REPORT (DRAFT)

Slapton Sands Beach Management Plan Non-Technical Summary

Prepared for

Slapton Line Partnership

March 2018

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SECTION 1

Introduction

This report provides a non-technical summary of the 2018 Slapton Sands Beach Management Plan (BMP). The BMP has been prepared for the Slapton Line Partnership (SLP) and their partners South Hams District Council (SHDC), the Environment Agency and Devon County Council (DCC). The BMP study area covers the Slapton Sands coastline from Torcross in the south, to Strete Gate in the north, as shown in Figure 1-1.

There are two key documents that form the BMP: (i) the BMP; and (ii) the Options Appraisal Report. This Non-Technical Summary provides a condensed report documenting the key aspects of these two documents, including:

- The background behind the BMP and why it has been produced (Section 1.1 and Section 1.2)
- The factors that the BMP has considered (Section 2).
- How the management options have been derived and appraised (Section 3.1. to Section 3.5).
- Details of the preferred management approach for Slapton Sands (Section 3.6).

Throughout this document, the reader is signposted to further information in the either the BMP or Options Appraisal Report.

As indicated in Figure 1-1, the study area was extended to include Blackpool Sands, Beesands and Hallsands for two of the four baseline reports prepared for BMP; including the Coastal Processes Baseline Report and the Economics Baseline Report. The reasons for this are outlined below:

- The Coastal Processes Baseline inherently covers the wider coastal processes operating to the north and south of the study area, however, the study area was extended to include new high-level trends analysis for the wider coastline at Blackpool Sands, Hallsands and Beesands. This ensured that the options appraisal process is underpinned by the best possible evidence and analysis of coastal processes and shoreline change. This information will also be available for use in any future studies.
- The Economics Baseline Study was extended to include damages arising from erosion risk at Blackpool Sands and Hallsands and flood risk at Beesands in lieu of the potential benefits that may arise from works that could be undertaken in the future or alongside those at Slapton and to inform any future studies.

