipe may be impacted in Policy Unit 25.1. However, it is not clear that erosion activities leading to exposed pipework would restrict current activities requiring repair, disconnection or alteration.

8.3.27 Unfortunately data on the cost of repair disconnection or alteration was unavailable, meaning that valuation of the impacts of erosion to the water network was not possible without further study and consultation with the Northumbrian Water Group.

8.3.28 There is however, significant sewerage infrastructure in Policy Unit 25.3 Briardene Burn to Table Rocks, to the rear of Central Promenade. At the time of assessment there is a scheme in place to replace the Central Promenade to provide upgraded coast protection and to continue to protect the sewerage infrastructure. Figures from the Project Appraisal Report for the scheme have been incorporated into the economic assessment for PU25.3.

## Transport

8.3.29 The Multicoloured Manual (Middlesex, 2013) states, related to transport, that 'the loss avoided by coastal risk management is the least cost option by society in a 'do nothing' scenario. This may be the cost of building new infrastructure, the cost of increasing the capacity of existing facilities or congestion costs from increased use of existing facilities (e.g. roads and through routes).'

8.3.30 When valuing the impact of coastal erosion on road infrastructure consideration was given to what would happen in the do nothing case. If the road serves only properties at risk of erosion and is eroded at the same time as the properties, the road no longer has connection purpose and therefore no value is counted. Should the section of road being eroded serve to connect areas not at risk of erosion, then a least cost alternative strategy would be imposed. This would be either to accept additional congestion on alternative routes or to realign the road.

8.3.31 The majority of roads subject to risk by coastal erosion in the area serve areas also at risk of erosion and therefore will no longer have a connection purpose. There are a number of roads, however, which would likely be reinstated or a diversion required.

8.3.32 The cost of redirection/reinstatement has been estimated based upon Multicoloured Manual methods. For traffic which will be diverted, traffic counts (Department for Transport, 2013) have been used to understand the daily number of cars which need to take an alternative route (estimated using Google maps) at a per km resource cost for the diversion (table 6.15, Multi-Coloured Manual, Middlesex, 2013). Note, the resource costs have been capped at the cost of reinstating the road.

8.3.33 For reinstatement of paths and roads, costs have been estimated from the Spons Civil and Highway report (AECOM, 2015).

**Table 8.10 Erosion of Roads – Approach of Economic Assessment**

| Policy Unit | Road | Comment |
|---|---|---|
| 25.1 | The Links to St Mary's Island | There are abandoned buildings (such as lighthouse) on St Marys Island. Assume least cost option is to not replace road. |
| 25.2 | The Links | This is a very small road. Traffic is likely to use the A193 (The Links) (which is not at risk of erosion in the study) to travel along the coast. No new diversion needed |
| | Private Road | Traffic is likely to use the A193 (The Links) to travel along the coast. No new diversion needed |
| 25.3 | Promenade | Addressed in Table 8.11 |
| | Brook Street | Road can be accessed by the westerly (town facing) end. It is unlikely that there will be much additional congestion costs from using this route in the do nothing case. |
| | Ocean View | Road can be accessed by the westerly (town facing) end. It is unlikely that there will be much additional congestion costs from using this route in the do nothing case. |
| | South Parade | Road can be accessed by the westerly (town facing) end. It is unlikely that there will be much additional congestion costs from using this route in the do nothing case. |
| | North Parade | Road can be accessed by the westerly (town facing) end. It is unlikely that there will be much additional congestion costs from using this route in the do nothing case. |
| | Esplanade | Road can be accessed by the westerly (town facing) end. It is unlikely that there will be much additional congestion costs from using this route in the do nothing case. |
| | Percy Road | Road can be accessed by the westerly (town facing) end. It is unlikely that there will be much additional congestion costs from using this route in the do nothing case. |
| | Unnamed Road | Road can be accessed by the westerly (town facing) end. It is unlikely that there will be much additional congestion costs from using this route in the do nothing case. |
| 25.4 | Windsor Crescent | Addressed in Table 8.11 |
| 26.2 | Private Road to Dove Marine Lab | Dove Marine Lab will be eroded, therefore the value of this road will be assumed to be void. |
| 26.4 | Private Road to Cullercoats | Addressed in Table 8.11 |

| Policy Unit | Road | Comment |
|---|---|---|
| | Bay North Facilities | |
| | Private Road to Cullercoats South Facilities | Addressed in Table 8.11 |
| 27.1 | Private Road to Tynemouth Sailing Club | The sailing club is on the beachside. Assuming the sailing club is lost then no access road will be reinstated. |
| | Private Road to Pier Cottage | Addressed in Table 8.11 |
| 27.2 | Cliffords Fort 1 | No alternative access required |
| | Cliffords Fort 2 | No alternative access required |
| | Union Quay | No alternative access required |

**Table 8.11 Value Damage of Transport Links**

| Policy Unit | Road | Year | Do nothing scenario | Cost calculation | Cost |
|---|---|---|---|---|---|
| 25.3 | Promenade | 75 | Much of the promenade will be eroded. The diversion for a vehicle will be 1.4km (Park Avenue) compared to 700m route on the promenade. This would be 6min by car instead of 1min. As this is a main route, information on traffic counts are available. Extra resource costs would mount up each year and are capped at the point where it would be cheaper to relocate the promenade. Spons Civil and Highway report (AECOM, 2015) provides estimated rates for tarmac or reinforced concrete roads. These include all earthworks, drainage, pavements, lighting, signs, fencing and safety barriers. The cost for a dual two lane road 1.3m wide carriageway is £3,000 to £3,800 per m. The cost of relocating the promenade would therefore, be approximately £3000 x 700m = £2,100,000. | Annual Average Daily Flow (cars) 7161 (2013 data[10])<br>X<br>0.7km extra distance<br>X<br>£0.69/km resource cost (Multi-Coloured Manual, 2014[11] table 6.15 assuming 20mph)<br>X<br>365 days | £1,262,450 per annum, capped at £2.1m |
| 25.4 | Windsor Crescent | 90 | Part of Windsor Crescent will be eroded, causing a diversion. 170 metres on Windsor Crescent (which would take 1 min by car) would require a diversion via Windsor Ave and Naters St of 350 metres or 2 minutes by car. Information on traffic counts are not available for this road. It is assumed that traffic is 1/10th the amount of the promenade. This is precautionary as although Windsor Crescent is a smaller road, it is a picturesque coastal route. Resource costs would cap at the point where it would be cheaper to relocate Windsor Crescent. Spons Civil and Highway report (AECOM, 2015) provides estimated rates for tarmac or reinforced concrete roads. These include all earthworks, drainage, pavements, lighting, signs, fencing and safety barriers. The cost for a dual two lane road 1.3m wide carriageway is £3,000 to £3,800 per m. The cost of relocating the promenade would be | Annual Average Daily Flow (cars) 700 (precautionary estimate)<br>X<br>0.17km extra distance<br>X<br>£0.69/km resource cost (Multi-Coloured Manual, 2014, table 6.15 assuming 20mph)<br>X<br>365 days | £29,970 per annum, capped at £510,000 |

[10] http://www.dft.gov.uk/traffic-counts/cp.php?la=North+Tyneside#46775

[11] GDP deflator information is not available for 2015 until 2015 is complete; so the latest full year we have inflation info is 2014. This data was in 2014 prices so we have not changed them.

| Policy Unit | Road | Year | Do nothing scenario | Cost calculation | Cost |
|---|---|---|---|---|---|
| | | | approximately £3000 x 170m = £510,000. | | |
| 26.4 | Private Road to Cullercoats Bay North Facilities | 100 | The path to the north sands (170m) would likely be maintained for recreational value. As the road slopes down from cliff side to beach, the extent of the works would depend on whether the erosion was gradual or whether erosion undermines the road. Spons Civil and Highway report (AECOM, 2015) provides estimated rates for Tarmac paving (two layers; limestone or igneous chipping finish paving on sub-base including excavation and type 1 sub base). This is £74 to £93 per m². As a single lane width is 7.3m, this equates to £10.13 to £12.74 per m length of path. | £10.13 (lower bound) (AECOM, 2015)<br>X<br>170 metres | £1,720 |
| 26.4 | Private Road to Cullercoats South Facilities | 100 | The path to the south facilities (160m) would likely be maintained for recreational value. As the road slopes down from cliff side to beach, the extent of the works would depend on whether the erosion was gradual or whether erosion undermines the road. Spons Civil and Highway report (AECOM, 2015) provides estimated rates for tarmac paving (two layers; limestone or igneous chipping finish paving on sub-base including excavation and type 1 sub base). This is £74 to £93 per m². As a single lane width is 7.3m, this equates to £10.13 to £12.74 per m length of path. | £10.13 (lower bound) (AECOM, 2015)<br>X<br>160 metres | £1,620 |
| 27.1 | Private Road to Pier Cottage | 100 | Pier Cottage is not expected to be eroded. Therefore 61m of the road would be reinstated inland. Spons Civil and Highway report (AECOM, 2015) provides estimated rates for tarmac or reinforced concrete roads. These include all earthworks, drainage, pavements, lighting, signs, fencing and safety barriers. For a single 7.3m wide carriageway, the range of cost is £1075-£1350 per metre. | £1075 per metre (lower bound) (AECOM, 2015)<br>X<br>61 metres | £65,575 |

## 8.4 Qualitative Damage Analysis

8.4.1 The Economic Appraisal detailed in the sections above is a quantitative analysis, and due to the nature of the coastal area in North Tyneside, a number of aspects are not included in this analysis.

8.4.2 The factors that are not included in this analysis, but which need to be considered in the options appraisal are:,

- Loss of open space which is used for recreation.
- Loss of footpaths, promenade and access to the beach.
- Loss of access to recreational facilities.
- Loss of historic features including the walls and areas around Tynemouth Castle.
- Loss of car parking facilities.

8.4.3 Table 8.12 provides the details of the qualitative damages in each of the policy unit areas.

**Table 8.12 Additional Losses in each Policy Unit**

| Policy Units | Erosion Loss Profiles | | |
|---|---|---|---|
| | 20 year | 50 year | 100 year |
| 24.2 | Loss of footpaths.<br>Loss of access to the beach | Loss of footpaths.<br>Loss of access to the beach | Loss of footpaths.<br>Loss of access to the beach |
| 25.1 | | | Loss of part of the car park and access.<br>Loss of the promenade and access to the beach. |
| 25.2 | Loss of recreational use of the boat yard | Loss of recreational use of the boat yard.<br>Loss of the promenade.<br>Loss of the car park area.<br>Loss of walkway and recreation areas around Briardene Burn.<br>Loss of access to the beach.<br>Loss of amenity | Loss of recreational use of the boat yard.<br>Loss of the promenade.<br>Loss of the car park area.<br>Loss of walkway and recreation areas around Briardene Burn.<br>Loss of access to the beach.<br>Loss of amenity |
| 25.3 | | Loss of access to the beach | Loss of promenade and footpaths.<br>Loss of the Whitley Bay Skate Park.<br>Loss of open park area.<br>Loss of access to the beach |

| Policy Units | Erosion Loss Profiles | | |
|---|---|---|---|
| | 20 year | 50 year | 100 year |
| 25.4 | | | Loss of promenade. |
| 26.2 | | | Loss of recreation use of the bay.<br>Loss of access to the bay |
| 26.3 | | | |
| 26.4 | | Loss of footpath along Long Sands.<br>Loss of recreational amenities. | Loss of footpath along Long Sands.<br>Loss of outdoor pool to the south of Longsands.<br>Loss of recreational amenities |
| 26.5 | | | Loss of Open Land.<br>Loss of access steps |
| 26.6 | | Loss of Promenade | Loss of Promenade<br>Loss of a number of walls and areas of Tynemouth Castle. |
| 26.7 | | | Loss of part of the Tynemouth Castle area. |
| 27.1 | | | Loss of footpath and access to the area. |
| 27.2 | 18 | Loss of paths on Freestone Point. | Loss of paths on Freestone Point.<br>Loss of Promenade<br>Loss of North Groyne parking.<br>Loss of access to the area. |

## 8.5 Costs

8.5.1 For each management unit a series of active intervention (Do Something) options have been considered under generic options as described in Section 4 of this report. For all options, where applicable, costs for maintenance have been based, where possible/appropriate, on historic costs. For replacement of structures costs have been based on a number of sources, including the EA Flood Risk Management Estimating Guide – Update 2010 (EA,2010), SPONS Civil Engineering and Highway Works Price Book (SPONS, 2015) and internal Capita cost databases. For each of these damages and costs have been calculated as follows:

- Do Minimum/Maintain. Whole life (100 year) present value costs have also been developed for these options based on historic maintenance costs where appropriate.

The Maintain option also includes costs for replacement of structures when they are life-expired.

- Sustain/Improve – these options involve changes to the current defences to either sustain or improve the standard of flood protection provided. These are considered for each frontage where appropriate. Each option is developed to a sufficient degree to allow costing.
- Managed Realignment – this option allows for the retreat of the coast to higher ground or set-back defences. The option may include for temporary maintenance of defences to enable planning and implementation of roll-back of assets behind defences. Where maintenance is required this is calculated based on historic expenditure and replacement structures are costed based on the appropriate cost source.

## 8.6 Identification of the Preferred Options

8.6.1 The guidance set out in FCERM-AG is used to select options based on a staged approach. Costs and benefits of options are considered against the Do Nothing baseline and the option with the highest Average Benefit Cost Ratio (ABCR) is primarily selected. Thereafter, the costs and benefits are compared between other options which demonstrate higher benefits than the option with the highest ABCR and the option with the highest ABCR to establish the Incremental Benefit-Cost Ratio, IBCR. The IBCR is used to understand if additional expenditure over and above the option with the highest ABCR would reap more benefits per pound spent.

8.6.2 The identification of the preferred option follows these steps:

- Total damages for each benefit area are calculated from the Do Nothing baseline
- The Do Minimum option is assessed to calculate option costs, benefits, net present value (NPV) and the benefit cost ratio (BCR).
- Identification of Maintain options costs, benefits, net present value, benefit cost ratio, etc.
- Identification of Sustain/Improve and Managed Realignment options costs, benefits, net present value, benefit cost ratio, etc.

8.6.3 Following these steps the identification of the preferred economic option can be made for each benefit area. If the benefits and costs of possible options are similar then non-monetised evidence can sway the preferred option. For example, the environmentally preferred option could be taken forward as the overall preferred option.

8.6.4 Table 8.13 to Table 8.15 shows the results of the economic appraisal for the identification of the preferred option for each policy unit (benefit area).

**Table 8.13 Analysis of costs and benefits**

| 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 8.14 Analysis of costs and benefits**

| 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 |

| 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)* |
| 27.2 | £156,073 | £2,843,523 | £156,073 | -£2,687,449 | 0.1 | - |

**Table 8.15 Analysis of Damages against Management Realignment, Sustain or Improve**

| Policy Unit | Do Nothing | Managed Realignment / Sustain / Improve | | | | |
|---|---|---|---|---|---|---|
| | *Total PV Damage* | *Option Cost* | *Total PV Benefits* | *Net Present Value (NPV)* | *Average Benefit Cost Ratio (ABCR)* | *Incremental Benefit Cost Ratio (ICBR)* |
| 25.2 (***Managed Realignment)*** | £26,037 | £3,946,133 | £26,037 | -£3,920,096 | 0 | 0 |
| 26.2 (***Improve)*** | £36,310 | £4,768,883 | £36,310 | -£4,732,573 | 0 | 0 |
| 26.4 (***Managed Realignment)*** | £290,751 | £1,870,938 | £290,751 | -£1,580,186 | 0.2 | - |
| 27.2 (***Sustain)*** | £156,073 | £3,588,877 | £156,073 | -£3,432,803 | 0 | 0 |
| 27.2 (***Improve)*** | | £5,515,910 | £156,073 | -£5,359,837 | 0 | 0 |

## 8.7 Sensitivity Testing

8.7.1 It is important to test the effect of uncertainties and assumptions made about the options. For the Economic Appraisal, the purpose of sensitivity testing is to determine whether, the results are within reasonable bounds of confidence:

- The project is economically worthwhile (benefits outweigh the costs); and
- The options choice is robust (where the options choice would not change to another option under reasonable changes to the assumptions made during the appraisal).

8.7.2 There are generally two standard methods by which to test the effects of uncertainty. The first is to create high and low scenarios, changing the inputs in the appraisal calculations to reflect these scenarios and observing the change in results. The second is to use tipping point analysis, which is to create an increase (or decrease) in the input until the recommended decision changes (e.g. an option no longer becomes cost beneficial or the preferred option changes). Then assess whether this change is likely or unlikely. If the input is shown to have a bearing on the final result, then the decision maker may seek more information (and even procure research) to help provide a robust recommendation.

8.7.3 Tipping point analysis was undertaken to understand what the magnitude of change in costs or benefits would be required for a scheme which was not economically viable in the 'base case' to become economically viable, or for a scheme which was economically viable in the 'base case' to become unviable; in other words when the net present value tips zero. In the base case, only the do minimum and Maintain options in Policy Unit 25.3 and the do minimum option in Policy Unit 27.1 are economically viable.

**Table 8.16: Change in cost or benefit for net present value to tip zero.**

| | **Do Nothing** | **Do Minimum** | | | | | |
|---|---|---|---|---|---|---|---|
| **Policy Unit** | *Total PV Damage* | *Option Cost* | *Total PV Benefits* | *Net Present Value (NPV)* | *Decrease in cost or increase in benefits for NPV to tip zero* | *% change on costs required* | *% change on benefits required* |
| 24.2 | £0 | £376,759 | £0 | -£376,759 | £376,759 | 100% | N/A |
| 25.1 | £15,391 | £815,728 | £11,794 | -£803,934 | £803,934 | 99% | 6817% |
| 25.2 | £26,037 | **NO DO MINIMUM** | | | | N/A | N/A |
| 25.3 | £7,670,340 | £1,611,766 | £5,983,095 | £4,371,329 | -£4,371,329 | -171% | -26.9% |
| 25.4 | £17,374 | £271,199 | £17,374 | -£253,824 | £253,824 | 94% | 1461% |
| 26.1 | | **DO NOTHING** | | | | N/A | N/A |
| 26.2 | £36,310 | £1,564,247 | £36,310 | -£1,527,937 | £1,527,937 | 98% | 4208% |
| 26.3 | | **DO NOTHING** | | | | N/A | N/A |
| 26.4 | £290,751 | £911,335 | £244,151 | -£667,184 | £667,184 | 73% | 273% |
| 26.5 | £0 | £371,894 | £0 | -£371,894 | £371,894 | 100% | N/A |
| 26.6 | £0 | £531,015 | £0 | -£531,015 | £531,015 | 100% | N/A |
| 26.7 | £0 | £451,290 | £0 | -£451,290 | £451,290 | 100% | N/A |
| 26.8 | £0 | £509,709 | £0 | -£509,709 | £509,709 | 100% | N/A |
| 27.1 | £161,536 | £64,623 | £127,566 | £62,943 | -£62,943 | -97% | -49% |
| 27.2 | £156,073 | £1,643,269 | £156,073 | -£1,487,196 | £1,487,196 | 91% | 953% |

**Table 8.17: Change in cost or benefit for net present value to tip zero.**

| Policy Unit | Do Nothing | Maintain | | | | | |
|---|---|---|---|---|---|---|---|
| | *Total PV Damage* | *Option Cost* | *Total PV Benefits* | *Net Present Value (NPV)* | *Decrease in cost or increase in benefits for NPV to tip zero* | *% change on costs required* | *% change on benefits required* |
| 25.1 | £15,391 | £2,022,966 | £15,391 | -£2,007,575 | £2,007,575 | 99% | 13044% |
| 25.3 | £7,670,340 | £5,941,789 | £7,670,340 | £1,728,551 | -£1,728,551 | -29% | -22% |
| 25.4 | £17,374 | £513,362 | £17,374 | -£495,988 | £495,988 | 97% | 2855% |
| 26.2 | £36,310 | £2,915,698 | £36,310 | -£2,879,388 | £2,879,388 | 99% | 7930% |
| 26.4 | | £1,922,726 | £290,751 | -£1,631,974 | £1,631,974 | 85% | 561% |
| | | £1,884,367 | £290,751 | -£1,593,616 | £1,593,616 | 85% | 548% |
| | £290,751 | £1,927,107 | £290,751 | -£1,636,356 | £1,636,356 | 85% | 563% |
| 26.6 | £0 | £1,126,127 | £0 | -£1,126,127 | £1,126,127 | 100% | N/A |
| 27.2 | £156,073 | £2,843,523 | £156,073 | -£2,687,449 | £2,687,449 | 95% | 1722% |

**Table 8.18: Change in cost or benefit for net present value to tip zero.**

| Policy Unit | Do Nothing | Managed Realignment / Sustain / Improve | | | | | |
|---|---|---|---|---|---|---|---|
| | *Total PV Damage* | *Option Cost* | *Total PV Benefits* | *Net Present Value (NPV)* | *Decrease in cost or increase in benefits for NPV to tip zero* | *% change on costs required* | *% change on benefits required* |
| 25.2 (***Managed Realignment)*** | £26,037 | £3,946,133 | £26,037 | -£3,920,096 | £3,920,096 | 99% | 15056% |
| 26.2 (***Improve)*** | £36,310 | £4,768,883 | £36,310 | -£4,732,573 | £4,732,573 | 99% | 13034% |
| 26.4 (***Managed Realignment)*** | £290,751 | £1,870,938 | £290,751 | -£1,580,186 | £1,580,186 | 84% | 543% |
| 27.2 (***Sustain)*** | | £3,588,877 | £156,073 | -£3,432,803 | £3,432,803 | 96% | 2199% |
| 27.2 (***Improve)*** | £156,073 | £3,588,877 | £156,073 | -£3,432,803 | £3,432,803 | 96% | 2199% |

8.7.4 In all cases the benefits need to at least double for the options which are unviable in the base case, to make them viable. The benefits assessment currently includes benefits to property and infrastructure, so these benefits would need to be found from analysing the environmental, recreational and health and safety damages associated with the do nothing case. If these wider benefits are expected to exceed those set out in the 'increase in benefits for NPV to tip to zero' column, then a move away from a Do Nothing solution may be justified.

8.7.5 Two additional sensitivity tests were undertaken using the high/low sensitivity test approach. The first (S1) considered the uncertainty around the date that erosion would write off property and infrastructure. In the base case appraisal, unless more information was present, properties and infrastructure which were estimated to be written off in years 50-100 were given a write off date of year 75, properties and infrastructure which were estimated to be written off in years 20-50 were given a write off date of 35 and properties and infrastructure which were estimated to be written off in years 0-20 were given a write off date of year 10. In the S1 sensitivity test, the write off date was changed from the middle of the range to the first date of the range (year 50, 20 and 1 respectively.