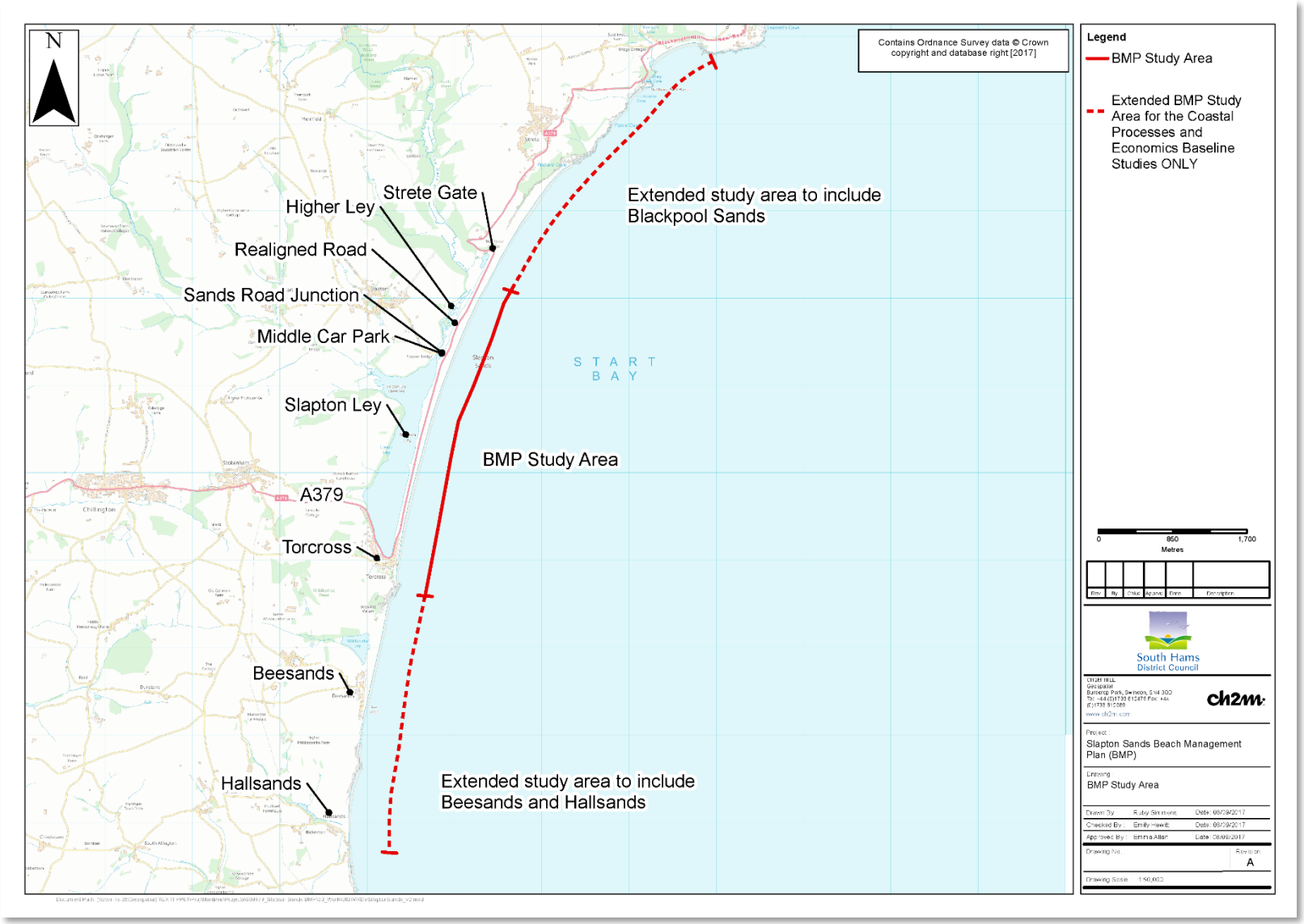


Figure 1-1 Slapton Sands BMP extent

1.1 Why the BMP is Needed

1.1.1 Flood and Coastal Erosion Risk

The Slapton Sands coastline is at risk of both coastal flooding and erosion. For example:

- The storms of 1979.
- The storms of 2001/2002, which resulted in significant damage and closure of the A379 road.
- The storms of 2014/2015.
- The storms of February 2016, which resulted in significant damage to, and failure of, the concrete seawall at Torcross.


Friday, February 2, 2001 TWENTY FIVE

Road could reopen but long term solution still debatable

Viewing Slapton Line towards Strete Gate. Surveyors are now assessing the damage before considering whether to open the road as a single track controlled with traffic lights

Coastal defences have been constructed along the frontage over the years, with the existing defences consisting of a concrete seawall and sheet piling, rock revetment, block armour work, and periodic beach recycling. These coastal defences protect a number of assets, including:


February 2016

- Up to 48 properties at risk of flooding at Torcross. The discounted Present Value (PV) of these properties is estimated to be £1,162k.
- The A379 road (operated and maintained by DCC), which is at risk of flooding and collapse via erosion of the underlying shingle barrier and beach during storms. The A379 provides an important transport link to the area for both local traffic and tourists. Sea level rise predictions and increased storminess will continue to increase the vulnerability of beach and shingle barrier and its associated infrastructure to damage. The discounted Present Value (PV) of damages arising from the impact of temporary and permanent closure of the A379 on local/tourist traffic and tourism revenue is estimated to be £30,550k.

This BMP has been prepared to address these issues and provide a way forward to manage flood and coastal erosion risk between Torcross and Strete Gate, allowing for the present-day funding limitations and technical constraints and opportunities.

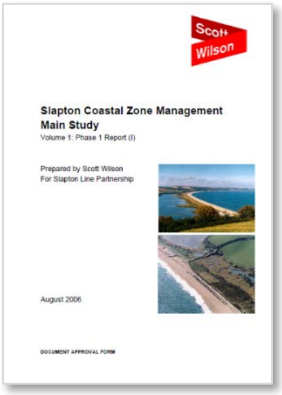

December 2000


March 2008


April 2017

1.1.2 Update to the Slapton Coastal Zone Management Study

The BMP provides an update to the Slapton Coastal Zone Management Study (SCZMS), which was prepared by Scott Wilson in 2006 and established a robust long-term coastal zone management strategy for Slapton Sands.