8.7.6 The second sensitivity test concerned the addition of the 60% optimism bias in the base case. Optimism bias is a contingency uplift applied to costs to ensure that they are not too low. This sensitivity test observed results after the optimism bias uplift was removed.

**Table 8.19: Sensitivity test results - Do nothing baseline**

| | **Base case** | **S1: Earlier erosion date** | **S2: No optimism bias** |
|---|---|---|---|
| | Do Nothing | Do Nothing | Do Nothing |
| **Policy Unit** | *Total PV Damage* | *Total PV Damage* | *Total PV Damage* |
| 24.2 | £0 | £0 | £0 |
| 25.1 | £15,391 | £21,711 | £15,391 |
| 25.2 | £26,037 | £39,124 | £26,037 |
| 25.3 | £4,867,716 | £10,774,774 | £10,774,774 |
| 25.4 | £17,374 | £61,635 | £17,374 |
| 26.1 | £0 | £0 | £0 |
| 26.2 | £36,310 | £93,856 | £36,310 |
| 26.3 | £0 | £0 | £0 |
| 26.4 | £290,751 | £301,804 | £290,751 |
| 26.5 | £0 | £0 | £0 |
| 26.6 | £0 | £0 | £0 |
| 26.7 | £0 | £0 | £0 |
| 26.8 | £0 | £0 | £0 |
| 27.1 | £161,536 | £174,472 | £161,536 |
| 27.2 | £156,073 | £488,145 | £156,073 |

**Table 8.20: Sensitivity test results - Do minimum**

| | Base case | S1: Earlier erosion date | S2: No optimism bias |
|---|---|---|---|
| Policy Unit | Do minimum | Do minimum | Do minimum |
| | *Net Present Value (NPV)* | *Net Present Value (NPV)* | *Net Present Value (NPV)* |
| 24.2 | -£376,759 | -£376,759 | -£235,474 |
| 25.1 | -£803,934 | -£798,736 | -£498,036 |
| 25.3 | £4,371,329 | £6,503,114 | £7,107,527 |
| 25.4 | -£253,824 | -£229,889 | -£152,125 |
| 26.2 | -£1,527,937 | -£1,470,391 | -£941,344 |
| 26.4 | -£667,184 | -£656,132 | -£325,433 |
| 26.5 | -£371,894 | -£371,894 | -£232,434 |
| 26.6 | -£531,015 | -£531,015 | -£331,884 |
| 26.7 | -£451,290 | -£451,290 | -£282,056 |
| 26.8 | -£509,709 | -£509,709 | -£318,568 |
| 27.1 | £62,943 | £72,378 | £87,177 |
| 27.2 | -£1,487,196 | -£1,155,124 | -£870,970 |

**Table 8.21: Sensitivity test results - Maintain**

| | Base case | S1: Earlier erosion date | S2: No optimism bias |
|---|---|---|---|
| Policy Unit | Maintain | Maintain | Maintain |
| | *Net Present Value (NPV)* | *Net Present Value (NPV)* | *Net Present Value (NPV)* |
| 25.1 | -£2,007,575 | -£2,001,255 | -£1,248,963 |
| 25.3 | £1,728,551 | £4,832,955 | £7,061,127 |
| 25.4 | -£495,988 | -£451,728 | -£303,477 |
| 26.2 | -£2,879,388 | -£2,821,842 | -£1,786,001 |
| | -£1,631,974 | -£1,620,922 | -£910,952 |
| | -£1,593,616 | -£1,582,563 | -£886,978 |
| 26.4 | -£1,636,356 | -£1,625,303 | -£913,691 |
| 26.6 | -£1,126,127 | -£1,126,127 | -£703,829 |

| | Base case | S1: Earlier erosion date | S2: No optimism bias |
|---|---|---|---|
| Policy Unit | Maintain<br>*Net Present Value (NPV)* | Maintain<br>*Net Present Value (NPV)* | Maintain<br>*Net Present Value (NPV)* |
| 27.2 | -£2,687,449 | -£2,355,378 | -£1,621,128 |

**Table 8.22: Sensitivity test results - Managed Realignment / Sustain / Improve**

| | Base case | S1: Earlier erosion date | S2: No optimism bias |
|---|---|---|---|
| Policy Unit | Managed Realignment / Sustain / Improve<br>*Net Present Value (NPV)* | Managed Realignment / Sustain / Improve<br>*Net Present Value (NPV)* | Managed Realignment / Sustain / Improve<br>*Net Present Value (NPV)* |
| 25.2 (***Managed Realignment)*** | -£3,920,096 | -£3,907,009 | -£2,440,296 |
| 26.2 (***Improve)*** | -£4,732,573 | -£4,675,027 | -£2,944,241 |
| 26.4 (***Managed Realignment)*** | -£1,580,186 | -£1,569,134 | -£878,585 |
| 27.2 (***Sustain)*** | -£3,432,803 | -£3,100,732 | -£2,086,975 |
| 27.2 (***Improve)*** | -£3,432,803 | -£3,100,732 | -£2,086,975 |

8.7.7 The sensitivity tests show that bringing erosion forward or reducing the PV costs by 60% does not make any difference to the viability of the options. The recommendations provided in this report are not sensitive to changes in assumptions within the economic analysis.

8.7.8 The following table summarises the conclusions from the sensitivity testing.

**Table 8.23: Sensitivity test conclusions**

| Input | Uncertainty | Likelihood |
|---|---|---|
| Costs | Estimated using standardised unit costs, rather than supplier quotation | Costs need to reduce by over 80% in most cases for the unviable options to become viable. This reduction in costs compared to standard unit costs is unlikely. For PU25.3 a change of 29% in costs would make the Maintain option unviable. This would need to be investigated in more detail at the Project Appraisal stage for any proposed scheme. |
| Benefits | Benefits do not include environmental, recreation and health and safety (risk to life) benefits from the options over do nothing | Benefits will need to greater than double in all cases for the preferred option to change, except for PU 25.3 where a change of 22% would make the Maintain option unviable. The decision maker should assess the likelihood of this when making the final recommendation on investment. |
| Erosion write off dates | Erosion write off dates were taken as the midpoint of a range. | Taking the first year of the range does not change the recommendation presented for the base case. |

## 8.8 Outcome Measures and Funding Calculators

8.8.1 Outcome Measures are a series of criteria that are used by EA and the Department for Food and Rural Affairs (Defra) to compare schemes when they are put forward for funding applications for grant in aid money. To aid in submitting applications for funding EA has produced a spreadsheet termed the Partnership Funding Calculator. This summarises the Outcome Measures and economics of the proposed scheme and allows for sources of Partnership Funding to be identified.

8.8.2 Where the preferred option is NAI (Do Nothing) or maintenance only, no outcome measure assessment or Funding Calculator calculation is required. As benefit does not exceed cost for any of the Do Something options, no funding applications for capital schemes will be put forward.

## 8.9 Conclusions

8.9.1 A full economic assessment has been undertaken in accord with the FCERM-AG guidance for each of the benefit areas and shortlisted options identified for the strategy. Table 8.24 summarises the preferred economic option for each benefit area.

**Table 8.24 Summary of preferred economic options for each benefit area**

| Policy Unit | Preferred Economic Option | Benefit Cost Ratio (BCR) |
|---|---|---|
| 24.2 1 | Do Nothing | N/A |
| 25.1 | Do Nothing | N/A |
| 25.2 | Managed Realignment (already completed) | 0 |
| 25.3 | Do Minimum | 3.7 |
| 25.4 | Do Nothing | N/A |
| 26.1 | Do Nothing | N/A |
| 26.2 | Do Nothing | N/A |
| 26.3 | Do Nothing | N/A |
| 26.4 | Do Nothing | N/A |
| 26.5 | Do Nothing | N/A |
| 26.6 | Do Nothing | N/A |
| 26.7 | Do Nothing | N/A |
| 26.8 | Do Nothing | N/A |
| 27.1 | Do Minimum | 2.0 |
| 27.2 | Do Nothing | N/A |

8.9.2 In conclusion it needs to be recognised that there are high costs associated with the Do Something options therefore the economic analysis does not show benefits exceeding costs. For the majority of the policy unit areas, Do Nothing is the economically preferred option. However, the final preferred option may be different from that identified during the economic analysis as there may be overriding reasons to select an alternative, such as environmental or social aspects.

8.9.3 A memorandum about the FDGiA grant[12] details:

8.9.4 “Under section 19 of the Coast Protection Act, you may have to pay compensation if the value of the land reduces or you disturb a person’s enjoyment of the land. These payments are eligible for a grant.” (page 6).

[12] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290027/LIT_7080_84163c.pdf

8.9.5 If it is decided to Do Nothing in some areas and this is the only way forward, the Council may need to compensate affected landowners (and potentially visitors). This compensation could be reclaimed through FDGiA.

# 9. Appraisal Summary Tables

## 9.1 Introduction

9.1.1 Appraisal Summary Tables (ASTs) summarise the options appraisal results for each policy unit and for each policy option for that unit. They provide:

- A brief description of the policy unit,
- A description of the policy option,
- Results from the economic appraisal, including economic impacts, present value costs and benefits and the benefit cost ratio,
- Environmental impacts including: flora and fauna; water; geology and coastal processes; historic environment; and landscape,
- Social impacts including: way of life; community; health and wellbeing; fears and aspirations

## 9.2 Appraisal Summary Tables

9.2.1 The Appraisal Summary Tables (AST) below show a summary of the results of the appraisal process. The preferred option for each policy unit is shown shaded in each table. Where the preferred option differs from the option identified by the economic analysis the reasons for this are detailed in the comments section of each AST.

| **Appraisal Summary Table: Policy Unit 24.2 Crag Point to Curry's Point** | | |
|---|---|---|
| PU description | Location: This PU runs from the study area's northern boundary at Crag Point to Curry's Point. The coastline consists of undefended cliffs. The only structure in this PU is steps to the foreshore at Hartley Cove.<br><br>Designations: Northumbria Coast SPA, Northumbria Coast Ramsar, Tynemouth to Seaton Sluice SSSI, Northumberland Shore SSSI, Curry's Point and Wetlands LWS<br><br>Issues: There are no defences in this PU. Eventually the cliffs will erode to the extent that the steps will need to be reconstructed further inland if access to the foreshore is to be maintained. The access steps also provide safe egress from the foreshore, which would not be the case if they were removed or allowed to collapse. | |
| SMP2 Policy | No Active Intervention (NAI) | |
| Option | Do Nothing baseline | Option 1 – Do Minimum |
| Description | No new defences would be constructed and the cliffs would erode | The access steps would be maintained until the cliffs have eroded |

| | | |
|---|---|---|
| | naturally. The access steps could be maintained by North Tyneside Council to retain their use as emergency access to the foreshore. | to an extent where they are no longer viable. At that time they would be reconstructed at a new position |
| Technical issues | None. | A different location may be more suitable when reconstructing the steps depending on how the cliffs erode. |
| Assumptions and uncertainties | Timing of the loss of the steps depends on future erosion rates continuing the historic trend | Timing of the reconstruction of the steps depends on future erosion rates continuing the historic trend |
| Present value costs (£k) | Nil | 377 |
| Present value benefits (£k) | Nil | Nil |
| Benefit Cost ratio | N/A | N/A |
| **Economic Impacts** | | |
| Properties | None affected | None affected |
| Infrastructure and Transport | None affected | None affected |
| Development/Tourism | The steps could be maintained as emergency access and used to access the foreshore and coal measures | Maintains access to foreshore and coal measures |
| **Environmental Impacts** | | |
| Flora and Fauna | Allows natural retreat of the coastline and does not adversely affect flora or fauna. | Allows natural retreat of the coastline and does not interfere with natural processes |
| Water | No positive or negative impacts | No positive or negative impacts |
| Geology and coastal processes | Allows natural processes to continue. Gradual loss of some geological features in the cliffs, however buried geology will be exposed. | Allows natural processes to continue. Gradual loss of some geological features in the cliffs, however buried geology will be exposed. |
| Historic | Loss of minor archaeological sites as | Loss of minor archaeological sites as |

| | | |
|---|---|---|
| environment | the cliffs erode | the cliffs erode |
| Landscape | Temporary negative impacts on visual amenity as the steps deteriorate. | No positive or negative impacts |
| **Social Impacts** | | |
| Way of Life | The steps could be maintained as emergency access. | Maintains access to the foreshore |
| Community | The steps could be maintained as emergency access. | Maintains access to the foreshore |
| Health and wellbeing | The steps could be maintained as emergency access. Possible future loss of part of the public right of way and national cycle route. Health and safety implications for emergency access and egress. | Maintains access to the foreshore. Cliffs would still be allowed to erode so future possible loss of part of the public right of way and national cycle route. |
| Fears and aspirations | The steps could be maintained as emergency access | Maintains access to the foreshore |
| **Comments** | Due to their possible use as emergency access and the archaeological interest in the exposed coal measures on the foreshore, it is likely that North Tyneside Council will continue to maintain the steps from their own budgets. | |

| **Appraisal Summary Table: Policy Unit 25.1 Curry's Point to Trinity Road Car Park** | | | |
|---|---|---|---|
| PU description | Location: This PU runs from Curry's Point to the southern end of Trinity Road Car Park and includes St. Mary's Island. Defences are present at the landward end of the causeway to the island and around the island itself as well as along the frontage of the car park.<br><br>Designation: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ, St. Mary's Island LNR, Curry's Point and Wetlands LWS<br><br>Issues: The causeway may be at risk from sea level rise. New defences have been constructed at the southern end of the car park where the existing defences were being outflanked by erosion of the clay cliffs. There are plans to construct a visitors' centre on the mainland near the end of the causeway. | | |
| SMP2 policy | Hold The Line (HTL) | | |
| Option | Do Nothing baseline | Option 1 – Do Minimum | Option 2 – Maintain |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. | Existing defences would be maintained until the end of their serviceable life. No new defences would be constructed. | Existing defences would be maintained and then replaced once they reached the end of their serviceable life. |
| Technical issues | No issues | No issues maintaining existing defences. While the causeway is not a defence itself it would need to be maintained to keep access to St. Mary's Island | No issues maintaining existing defences. While the causeway is not a defence itself it would need to be maintained to keep access to St. Mary's Island. New defences would need to be designed to take account of any changes in exposure conditions that may arise due to sea level rise. |
| Assumptions and uncertainties | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue |
| Present value cost (£k) | Nil | 816 | 2,022 |
| Present value benefits (£k) | Nil | 12 | 15 |

| | | | |
|---|---|---|---|
| Benefit cost ratio | N/A | N/A | N/A |
| **Economic Impacts** | | | |
| Properties | St. Mary's Lighthouse would eventually be at risk from erosion. Loss of Curry's Point could put increased pressure on defences further south and this increase future risks to properties behind those defences. | St. Mary's Lighthouse would eventually be at risk from erosion, though at a later date than for the Do Nothing baseline. Loss of Curry's Point could put increased pressure on defences further south and thus increase future risks to properties behind those defences. The visitors' centre would eventually be at risk. | St. Mary's Lighthouse and the other properties on the Island would be protected |
| Infrastructure and transport | The causeway to St. Mary's Island would be lost. Eventual erosion of sections of the Trinity Road car park and The Links road. | The causeway to St. Mary's Island would be lost once defences eventually failed. Eventual erosion of sections of the Trinity Road car park and The Links road. | The causeway, car park and road would be protected |
| Development and tourism | Access to St. Mary's Island via the causeway would be lost and St. Mary's Lighthouse would be lost. Erosion of the car park. | Access to St. Mary's Island via the causeway would be lost and St. Mary's Lighthouse would be lost, though at a later date than in the Do Nothing baseline case. Eventual erosion of sections of the car park. The visitors' centre would eventually be at risk. | Access to the Island would be maintained. The car park would be protected for use by visitors to the Island and surrounding area. |
| **Environmental Impacts** | | | |
| Flora and fauna | Potential for creation of further rocky shore habitat as defences are eroded. Negative impacts as an area of the Curry's Point and Wetlands LWS would be eroded. | Potential for creation of further rocky shore habitat as defences are eroded. Negative impacts as an area of the Curry's Point and Wetlands LWS would be eroded. | Negative impacts from coastal squeeze as the defences are maintained and sea levels rise. This will have a negative effect on the designated sites on the foreshore, though it will protect the Curry's Point and Wetlands LWS |

| | | | |
|---|---|---|---|
| Water | No positive or negative impacts | No positive or negative impacts | No positive or negative impacts |
| Geology and coastal processes | Once defences had eroded coastal processes would continue naturally. Potential for losses of geological interest as erosion occurs, though some buried geology will be exposed. | Once defences had eroded coastal processes would continue naturally. Potential for losses of geological interest as erosion occurs, though some buried geology will be exposed. | Negative impacts from coastal squeeze as the defences are maintained and sea levels rise. This will have a negative effect on the designated sites on the foreshore, though it will protect the Curry's Point and Wetlands LWS |
| Historic environment | Risks to St. Mary's Lighthouse from erosion | Risk to St. Mary's Lighthouse when the defences eventually fail | This option will protect St. Mary's Lighthouse |
| Landscape | Temporary negative visual impacts as structures fail and are eroded. | Temporary negative visual impacts as structures fail and are eroded. | No negative or positive impacts |
| **Social Impacts** | | | |
| Way of Life | A PROW and cycleway would be at risk of erosion (within 50-100 years). | The PROW and cycleway would be at risk once defences fail, though at a later date than in the Do Nothing case | Maintains St. Mary's Island |
| Community | Loss of access to St. Mary's Island and the properties on the Island including the lighthouse | Eventual loss of access to St. Mary's Island, including the lighthouse, though at a later date than in the Do Nothing case. | Maintains St. Mary's Island |
| Health and Wellbeing | Loss of the PROW and cycleway | Eventual loss of the PROW and cycleway | Protects the PROW and cycleway |
| Fears and aspirations | Increased risks to the properties on St. Mary's Island and eventual increases in risks to areas further south after the loss of Curry's Point | Increased risks to the properties on St. Mary's Island and eventual increases in risks to areas further south after the loss of Curry's Point | Provides protection to the Island and maintains Curry's Point as a protection to the coastline to the south |
| **Comments** | The Do Minimum option has been selected as the preferred option as it provides protection to the headland and thus maintains beneficial sheltering effects that it provides to the coastline to the south. This cannot be quantified at this stage, but it is considered that if the headland were to be eroded the costs of maintaining defences to the south would be significantly increased in the long term. | | |

| | |
|---|---|
| | While it does not act as a defence structure in itself it is likely that the causeway to St. Mary's Island will be maintained and improved as necessary to ensure access to the island for tourism. |

| **Appraisal Summary Table: Policy Unit 25.2 Trinity Road Car Park to Briardene Burn** | | |
|---|---|---|
| PU description | Location: This PU mainly consists of undefended clay cliffs. There is one section that is defended at the mouth of Briardene Burn by a rock armour revetment.<br><br>Designations: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ, Briardene LWS<br><br>Issues: Erosion of the clay cliffs adjacent to the Trinity Road Car Park defences could lead to further outflanking in future. | |
| SMP2 Policy | Managed Realignment (MR) | |
| Option | Do Nothing baseline | Option 1 – Managed Realignment |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. | The clay cliffs would be allowed to erode naturally. The interface between the cliffs and the defences at the northern and southern ends of the PU would be managed to avoid outflanking of those defences. |
| Technical Issues | None | The existing defences may need to be partially reconstructed, or new terminal defences may need to be constructed, to avoid outflanking |
| Assumptions and uncertainties | Timing of any future works assumes that historic erosion trends will continue | Timing of any future works assumes that historic erosion trends will continue |
| Present Value Costs (£k) | Nil | 31.6 |
| Present Value Benefits (£k) | Nil | 26 |
| Benefit Cost Ratio | N/A | 0.8 |
| **Economic Impacts** | | |
| Properties | The only property at risk in this unit is the boathouse. | The only property at risk in this unit is the boathouse. |
| Infrastructure and transport | A section of the PRoW and Briardene Car Park would be lost | A section of the PRoW and Briardene Car Park would be lost |
| Development and | An area of the miniature golf course | An area of the miniature golf course |

| | | |
|---|---|---|
| tourism | would be lost | would be lost |
| **Environmental Issues** | | |
| Flora and fauna | Natural processes would be allowed to continue with creation of boulder and cobble beaches which would benefit flora and fauna | Natural processes would be allowed to continue with creation of boulder and cobble beaches which would benefit flora and fauna |
| Water | Flows in Brairdene Burn will not be affected | Briardene Burn will be allowed to flow naturally and the defences on the mouth of the Burn will be adjusted as necessary as the adjacent cliffs erode. |
| Geology and coastal processes | Coastal processes will be allowed to occur naturally. Some geological features may be lost to erosion but buried features may be exposed | Coastal processes will be allowed to occur naturally. Some geological features may be lost to erosion but buried features may be exposed |
| Historic environment | None affected | None affected |
| Landscape | Natural processes will be allowed to continue and the landscape will evolve naturally | Natural processes will be allowed to continue and the landscape will evolve naturally |
| **Social Impacts** | | |
| Way of Life | A large area of the miniature golf course will eventually be lost which may make it unviable. Loss of the boathouse | A large area of the miniature golf course will eventually be lost which may make it unviable. Loss of the boathouse |
| Community | Loss of use of the golf course | Loss of use of the golf course |
| Health and wellbeing | Loss of a section of the PRoW | Loss of a section of the PRoW |
| Fears and aspirations | Loss of the boathouse | Loss of the boathouse |
| **Comments** | Managed Realignment is selected as the preferred option rather than Do Nothing as if erosion is allowed to continue without any management then the defences at the northern end of the unit (Trinity Road) and southern end of the unit (Briardene Burn) would eventually be outflanked. Therefore, although there are no proposals for defences within this PU there will be a requirement for some works within the PU. | |