The SCZMS recommended that a review of the recommended management strategy is undertaken intervals of no less than every five years. This was recognised in the Environment Agency's Management Investment Programme 2015 – 2021. However, following the 2015 storms and the significant damage that they caused, a decision was made by the SLP to advance the review of the 2006 recommended management strategy in the SCZMS and bring it forward to 2016/2017. This update has now been undertaken and presented within the Slapton Sands BMP.

Since the completion of the SCZMS, there have been a number of changes that determine the way in which flood and coastal erosion risk management is defined and this needed to be reflected in the SCZMS update (and therefore the BMP accordingly). These changes are summarised below:

1. Changes to the governmental funding system and the way in which expenditure is allocated to flood and coastal erosion risk management; and

2. 10 more years of beach profile, providing a better understanding of coastal processes and shoreline interaction taking place along the Slapton Sands coastline.

3. Advance in the development of Beach Management Plans, with the release of the CIRIA Beach Management Manual, 2nd Edition in 2010, and the production of numerous BMPs since then.

The recommendations made by the SCZMS are generally similar; both including reactive realignment, beach recycling, development of an adaptation plan, ongoing beach monitoring and ensuring ecological data is kept up-to-date; however, recommendations to maintain/improve/upgrade the defences at Torcross are included within the BMP.

1.2 Aims and Objectives of the Beach Management Plan

1.2.1 Aim of the BMP

The aim of the BMP is to identify the management activities that could be undertaken to reduce the flood and coastal erosion risk between Torcross and Strete Gate over the next 20 years whilst recognising and managing the environmental and amenity implications of doing so.

1.2.2 Objectives of the BMP

The specific objectives of the BMP are:

- To review and better understand the coastal processes which contribute to change along the study boundary.
- To assess the performance of the existing coastal defences.
- To assess the local economic benefit of future management options.

- To appraise each short-listed option against technical, economic, environmental and social criteria and identify the preferred management approach.
- Present a monitoring and intervention plan to sustain the A379 for the next 20 years.
- To develop and implement more sustainable longer-term solutions with consideration of the current 'Shoreline Management Plan'.
- To consider immediate and long-term changes to both funding and local policy.
- Consider that impact of any management solution on the Slapton Line which is in a National Nature Reserve and SSSI designated for vegetated shingle, freshwater lakes and wetlands, geomorphologic features and rare plants and birds.

SECTION 2

Background

2.1 Physical Setting of the BMP Area

Slapton Sands is a southeast facing gravel (or 'shingle') barrier beach in Start Bay, on the south coast of Devon, UK. To the northeast of Slapton Sands lies Strete and Blackpool Sands, and to the southwest lies Beesands and Hallsands beaches. The barrier is approximately 4.5 km long, and extends continuously between headlands at its southwestern (Torcross) and northeastern (Strete) extents. The gravel barrier at Slapton Sands is between 50 and 100 m wide at high tide and widens between Torcross and the northeast extent of the barrier.

The central section of Slapton Sands separates the freshwater lake, Slapton Ley lagoon, from Start Bay. Referred to as 'The Line', this stretch of the barrier supports a section of the A379 road, which provides an important transport link between Torcross and Strete.

2.2 Coastal Processes

Coastal processes influence the beaches of Start Bay over three main time-scales;

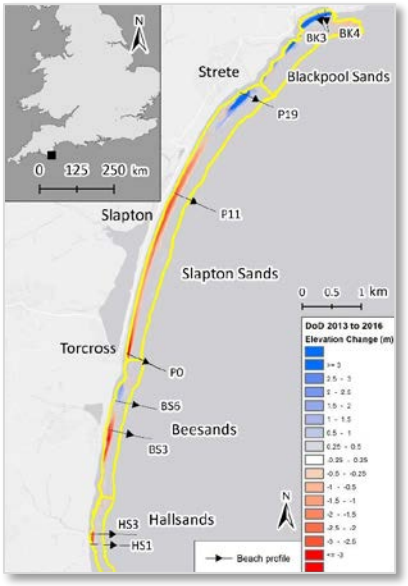
- **Short term (hours to days) storm impacts:**
  - Wave attack results in sections of Start Bay barrier being cut-back and eroded.
  - Vulnerable sections of Start Bay can be eroded even further, which allows wave run-up to overtop and overwash sections of the beaches.