| **Appraisal Summary Table: Policy Unit 25.3 Briardene Burn to Table Rocks** | | | |
|---|---|---|---|
| PU description | Location: This PU is mostly defended, except for a short length adjacent to Briardene Burn at the northern end of the PU.<br><br>Designation: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ, Briardene LWS<br><br>Issues: At the time of writing the Central Promenade defences are in the process of being replaced. | | |
| SMP2 policy | Hold The Line (HTL) | | |
| Option | Do Nothing baseline | Option 1 – Do Minimum | Option 2 – Maintain |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. | Existing defences would be maintained until the end of their serviceable life. No new defences would be constructed. | Existing defences would be maintained and then replaced once they reached the end of their serviceable life. |
| Technical issues | No issues | No issues maintaining existing defences. | No issues maintaining existing defences. |
| Assumptions and uncertainties | Timing of defence failure assumes that historic erosion trends will continue and does not take account of the new defences being planned for Central Promenade | Timing of defence failure assumes that historic erosion trends will continue and does not take account of the new defences being planned for Central Promenade | Timing of defence failure assumes that historic erosion trends will continue and does not take account of the new defences being planned for Central Promenade |
| Present value cost (£k) | Nil | 1,612 | 5,941 |
| Present value benefits (£k) | Nil | 5,983 | 7,670 |
| Benefit cost ratio | N/A | 3.7 | 1.3 |
| **Economic Impacts** | | | |
| Properties | A number of residential and commercial properties are at risk once the defences fail including a hotel and a | A number of residential and commercial properties would be at risk once the defences failed including a | None at risk |

| | | | |
|---|---|---|---|
| | care home | hotel and a care home | |
| Infrastructure and transport | The main coastal route along the Promenade and Rockliffe Gardens would be lost | The main coastal route along the Promenade and Rockliffe Gardens would be lost | None at risk |
| Development and tourism | Shops, a hotel guest houses, a cafe and bars will be lost as well as the main coastal road and the Promenade which is well used by pedestrians including tourists | Shops, a hotel guest houses, a cafe and bars will be lost as well as the main coastal road and the Promenade which is well used by pedestrians including tourists | None at risk |
| **Environmental Impacts** | | | |
| Flora and fauna | Eventual failure of the defences would allow erosion of the cliffs and creation of rocky shore habitat which would benefit flora and fauna | Eventual failure of the defences would allow erosion of the cliffs and creation of rocky shore habitat which would benefit flora and fauna | Maintaining current defences would eventually lead to coastal squeeze as sea levels rise and the loss of rocky shore habitats |
| Water | The main sewer which runs along the Promenade would be at risk | The main sewer which runs along the Promenade would be at risk | The sewer would remain protected |
| Geology and coastal processes | After failure of the defences natural coastal processes would be allowed to continue and rocky shore would be created. Some geological features may be lost to erosion but buried features may be exposed | After failure of the defences natural coastal processes would be allowed to continue and rocky shore would be created. Some geological features may be lost to erosion but buried features may be exposed | The coastline would be held in its current position and no erosion would occur. Loss of rocky shore would happen as sea levels rise |
| Historic environment | Several nationally important buildings/structures would be at risk | Several nationally important buildings/structures would be at risk | None at risk |
| Landscape | Adverse impacts from the deterioration and failure of the defences and eventual destruction of properties | Adverse impacts from the deterioration and failure of the defences and eventual destruction of properties | The existing landscape would be maintained |
| **Social Impacts** | | | |
| Way of Life | Adverse impacts from the loss of residential and commercial properties and | Adverse impacts from the loss of residential and commercial properties and | Maintains the current way of life by protecting properties and |

| | | | |
|---|---|---|---|
| | use of the Promenade | use of the Promenade | infrastructure |
| Community | Adverse impacts form the loss of properties including a care home | Adverse impacts form the loss of properties including a care home | Protects properties and infrastructure |
| Health and Wellbeing | Loss of the Promenade for leisure activities, stress due to concerns over loss of properties | Loss of the Promenade for leisure activities, stress due to concerns over loss of properties | Protects the current usage of the unit for leisure activities |
| Fears and aspirations | Fears over the loss of properties | Fears over the loss of properties | Protects properties and infrastructure |
| **Comments** | Maintain is selected as the preferred option due to the presence of major sewerage infrastructure that serves not only Whitley Bay but also towns to the north, behind the defences at Central and Southern Promenade. At the time of writing this report North Tyneside Council is proceeding with a scheme to replace Central Promenade that is being partly funded by the Council and Northumbrian Water Ltd, the owners of the sewerage infrastructure. | | |

| **Appraisal Summary Table: Policy Unit 25.4 Table Rocks to Brown's Point** | | | |
|---|---|---|---|
| PU description | Location: This PU is fully defended, apart from a short length of rock cliff at the northern end.<br><br>Designation: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ, Brown's Point Clifftop Grassland SLCI<br><br>Issues: None | | |
| SMP2 policy | Hold The Line (HTL) | | |
| Option | Do Nothing baseline | Option 1 – Do Minimum | Option 2 – Maintain |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. | Existing defences would be maintained until the end of their serviceable life. No new defences would be constructed. | Existing defences would be maintained and then replaced once they reached the end of their serviceable life. |
| Technical issues | No issues | No issues maintaining existing defences. | No issues maintaining existing defences. |
| Assumptions and uncertainties | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue |
| Present value cost (£k) | Nil | 271 | 513 |
| Present value benefits (£k) | Nil | 17 | 17 |
| Benefit cost ratio | N/A | 0.1 | N/A |
| **Economic Impacts** | | | |
| Properties | A number of properties on Windsor Crescent would be at risk of erosion | A number of properties on Windsor Crescent would be at risk of erosion once the defences failed | None at risk |
| Infrastructure and transport | Windsor Crescent would be at risk of erosion | Windsor Crescent would be at risk of erosion once the defences failed | None at risk |

| | | | |
|---|---|---|---|
| Development and tourism | None affected | None affected | None affected |
| **Environmental Impacts** | | | |
| Flora and fauna | Once defences fail and erosion occurs rocky shore habitat may be created | Once defences fail and erosion occurs rocky shore habitat may be created | Coastal squeeze due to sea level rise may result in the loss of rocky shore habitat |
| Water | Localised sewage systems may be damaged by erosion | Localised sewage systems may be damaged by erosion | None affected |
| Geology and coastal processes | Once defences fail natural processes will be reinstated and rocky shore may be created as the coastline erodes. Some geological features may be lost to erosion but buried features may be exposed | Once defences fail natural processes will be reinstated and rocky shore may be created as the coastline erodes. Some geological features may be lost to erosion but buried features may be exposed | Coastal squeeze due to sea level rise may result in the loss of rocky shore habitat |
| Historic environment | None affected | None affected | None affected |
| Landscape | Eroding defences may have a temporary adverse effect on the landscape | Eroding defences may have a temporary adverse effect on the landscape | No effects |
| **Social Impacts** | | | |
| Way of Life | Increased risks from erosion to properties on Windsor Crescent | Increased risks from erosion to properties on Windsor Crescent once defences fail | Defences will be maintained to protect properties |
| Community | Increased risks from erosion to properties on Windsor Crescent | Increased risks from erosion to properties on Windsor Crescent once defences fail | Defences will be maintained to protect properties |
| Health and Wellbeing | Increased risks from erosion to properties on Windsor Crescent | Increased risks from erosion to properties on Windsor Crescent once defences fail | Defences will be maintained to protect properties |
| Fears and aspirations | Increased risks from erosion to properties on Windsor Crescent | Increased risks from erosion to properties on Windsor Crescent once defences fail | Defences will be maintained to protect properties |

| | |
|---|---|
| **Comments** | Do Minimum allows for the existing defences to be maintained. As the defences reach the end of their effective lifespan the viability of the Maintain option should be reconsidered. |

| **Appraisal Summary Table: Policy Unit 26.1 Brown's Point** | |
|---|---|
| PU description | Location: This PU covers the rock cliffs of Brown's Point, which are undefended.<br><br>Designation: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ, Brown's Point Clifftop Grassland SLCI<br><br>Issues: None |
| SMP2 Policy | No Active Intervention (NAI) |
| Option | Do Nothing baseline |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. |
| Technical Issues | None |
| Assumptions and uncertainties | Erosion rates for the cliffs assume that historic erosion trends will continue |
| Present Value Costs (£k) | Nil |
| Present Value Benefits (£k) | Nil |
| Benefit Cost Ratio | N/A |
| **Economic Impacts** | |
| Properties | None affected |
| Infrastructure and transport | None affected |
| Development and tourism | None affected |
| **Environmental Impacts** | |
| Flora and | Natural processes would be allowed to continue with no impacts on flora or fauna |

| | |
|---|---|
| fauna | |
| Water | Not affected |
| Geology and coastal processes | Natural processes would be allowed to continue. Some geological features may be lost to erosion but buried features may be exposed |
| Historic environment | Not affected |
| Landscape | Not affected |
| **Social Impacts** | |
| Way of life | Not affected |
| Community | Not affected |
| Health and wellbeing | Not affected |
| Fears and aspirations | Not affected |
| **Comments** | None |

| **Appraisal Summary Table: Policy Unit 26.2 Cullercoats Bay** | | | | |
|---|---|---|---|---|
| PU description | Location: This PU includes the two piers within Cullercoats Bay and the defences around the RNLI station and Dove Marine Laboratory, as well as the area known as the Brae. It also includes rock cliffs between the laboratory and the north pier.<br><br>Designation: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ<br><br>Issues: Overtopping of the north pier and flooding of the RNLI station and The Brae, with risk of damage to fishermen's boats. | | | |
| SMP2 Policy | Hold The Line (HTL) | | | |
| Option | Do Nothing baseline | Option 1 – Do Minimum | Option 2 – Maintain | Option 3 – Improve |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. | Existing defences would be maintained until the end of their serviceable life. No new defences would be constructed. | Existing defences would be maintained and then replaced once they reached the end of their serviceable life. | Existing defences would be maintained and where necessary defences would be replaced to improve the level of flood protection early in the appraisal period |
| Technical issues | None | None | The North Pier would need to be substantially larger to cope with the expected affects of sea level rise | The North Pier would need to be substantially larger to cope with the expected affects of sea level rise |
| Assumptions and uncertainties | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue |
| Present Value Costs (£k) | Nil | 1,564 | 2,916 | 4,769 |
| Present Value Benefits (£k) | Nil | 36 | 36 | 36 |
| Benefit Cost Ratio | N/A | N/A | N/A | N/A |

| | | | | |
|---|---|---|---|---|
| **Economic Impacts** | | | | |
| Properties | A number of residential and commercial properties would be at risk including the Dove Marine Laboratory and the RNLI station | Once the defences fail a number of residential and commercial properties would be at risk including the Dove Marine Laboratory and the RNLI station | Properties will be protected by maintaining and replacing defences as needed | Properties will be protected by replacing defences with upgraded structures to take account of future estimates of sea level rise and maintaining defences into the future |
| Infrastructure and transport | Part of a PRoW and National Cycle Route would be at risk and the access to the beach would be lost. Use of The Brae by fishermen to store boats would be lost. | Once the defences failed part of a PRoW and National Cycle Route would be at risk and the access to the beach would be lost. Use of The Brae by fishermen to store boats would be lost. | The PRoW and Cycle Route will be protected. The Brae would be maintained | The PRoW and Cycle Route will be protected. The Brae would be maintained |
| Development and tourism | The beach is a Blue Flag Beach and is well used by Jet Skiers and Kayakers as well as in general by the local public and tourists. Under this option access would be lost/reduced. | The beach is a Blue Flag Beach and is well used by Jet Skiers and Kayakers as well as in general by the local public and tourists. Under this option access would be lost/reduced, once the defences failed and the ramp was lost. | Access and use of the beach will be maintained | Access and use of the beach will be maintained |
| **Environmental Impacts** | | | | |
| Flora and fauna | Failure of defences and subsequent erosion of the cliffs would lead to creation of rocky | Once the defences failed subsequent erosion of the cliffs would lead to creation of rocky shore habitat | Natural coastal erosion is prevented by the defences and coastal squeeze | Natural coastal erosion is prevented by the defences and coastal squeeze |

| | | | | |
|---|---|---|---|---|
| | shore habitat | | may result in the loss of rocky shore habitat | may result in the loss of rocky shore habitat |
| Water | Increased risk to localised sewage infrastructure | Increased risk to localised sewage infrastructure once defences eventually fail | Not affected | Not affected |
| Geology and coastal processes | Some geological features may be lost to erosion but buried features may be exposed | Some geological features may be lost to erosion but buried features may be exposed | Some geological features may be lost to erosion but buried features may be exposed | Some geological features may be lost to erosion but buried features may be exposed |
| Historic environment | The Dove Marine Laboratory, Lifeboat Station and Cliffe House and Cullercoats Watch Club would be at risk from erosion | Once the defences failed the Dove Marine Laboratory, Lifeboat Station and Cliffe House and Cullercoats Watch Club would be at risk from erosion | Historic properties will be protected though risk may increase in future as sea levels rise | Historic properties will be protected |
| Landscape | There would be negative impacts on landscape as the defences and eventually properties were eroded and collapse | There would be negative impacts on landscape as the defences and eventually properties were eroded and collapse | The current landscape will be maintained | The current landscape will be maintained |
| | | | | **Social Impacts** |
| Way of life | Loss of access to the beach which is well-used and popular with local residents. Use of The Brae by fishermen to store boats would be lost | Loss of access to the beach which is well-used and popular with local residents. Use of The Brae by fishermen to store boats would be lost | Properties and use of the beach will be maintained. Use of The Brae would be maintained | Properties and use of the beach will be maintained. Use of The Brae would be maintained |

| | | | | |
|---|---|---|---|---|
| Community | Loss of access to the beach which is well-used and popular with local residents | Loss of access to the beach which is well-used and popular with local residents | Properties and use of the beach will be maintained | Properties and use of the beach will be maintained |
| Health and wellbeing | Loss of recreational use of the beach and a section of PRoW | Loss of recreational use of the beach and a section of PRoW | Properties and use of the beach will be maintained | Properties and use of the beach will be maintained |
| Fears and aspirations | The risk of loss of properties will increase anxiety of residents | The risk of loss of properties will increase anxiety of residents | Properties and use of the beach will be maintained | Properties and use of the beach will be maintained |
| **Comments** | Maintain is selected as the preferred option as this continues to provide protection to the properties within the Bay, especially the lifeboat station. If beach levels drop there may be a need to extend the access ramp. The Brae will be maintained, but not improved as although it is currently used for storing boats, this is not its intended function and the official boat storage yard is adjacent to the road above the Bay. During consultation it was noted that it is difficult for trailers to be towed from the access ramp onto the highway. This issue could be considered by the Highway Authority to investigate if any improvements could be made. | | | |

| **Appraisal Summary Table: Policy Unit 26.3 Tynemouth North Point** | |
|---|---|
| PU description | Location: This PU covers the rock cliffs of Tynemouth North Point, which are undefended.<br><br>Designation: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ<br><br>Issues: None |
| SMP2 Policy | No Active Intervention (NAI) |
| Option | Do Nothing baseline |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. |
| Technical Issues | None |
| Assumptions and uncertainties | Erosion rates for the cliffs assume that historic erosion trends will continue |
| Present Value Costs (£k) | Nil |
| Present Value Benefits (£k) | Nil |
| Benefit Cost Ratio | N/A |
| **Economic Impacts** | |
| Properties | No properties at risk |
| Infrastructure and transport | None at risk |
| Development and tourism | Not at risk |
| **Environmental Impacts** | |
| Flora and | No change from the present |

| | |
|---|---|
| fauna | |
| Water | Not affected |
| Geology and coastal processes | As erosion continues there may be some loss of rocky shore due to erosion and sea level rise. However, some buried geological features may be exposed. |
| Historic environment | No change from the present |
| Landscape | No change from the present |
| **Social Impacts** | |
| Way of life | No change from the present |
| Community | No change from the present |
| Health and wellbeing | No change from the present |
| Fears and aspirations | No change from the present |
| **Comments** | None |

| **Appraisal Summary Table: PU26.4 Tynemouth Longsands** | | | | | | |
|---|---|---|---|---|---|---|
| PU Description | Location: This PU has defences at the northern and southern ends, with the centre consisting of a dune system. At the southern end the defences bound the Tynemouth Outdoor Pool.<br><br>Designation: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ, Tynemouth Longsands SLCI, Tynemouth Boating Lake SLCI<br><br>Issues: Coastal squeeze of the dunes. Flood risk to the cafe at the southern end of the PU. There are plans to refurbish and reopen the Outdoor Pool | | | | | |
| SMP2 Policy | Hold The Line (HTL) and Managed Realignment (MR) | | | | | |
| Option | Do Nothing baseline | Option 1 – Do Minimum | Option 2 – Maintain | Option 3 – Maintain | Option 4 – Maintain | Option 5 – Managed Realignment |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. | Existing defences would be maintained until the end of their serviceable life. No new defences would be constructed. The dune system would also be managed to protect them from erosion. | Defences would be maintained and replaced at the end of their serviceable life. Dunes would be managed to protect them from erosion. | This option includes maintenance the same as Option 2, but includes consideration of construction of rock groynes on the foreshore to retain sediment and stabilise beach levels to provide protection to the dunes and hinterland. | This option includes maintenance the same as Options 2 and 3, but includes consideration of the construction of an offshore reef to reduce exposure and stabilise beach levels to provide protection to the dunes and the hinterland | This option includes maintenance of the existing defences the same as options 2, 3 and 4 for the first two SMP2 epochs (i.e. to year 50), but from year 50 onward the dunes would be managed to bring forward the coastline and avoid the need for further linear defences |
| Technical Issues | None | None | None | A groyne field would create barriers across the beach which may be visually intrusive and reduce use of the beach | An offshore reef may help to stabilise the beach but may affect watercraft using the area and be visually intrusive at low tide | Dune management would need to be carefully managed and may require construction of structures to pull the beach forward to maintain beach levels and combat coastal squeeze. |
| Assumptions and uncertainties | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue. It is assumed that the groyne field would be along the beach in front of the dunes | Timing of defence failure assumes that historic erosion trends will continue. It is assumed that the offshore reef would be constructed opposite the dunes | Timing of defence failure assumes that historic erosion trends will continue. No costs have been included for whatever structures may be required in epoch 3 for managed realignment |
| Present Value Costs (£k) | Nil | 911 | 1,923 | 1,884 | 1,927 | 1,870 |
| Present Value Benefits (£k) | Nil | 244 | 291 | 291 | 291 | 291 |
| Benefit Cost Ratio | N/A | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 |
| **Economic Impacts** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Properties | A number of properties would be at risk including the lifeguard station, Tynemouth Canoe and Wave Ski Club, Crusoe's cafe and a boathouse. | Once the defences eventually fail a number of properties would be at risk including the lifeguard station, Tynemouth Canoe and Wave Ski Club, Crusoe's cafe and a boathouse. | Properties behind the defences would be protected but those on the beach, such as Crusoe's Cafe, would still be at risk | A groyne field would help to stabilise beach levels by interrupting longshore sediment transport and may provide greater protection to properties on the beach | An offshore reef is designed to stabilise the beach by reducing exposure conditions and would provide greater protection to the dunes and properties on the beach | Existing defences would be maintained and the dune system would be actively managed to stabilise the coast. However, properties on the beach would still be at risk from flooding |
| Infrastructure and transport | Short areas of promenade would be at risk once defences failed | Short areas of promenade would be at risk once defences failed | Infrastructure and transport would be protected | Infrastructure and transport would be protected | Infrastructure and transport would be protected | Infrastructure and transport would be protected |
| Development and tourism | Amenity value of the beach may be impacted as defences fail and erode. Coastal squeeze may reduce the usable area of the beach | Amenity value of the beach may be impacted as defences fail and erode. Coastal squeeze may reduce the usable area of the beach | Access to the beach would be maintained, however amenity value of the beach may be affected by coastal squeeze | Access to the beach would be maintained, however the groyne field would be perpendicular to the shoreline and would reduce ease of access along the beach | Access to the beach would be maintained and properties on the beach protected. May have an adverse impact on use of the beach for surfing | Use of the beach would be maintained, but coastal squeeze may impact use in the future. Crusoe's Cafe would be at increased risk of flooding with sea level rise |
| **Environmental Impacts** | | | | | | |
| Flora and fauna | Additional habitat may be created as the defences fail and erosion continues. However, the dunes would eventually be eroded losing that habitat. | Additional habitat may be created as the defences fail and erosion continues. However, the dunes would eventually be eroded losing that habitat. | The dune habitats would be maintained | The dune habitats would be maintained but there may be some loss of rocky shore due to coastal squeeze beyond the groyne field. | Dune habitats would be maintained. There may be some loss of habitats due to coastal squeeze, though the reef may create new habitat | Dune habitats would be maintained and may be increase with expansion of the dunes. There may be some loss of habitats due to coastal squeeze, though rocky shore may be created |
| Water | Sewers would eventually be damaged on Grand Parade. | Sewers would eventually be damaged on Grand Parade. | Not affected | Not affected | Not affected | Not affected |
| Geology and coastal processes | Natural processes would be allowed to occur and some geological features may be eroded. However, buried geology may be exposed. | Once defences failed natural processes would be allowed to occur and some geological features may be eroded. However, buried geology may be exposed. | Defences would be maintained, but coastal squeeze may lead to loss of beach area | Longshore drift of sediment would be interrupted by the groyne field and this may impact areas downdrift, such as St. Edward's Bay | There may be some coastal squeeze with sea level rise and there would be some effects on longshore sediment movement | There may be some coastal squeeze with sea level rise |
| Historic environment | No listed buildings are at risk. However, the Tynemouth Open Pool would be lost to erosion. | No listed buildings are at risk. However, the Tynemouth Open Pool would be lost to erosion once defences failed. There is a possibility that maintenance of the Pool may be funded from other sources. | Tynemouth Open Pool would be protected | Tynemouth Open Pool would be protected | Tynemouth Open Pool would be protected | Tynemouth Open Pool would be protected |
| Landscape | Long term negative effects would occur to visual amenity as defences failed and were eroded | Long term negative effects would occur to visual amenity as defences failed and were eroded | The current landscape character would remain | The groyne field would be visually intrusive on the currently open nature of the beach, though this could be minimised through careful | The reef would be a prominent feature at low water and may have an adverse visual impact | The landscape would be largely unchanged and may benefit from increased dune area |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | design | | |
| **Social Impacts** | | | | | | |
| Way of life | Use of sections of the promenade would be lost and the beach area may reduce over time. Tynemouth Open Pool would be lost | Use of sections of the promenade would be lost and the beach area may reduce over time. Tynemouth Open Pool would be lost | Use of the promenade would be maintained and Tynemouth Open Pool would be protected | Use of the promenade would be maintained. Use of the beach would change due to the existence of the groynes. Tynemouth Open Pool would be protected. | Use of the promenade and the beach would be maintained. Tynemouth Open Pool would be protected | Use of the promenade and the beach would be maintained. Tynemouth Open Pool would be protected |
| Community | Amenity value of the beach and promenades would reduce and the Tynemouth Open Pool would be lost | Amenity value of the beach and promenades would reduce and the Tynemouth Open Pool would be lost | Amenity value of the beach may reduce due to coastal squeeze | Use of the promenade and beach would be maintained and the Open Pool would be protected. | Use of the promenade and the beach would be maintained. Tynemouth Open Pool would be protected | Use of the promenade and the beach would be maintained. Tynemouth Open Pool would be protected |
| Health and wellbeing | Use of sections of the promenade would be lost and use of the beach may be affected by coastal squeeze | Use of sections of the promenade would be lost and use of the beach may be affected by coastal squeeze | Amenity value of the beach may reduce due to coastal squeeze | Use of the promenade and beach would be maintained and the Open Pool would be protected. | Use of the promenade and the beach would be maintained. Tynemouth Open Pool would be protected | Use of the promenade and the beach would be maintained. Tynemouth Open Pool would be protected |
| Fears and aspirations | Concerns over flooding to the Canoe Club and Crusoe's Cafe would increase as risks become higher with sea level rise | Concerns over flooding to the Canoe Club and Crusoe's Cafe would increase as risks become higher with sea level rise | Concerns over flooding to the Canoe Club and Crusoe's Cafe would increase as risks become higher with sea level rise | Stabilising beach levels would help to reduce flood risks to properties on the beach | Stabilising beach levels would help to reduce flood risks to properties on the beach | Concerns over flooding to the Canoe Club and Crusoe's Cafe would increase as risks become higher with sea level rise |
| **Comments** | The Do Minimum option has been selected mainly due to the high costs of undertaking more extensive works in comparison to the value of benefits. Under this option the ecologically important dune system will still be managed, but may eventually suffer from coastal squeeze. North Tyneside Council has proposals for future schemes to undertake works to maintain the sea walls and these may require funding to be secured from sources other than grant in aid for flood and coastal erosion. The SMP2 policy of managed realignment in the second epoch (years 20-50) should be reconsidered nearer that time to determine whether it may become viable. The preferred option does not preclude the removal of Tynemouth Outdoor Pool if it is not to be maintained, as this will allow the sea wall to be reconstructed in line with the existing sea walls on either side of the pool. | | | | | |