December 2000 – cutback of the barrier

- **Medium term (weeks to years) alongshore sediment transport:**
  - The every-day/storm/seasonal wind and wave conditions drives a net movement of beach material from south to north.
  - Meanwhile, alongshore-oriented waves cause beach rotation over medium time-scales, which intermittently reduces the sediment volume along certain stretches of Start Bay. Those sections are then vulnerable to short-term wave attack and overwashing (see erosional spots below).
  - Because of the decreasing trend in easterly storm waves over the last 30 years or more, alongshore sediment transport to the south is becoming less prevalent. This means that the southern part of Start Bay (between Hallsands and Strete) is suffering from a gradually decreasing sediment supply from the north, and is increasingly vulnerable to storm wave attack, overtopping, and barrier retreat.

- **Long term (years to centuries) influence of sea level rise:**
  - Relative sea-level rise gradually increases the vertical reach of waves; this increasingly allows for short-term events (storm waves) to cut-back the upper beach profile and for wave run-up to overtop/overwash the crest of the beach.
  - These episodic, short time-scale overwashing events (described above), are the mechanism for long-term barrier roll-back, and allow the barrier to retreat in response to sea level rise.

Eventually, the decreasing cross-sectional area of Slapton barrier, caused by the lengthening of the shoreline as it retreats, will make the barrier increasingly vulnerable to breaching. Once significant breaching occurs, the barrier could begin to break down into a series of tidal inlets.



Erosional hot-spots in Start Bay can be identified as areas of beach that have the combination of a low mean sediment volume, and a large variance in sediment volume. This combination indicates that regular erosion of the profile occurs, and that there is limited sediment available to provide resilience against such erosion. From examination of beach volume change over time, a number of erosional hot-spots have been identified within Start Bay (listed from north to south):

1. Middle of Slapton Sands (profiles P8 – P11).
2. South end of Slapton Sands (profile P0 – P3).
3. North end of Beesands (profile BS6).
4. South end of Beesands (profile BS1).
5. All of Hallsands (profiles HS1 – HS4).

Signpost!

Full details of the physical setting, coastal processes and shoreline interactions are provided in the **Coastal Processes Baseline Report**, which is provided in Appendix B to the BMP.

2.3 Environmental

Slapton Sands is located within an area of considerable ecological importance; designated for its environmental, landscape, geological and geomorphological value. The environmental and nature conservation designations within the BMP study area are described below. Further, the South West Coastal Path runs along 'The Line' and the area has several local small businesses and settlements where tourism makes up a major source of income.

- 'The Line' is located within a Site of Special Scientific Interest (SSSI), nationally designated for its biological and geomorphological features.
- 'The Line' and Ley are also located within a nationally designated Geological Conservation Review (GCR) site (no. 1840) and a Regionally Important Geological and Geomorphological Site (RIGS)in recognition of the key scientific elements of the Earth heritage of Britain that it shows and regionally/locally important earth science.
- The Slapton Ley is the largest freshwater lake in southwest England and is a nationally designated National Nature Reserve (NNR).

- For its landscape setting, the area is located within the nationally designated:
  - South Devon Area of Outstanding Natural Beauty (AONB); and
  - South Devon Heritage Coast.
- In the vicinity of the BMP study area, situated from mean high water at the southern tip of the BMP study area, is the nationally designated Skerries Bank and Surrounds Marine Conservation Zone (MCZ). The MCZ is a large area that covers 24,969 ha of marine subtidal and intertidal habitat.
- In the vicinity of the BMP study area, situated to the north/north-east of Blackpool Sands, is the internationally designated Lyme Bay and Torbay SCI; recognised for reefs and submerged or partially submerged sea caves.
- The nearby area also includes several conservation areas as well as many listed buildings, scheduled monuments and a number of designated and non-designated archaeological/cultural heritage sites.

These designated sites are important in the consideration of options for beach management, with many having legislative requirements to ensure they are not adversely impacted by human actions.

Signpost!

The full **Environmental Baseline Report** is provided in Appendix C to the BMP.