| **Appraisal Summary Table: Policy Unit 26.5 Sharpness Point** | | |
|---|---|---|
| PU description | Location: This PU mainly consists of undefended cliffs. There are steps providing access to the foreshore.<br><br>Designations: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ<br><br>Issues: Maintenance of the steps to continue providing access to the foreshore. | |
| SMP2 Policy | No Active Intervention (NAI) | |
| Option | Do Nothing baseline | Option 1 – Do Minimum |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. | The cliffs would be allowed to erode naturally. The steps would be maintained and replaced as necessary |
| Technical Issues | None – access to the foreshore would be lost once the steps failed. This may be a safety issue. | None |
| Assumptions and uncertainties | Timing of any future works assumes that historic erosion trends will continue | Timing of any future works assumes that historic erosion trends will continue |
| Present Value Costs (£k) | Nil | 372 |
| Present Value Benefits (£k) | Nil | Nil |
| Benefit Cost Ratio | N/A | N/A |
| **Economic Impacts** | | |
| Properties | No properties are at risk | No properties are at risk |
| Infrastructure and transport | Not at risk | Not at risk |
| Development and tourism | Access to the beach would be lost | Access to the beach would be maintained |
| **Environmental Issues** | | |
| Flora and fauna | Erosion of the coastline would lead to increases in rocky shore habitat | Erosion of the coastline would lead to increases in rocky shore habitat |

| | | |
|---|---|---|
| Water | The sewage pumping station may eventually be at risk | The sewage pumping station may eventually be at risk |
| Geology and coastal processes | Natural processes would be allowed to occur and rocky shore may be created by erosion | Natural processes would be allowed to occur and rocky shore may be created by erosion |
| Historic environment | Not affected | Not affected |
| Landscape | The steps are currently in poor condition and have a negative visual impact, which would continue until they failed and were eroded | The steps would be maintained and their condition improved to remove the adverse visual impacts |
| **Social Impacts** | | |
| Way of Life | Loss of access to the beach | Maintains access to the beach |
| Community | Loss of access to the beach | Maintains access to the beach |
| Health and wellbeing | Loss of access to the beach | Maintains access to the beach |
| Fears and aspirations | Loss of access to the beach | Maintains access to the beach |
| **Comments** | None | |

| **Appraisal Summary Table: Policy Unit 26.6 Tynemouth Shortsands (King Edward's Bay)** | | | |
|---|---|---|---|
| PU description | Location: This PU is fully defended.<br><br>Designation: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ<br><br>Issues: None | | |
| SMP2 policy | Hold The Line (HTL) | | |
| Option | Do Nothing baseline | Option 1 – Do Minimum | Option 2 – Maintain |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. | Existing defences would be maintained until the end of their serviceable life. No new defences would be constructed. | Existing defences would be maintained and then replaced once they reached the end of their serviceable life. |
| Technical issues | No issues | No issues maintaining existing defences. | No issues maintaining existing defences. |
| Assumptions and uncertainties | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue | Timing of defence failure assumes that historic erosion trends will continue |
| Present value cost (£k) | Nil | 531 | 1,126 |
| Present value benefits (£k) | Nil | Nil | Nil |
| Benefit cost ratio | N/A | N/A | N/A |
| **Economic Impacts** | | | |
| Properties | The only property at risk is the lifeguard hut on the beach | The lifeguard hut would remain at risk | The lifeguard hut would remain at risk |
| Infrastructure and transport | Sea Banks, the coastal road, would be at risk along with parking places on Percy Gardens | Once defences failed Sea Banks, the coastal road, would be at risk along with parking places on Percy Gardens | Sea Banks and Percy Gardens would be protected |
| Development | Not affected | Not affected | Not affected |

| | | | |
|---|---|---|---|
| and tourism | | | |
| **Environmental Impacts** | | | |
| Flora and fauna | Rocky shore habitat may be created as defences fail and are eroded | Maintenance of defences could lead to coastal squeeze and loss of habitats | Maintenance of defences could lead to coastal squeeze and loss of habitats |
| Water | Sewers in the affected roads would need to be disconnected/re-routed to avoid pollution of coastal waters | Once defences failed sewers in the affected roads would need to be disconnected/re-routed to avoid pollution of coastal waters | Sewers would be protected |
| Geology and coastal processes | Natural coastal processes would be allowed to occur and rocky shore may be created due to erosion | Once defences failed natural coastal processes would be allowed to occur and rocky shore may be created due to erosion | No change from the current situation |
| Historic environment | Percy Gardens would be at risk from erosion and at the southern end of the unit part of the Tynemouth Priory site would be at risk | Once defences failed Percy Gardens would be at risk from erosion and at the southern end of the unit part of the Tynemouth Priory site would be at risk | The highly important Tynemouth Priory site would be protected. |
| Landscape | Failure and erosion of the existing defences would have a negative visual impact | Failure and erosion of the existing defences would have a negative visual impact | No change from the current situation |
| **Social Impacts** | | | |
| Way of Life | Loss of access to the beach and erosion of roads would have a negative impact | Loss of access to the beach and erosion of roads would have a negative impact | Access to the beach would be maintained |
| Community | Loss of access to the beach and erosion of roads would have a negative impact | Loss of access to the beach and erosion of roads would have a negative impact | Access to the beach would be maintained |
| Health and Wellbeing | Loss of access to the beach would have a negative impact | Loss of access to the beach would have a negative impact | Access to the beach would be maintained |
| Fears and aspirations | There would be concern over erosion risk to the roads and Priory | There would be concern over erosion risk to the roads and Priory | Existing assets would be protected |

| | |
|---|---|
| **Comments** | Maintain is selected as the preferred option as, despite it not being the most economically preferable option, it provides protection to properties in Sea Banks and Percy Gardens and also maintains protection to the Priory. |

| **Appraisal Summary Table: Policy Unit 26.7 Tynemouth Headland** | | |
|---|---|---|
| PU description | Location: This PU mainly consists of cliffs that are actively eroding. There are no defences, but cliff stabilisation structures have been constructed to stabilise the upper cliff in some sections.<br><br>Designations: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ, Tyne Entrance LWS, River Tyne (tidal extent) North Tyneside Section LWS<br><br>Issues: Ongoing cliff stability. | |
| SMP2 Policy | Hold The Line (HTL) | |
| Option | Do Nothing baseline | Option 1 – Do Minimum |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. | The existing cliff stabilisation works would be maintained and new structures constructed as necessary |
| Technical Issues | None | None |
| Assumptions and uncertainties | Erosion rates for the cliffs assume that historic erosion trends will continue | Timing of any future works assumes that historic erosion trends will continue |
| Present Value Costs (£k) | Nil | 451 |
| Present Value Benefits (£k) | Nil | Nil |
| Benefit Cost Ratio | N/A | N/A |
| **Economic Impacts** | | |
| Properties | No properties at risk | No properties at risk |
| Infrastructure and transport | Not at risk | Not at risk |
| Development and tourism | Areas of the Tynemouth Priory site could become unsafe due to rock falls and landslips | If the cliff stabilisation structures failed areas of the Tynemouth Priory site could become unsafe due to rock falls and landslips |
| **Environmental Issues** | | |

| | | |
|---|---|---|
| Flora and fauna | As the cliffs eroded new rocky shore habitat would be created | If the cliffs were allowed to erode new rocky shore habitat would be created |
| Water | Not affected | Not affected |
| Geology and coastal processes | Coastal processes would be allowed to continue naturally | Coastal processes would be allowed to continue naturally |
| Historic environment | The potential for landslips would put the Priory and other listed buildings at risk | If the cliffs were allowed to erode the potential for landslips would put the Priory and other listed buildings at risk |
| Landscape | Not affected | Not affected |
| **Social Impacts** | | |
| Way of Life | Loss of an area of the Priory site would have a negative impact | Loss of an area of the Priory site would have a negative impact |
| Community | Loss of an area of the Priory site would have a negative impact | Loss of an area of the Priory site would have a negative impact |
| Health and wellbeing | Loss of an area of the Priory site would have a negative impact | Loss of an area of the Priory site would have a negative impact |
| Fears and aspirations | Loss of an area of the Priory site would have a negative impact | Loss of an area of the Priory site would have a negative impact |
| **Comments** | Do Nothing being the preferred option does not preclude maintenance of the cliff stabilisation works by English Heritage. | |