2.4 Coastal Defences

The majority of coastal defences along the western and central end of the BMP frontage, are in fair or good condition. The seawall and sheet pile wall are in good or fair condition with a residual life of 35-40 years, due to recent emergency works completed by the Environment Agency, SHDC and DCC completed in 2016. The rock armour protection that runs along a large extent of 'The Line' appears in reasonable condition, however, it is no longer in its 1979 structural form and thus as a coastal defence is not fully serving its intended function. The concrete seawall (constructed in 1917) and the Concrete 'Armourflex' blockwork were both assessed to be in poor condition, with significantly reduced performance.

Signpost!

Full details of the history of defences, visual inspection and condition assessment are provided in the **Defence Baseline Report**, which is provided in Appendix D to the BMP.

2.5 Economics

2.5.1 Funding for Flood and Coastal Erosion Risk Management (FCERM)

Funding for flood and coastal erosion risk management can be achieved via a number of sources, some examples are provided below:

- Environment Agency via Flood and Coastal Erosion Risk Management Grant-in-Aid (FCERM-GiA). FCERM-GiA funding must be used to provide measures that protect against flood and erosion damages and realise the 'benefits'. Any business case submitted to the Environment Agency National Projects Assurance Services must demonstrate 'confidently' that the problem of flooding/erosion would be 'solved' and not need further protecting for the duration of the 'benefits' claimed.

- Environment Agency funding streams, including:
  - Capital budgets – allocated to the construction, provision, purchase and replacement of assets owned and managed by the Environment Agency. This is expenditure that leads to the creation of tangible and intangible assets which are included on the Environment Agency asset register. Capital assets must have a value greater than the £5k.
  - Capital Works Expensed in a Year (CWEiY) – this is budget allocated to works on assets that are not included on the Environment Agency asset register and includes works to replace an existing asset or structure / significantly improve the useful life of the existing asset or structure beyond its original design. CWEIY is treated by Defra as part of the grant in aid capital allocation.
  - Revenue Budgets – allocated as operating expenditure. This includes the likes of maintenance of existing structures of the structure that is not below target or useable condition; or capital works valued to be less than £5k).
- Directly via the assets owner / responsible authority, such as SHDC via local levy, or Devon County Council.
- Third party funding, such as utilities companies, local landowners and residents.

2.5.2 Estimated Value of Damage Resulting from Flooding and Erosion

For the Economics Baseline Report, estimates of damages arising from flooding and erosion were calculated and are summarised below:

- Up to 48 residential properties are at risk of coastal flooding. The discounted Present Value (PVd) of these properties is estimated to be £1,162k (over a 20-year appraisal period).
- The A379 road is at risk from flooding and erosion. The discounted Present Value (PVd) of damages (over a 20-year appraisal period) to tourist income occurring as a result of road closure is £27,534k, whilst the impact of road closure on the local economy is estimated to be £3,016k
- **In total therefore, the damages for the BMP frontage arising from flood and coastal erosion risk could be up to £31,712k.**

2.5.3 Potential Funding for Slapton Sands

As part of the economic baseline reporting, an assessment was undertaken to determine how much money could be sourced from the Environment Agency FCERM-GiA to provide flood and coastal erosion risk management for the BMP frontage. Allowing for 'some form of' protection to move the 48 properties from a moderate to a low risk of erosion; and prevent damages arising from the impact of temporary and permanent closure of the A379 on local/tourist traffic and tourism revenue would be prevented; it was calculated that approximately £1,778k of FCERM-GiA could be available.

The overall strategy going forward is to recognise that reactive work should be done, but only to patch and mend the defences and road as required over the next 20 years. This is in line with funding available via FCERM-GiA. Further options do exist but their implementation is wholly dependent on the availability of third party funds. Preparations should be made for the next 50 years, and not to leave a legacy of unmanageable and unaffordable solutions to future generations.

Full details of the economics assessment are provided in the **Economics Baseline Report**, which is provided Appendix E.

SECTION 3

Management Options

3.1 Options Appraisal Approach

To determine the preferred option / management approach for the BMP frontage, an options appraisal process was undertaken, as summarised below, in Figure 3-1, and described in detail within the subsequent sections.