| **Appraisal Summary Table: Policy Unit 26.8 Tynemouth North Pier** | | |
|---|---|---|
| PU description | Location: This PU mainly consists of a short length of defences at the landward end of the Pier and the Pier itself.<br><br>Designations: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ, Tyne Entrance LWS, River Tyne (tidal extent) North Tyneside Section LWS<br><br>Issues: None | |
| SMP2 Policy | Hold The Line (HTL) | |
| Option | Do Nothing baseline | Option 1 – Do Minimum |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. | Existing defences would be maintained and replaced once they reach the end of their serviceable life. |
| Technical Issues | None | None |
| Assumptions and uncertainties | Erosion rates assume that historic erosion trends will continue | Timing of any future works assumes that historic erosion trends will continue |
| Present Value Costs (£k) | Nil | 510 |
| Present Value Benefits (£k) | Nil | Nil |
| Benefit Cost Ratio | N/A | N/A |
| **Economic Impacts** | | |
| Properties | None directly at risk but could increase risk to properties on the south of the Tyne and further inland | The Pier would be maintained and continue to provide protection to areas upstream in the Tyne |
| Infrastructure and transport | Loss of the pier may affect access to the Tyne and the port | The Pier would be maintained and continue to provide protection to areas upstream in the Tyne |
| Development and tourism | Loss of the Pier may increase risks to the Priory site and affect use of the mouth of the Tyne for water-based recreation. The Pier itself is used by sea anglers and for recreation | The Pier would be maintained and continue to provide protection to areas upstream in the Tyne |

| | | |
|---|---|---|
| **Environmental Issues** | | |
| Flora and fauna | Loss of the Pier may have impacts on the south side of the Tyne and further inland | The Pier would be maintained and continue to provide protection to areas upstream in the Tyne |
| Water | Not affected | Not affected |
| Geology and coastal processes | Coastal processes would be allowed to occur naturally | The current situation would be unchanged |
| Historic environment | Risks to the Priory site may increase if the Pier is allowed to fail along with possible increased risks to assets on the south of the Tyne | The Pier would be retained and continue to provide some protection to the Priory site |
| Landscape | Long term adverse effects on visual amenity through damage and erosion to the Pier | No change to present situation |
| **Social Impacts** | | |
| Way of Life | Loss of the Pier could have a negative impact on the Port | The Pier would be maintained and continue to provide protection to areas upstream in the Tyne |
| Community | Loss of the Pier could have a negative impact on the Port | The Pier would be maintained and continue to provide protection to areas upstream in the Tyne |
| Health and wellbeing | Not affected | Not affected |
| Fears and aspirations | Fears and concern over the loss of the Pier and possible increased risks to the Priory | The Pier would be maintained and continue to provide protection to areas upstream in the Tyne and the Priory site |
| **Comments** | It is assumed that the Port Authority will continue to maintain the Pier. | |

| **Appraisal Summary Table: Policy Unit 27.1 Prior's Haven** | |
|---|---|
| PU description | Location: This PU covers the small bay and includes two sections of defences. .<br><br>Designations: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ, Tyne Entrance LWS, River Tyne (tidal extent) North Tyneside Section LWS<br><br>Issues: Erosion and flood risks to the yacht club and canoe club |
| SMP2 Policy | Hold The Line (NAI) |
| Option | Do Nothing baseline |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. |
| Technical Issues | None |
| Assumptions and uncertainties | Erosion rates assume that historic erosion trends will continue |
| Present Value Costs (£k) | Nil |
| Present Value Benefits (£k) | Nil |
| Benefit Cost Ratio | N/A |
| **Economic Impacts** | |
| Properties | The Sailing Club, Rowing Club and a scout hut would be at risk |
| Infrastructure and transport | Loss of the car park above Prior's Haven |
| Development and tourism | Loss of the car park above Prior's Haven |
| **Environmental Issues** | |

| | |
|---|---|
| Flora and fauna | As erosion continues new habitats may be created |
| Water | There may be damage to sewers on Pier Road, which would need to be disconnected/re-routed to avoid pollution |
| Geology and coastal processes | Coastal processes would be allowed to occur naturally |
| Historic environment | The Sailing Club would be at risk |
| Landscape | Negative visual impacts would arise as properties were damaged and fell into the sea |
| **Social Impacts** | |
| Way of Life | Adverse effects from the loss of the Sailing Club, rowing club, scout hut and car parking |
| Community | Adverse effects from the loss of the Sailing Club, rowing club, scout hut and car parking |
| Health and wellbeing | Adverse effects from the loss of the Sailing Club, rowing club, scout hut and car parking |
| Fears and aspirations | Adverse effects from the loss of the Sailing Club, rowing club, scout hut and car parking |
| **Comments** | It may be appropriate for property level protection to be provided to the properties that may be at risk of flooding. |

| **Appraisal Summary Table: PU27.2 Tynemouth** | | | | | |
|---|---|---|---|---|---|
| PU Description | Location: This PU includes Freestone Point, The Flats, Low Lights and Fish Quay. Apart from a short section around Freestone Point the entire length is defended to the breakwater east of Fish Quay. The remainder of the PU is made up of the commercial quays.<br><br>Designation: Northumbria Coast SPA, Northumbria Coast Ramsar, Northumberland Shore SSSI, Coquet to St. Mary's Island Candidate MCZ, Tyne Entrance LWS, River Tyne (tidal extent) North Tyneside Section LWS<br><br>Issues: Flood risks to the Fish Quay and Low Lights areas | | | | |
| SMP2 Policy | Hold The Line (HTL) | | | | |
| Option | Do Nothing baseline | Option 1 – Do Minimum | Option 2 – Maintain | Option 3 – Sustain | Option 4 – Improve |
| Description | No maintenance would be undertaken on existing defences and no new defences would be constructed. | The existing defences would be maintained until the end of their serviceable life | Existing defences would be maintained and new defences constructed to replace them as necessary | Existing defences would be maintained and replaced as necessary. Replacement defences would be constructed to provide the same standard of protection taking into account sea level rise, i.e. higher crest levels may be needed. | New defences would be constructed to replace the existing defences earlier than for Option 3 and would incorporate the necessary changes to provide the standard of protection anticipated to be required due to future estimates of sea level rise. |
| Technical issues | None | None | None | None | None |
| Assumptions and uncertainties | Erosion rates assume that historic erosion trends will continue | Timing of any future works assumes that historic erosion trends will continue | Timing of any future works assumes that historic erosion trends will continue | Timing of any future works assumes that historic erosion trends will continue | Timing of any future works assumes that historic erosion trends will continue |
| Present Value Costs (£k) | Nil | 1,643 | 2,844 | 3,589 | 5,516 |
| Present Value Benefits (£k) | Nil | 156 | 156 | 156 | 156 |
| Benefit Cost Ratio | N/A | 0.1 | N/A | N/A | N/A |
| **Economic Impacts** | | | | | |
| Properties | A number of properties at Freestone Point, Low Lights and Fish Quay would be at risk from erosion and flooding | A number of properties at Freestone Point, Low Lights and Fish Quay would be at risk from flooding and from erosion once defences failed | Properties would be protected from erosion but flood risks may still increase with sea level rise | Properties would be protected from erosion and flood risks would be unchanged as defences are replaced | Properties would be protected from erosion and flood risks would be reduced by construction of new defences |
| Infrastructure and transport | Loss of PRoW and the promenade including the national cycle trail. Union Quay, Bell Street and union Road are currently at risk of flooding and this risk would increase with sea level rise. | Once defences failed loss of PRoW and the promenade including the national cycle trail. Union Quay, Bell Street and union Road are currently at risk of flooding and this risk would increase with sea level rise. | Infrastructure and transport would be protected but flood risks to roads may increase with sea level rise | Infrastructure and transport would be protected from erosion and flood risks would be unchanged as defences are replaced | Infrastructure and transport would be protected from erosion and flood risks would be reduced by construction of new defences |
| Development and tourism | Use of the promenade would be lost | Use of the promenade would be lost | Use of the promenade would be maintained | Use of the promenade would be maintained | Use of the promenade would be maintained |

| | | | | | |
|---|---|---|---|---|---|
| **Environmental Impacts** | | | | | |
| Flora and fauna | Erosion of the cliffs would lead to creation of new habitats | Erosion of the cliffs would lead to creation of new habitats | Maintenance of the defences may lead to coastal squeeze and loss of rocky shore habitat | Maintenance of the defences may lead to coastal squeeze and loss of rocky shore habitat | Maintenance of the defences may lead to coastal squeeze and loss of rocky shore habitat |
| Water | Damage to sewers serving the properties at risk of erosion could lead to pollution if they are not replaced/re-routed. | Damage to sewers serving the properties at risk of erosion could lead to pollution if they are not replaced/re-routed. | Not affected | Not affected | Not affected |
| Geology and coastal processes | Natural coastal processes would be allowed to occur | The current situation would be maintained until defences failed at which point coastal processes would be allowed to occur naturally | Unchanged from the present situation | Unchanged from the present situation | Unchanged from the present situation |
| Historic environment | There are numerous assets at risk including listed buildings and archaeological sites | There are numerous assets at risk including listed buildings and archaeological sites | Historic assets would be protected from erosion but flood risks may increase with sea level rise | Historic assets would be protected from erosion but flood risks may increase with sea level rise | Historic assets would be protected from erosion and flood risks would be reduced by construction of new defences |
| Landscape | Erosion of defences and properties would have serious negative impacts on visual amenity | Erosion of defences and properties would have serious negative impacts on visual amenity | Unchanged from the present situation | Upgraded defences may have a negative visual impact | Upgraded defences may have a negative visual impact |
| **Social Impacts** | | | | | |
| Way of life | The quays are important for local fisheries and Fish Quay is one of the largest prawn ports in England so any loss would be a negative impact for local employment | The quays are important for local fisheries and Fish Quay is one of the largest prawn ports in England so any loss would be a negative impact for local employment | The quays would be protected from erosion but flooding would still be an issue | The quays would be protected from erosion and flood risks should be unchanged as new defences are constructed | The quays would be protected from erosion and flood risks would be reduced by the construction of new defences |
| Community | Loss of the properties including commercial and residential, along with loss of transport and infrastructure and historic assets would have a negative impact on the local community | Loss of the properties including commercial and residential, along with loss of transport and infrastructure and historic assets would have a negative impact on the local community | The quays would be protected from erosion but flooding would still be an issue | The quays would be protected from erosion and flood risks should be unchanged as new defences are constructed | The quays would be protected from erosion and flood risks would be reduced by the construction of new defences |
| Health and wellbeing | Loss of PRoW and the promenade would negatively impact on recreation | Loss of PRoW and the promenade would negatively impact on recreation | The PRoW and the promenade would be maintained | The PRoW and the promenade would be maintained | The PRoW and the promenade would be maintained |
| Fears and aspirations | Risks to properties and businesses would lead to concern and fears over loss of properties and jobs | Risks to properties and businesses would lead to concern and fears over loss of properties and jobs | Some risk of flooding would remain and this could increase due to sea level rise | Some risk of flooding would remain | Flood risks would be reduced by construction of new defences |
| **Comments** | Maintain is selected as the preferred option as it allows for protection of properties and businesses in the immediate area and further into the Tyne. These benefits are not reflected in the economic appraisal as their assessment was outside the scope of the strategy. It may be appropriate to provide property level protection to those properties at risk of flooding. | | | | |

# 10. Strategy Delivery Plan

10.1.1 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.

10.1.2 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.

10.1.3 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.

10.1.4 Table 10-1 sets out the proposed Strategy Plan, including estimated expenditure for each PU for each of the ten years.

**Table 10-1 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 | Nil | Nil | Nil | Nil | Nil | Nil | Nil | 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

# 11. References

Environment Agency (2015) *Flood and coastal defence: develop a project business case* [online] available at https://www.gov.uk/flood-and-coastal-defence-appraisal-of-projects

*Environment Agency (2010) Flood and Coastal Erosion Risk Management appraisal guidance* [online] available at https://www.gov.uk/flood-and-coastal-defence-appraisal-of-projects

CAPITA

**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

www.capita.co.uk