- 1 – The options appraisal consisted of a number of stages, which started with the definition and confirmation of a long-list of options. The long-list of options included all possible solutions to provide flood and coastal erosion risk management along the BMP frontage, irrespective of suitability and cost**. Refer to Section 3.2**.
- 2 and 3 – Following that, the long-list was rationalised to a short-list of options via an appraisal of suitability and viability. **Refer to Section 3.3**.
- 4 – The short-list was then rationalised further, via a more in-depth appraisal of suitability and viability, including a detailed assessment of option costs. **Refer to Section 3.4**.
- 5 – Based on the findings of the short-list options appraisal, a series of preferred options were selected. **Refer to Section 3.5**.

Figure 3-1 Options appraisal process – staged approach to option selection

Signpost!

Full details of the options appraisal are presented in the **Options Appraisal Report**, which is provided Appendix F to the BMP.

3.2 Confirm Long-List

The options appraisal was initiated by defining and confirming a long-list of options. This was necessary to ensure that all possible options to address flood and coastal erosion risk within the BMP area were identified and considered the views of and suggestions made by the stakeholders and wider community. As such, the long-list was developed using the findings of the BMP baseline reports and in collaboration with the stakeholders and wider community, as listed below. The long-list is presented in Table 3-1.

- Baseline reports (coastal processes, environmental, defence, and economics);
- Outcomes of a Stakeholder Workshop to Identify long-list options held on the 25th July 2017;
- Feedback provided from a BMP public consultation event also held on the 25th July 2017; and
- Feedback provided directly to the Slapton Line Partnership (SLP).

Table 3-1 Slapton Sands BMP long-list

Option Number	Option Description
1	Do nothing
2	Tidal barrier (enclosing a tidal lagoon to move the risk out to sea and generate energy)
3	Tidal/wave energy generation scheme (e.g. an array of surface or submerged wave energy convertors)
4	Offshore submerged reef (sand bags; surfing)
5	Offshore (partially or fully submerged) reef (sunken ships)
6	Inshore (partially submerged) breakwater
7	Offshore breakwater (large, offshore)
8	Seawall (along the length of the barrier) (continuation of Torcross)
9	Seawall (strategically placed at specific locations)
10	Seawall (maintain and upgrade existing seawall at Torcross)
11	Demountable defences (behind existing seawall)
12	Sheet pile wall (along the length of the barrier)
13	Sheet pile wall (strategically placed at specific locations)
14	Rock revetment (along the length of the barrier)
15	Rock revetment (strategically placed at specific locations)
16	Timber groynes (along length of beach between Torcross and Strete)
17	Timber groynes (strategically placed at specific locations)
18	Rock groynes (along the length of the barrier)
19	Rock groynes (strategically placed at specific locations)
20	Terminal groyne at Pilchard Cove (to prevent northerly transport of material north towards Black Pool Sands)
21	Beach recycling (move material along the beach from area of accretion in the north to area of erosion in the south)
22	Beach recycling (strategic movement of material along the coast, in support of beach retaining structures such as wooden groynes)
23	Beach recycling (move material from the road / back of the barrier back to the front)
24	Beach recycling (with the use of a lightweight railway built along the length of the barrier; the railway would be used to transport shingle collected from areas of accretion to two drop-off points; (i) off the sea front in Torcross; and (ii) in the region of the car park in the middle of the barrier. The recycled material would then be redistributed by natural processes. Loading at the north end could be facilitated by an overhead hopper, and unloading could be by done by using self unloading trucks, with the shingle being carried out to the edge of the sea by means of a conveyor belt at each of the two drop off locations. As for the economics of such a scheme, building costs would be low as most of it would simply be laid on top of the existing shingle, while profits from the passenger service would likely cover the cost of carrying shingle, the shingle operation probably only requiring two people to run it, thereby keeping costs to a minimum.
25	Beach nourishment/recharge

Option Number	Option Description
26	Build-up (recharge) sherries bank with similar material/plastic (to reduce the wave energy approaching the shoreline)
27	Reactive realignment of the road, with all planning requirements in place (emergency works)
28	Pro-active realignment of the road at locations identified as 'erosion hotspots' (similar to Option 29)
29	Realignment of the A379 road, either side of the previous realignment
30	Relocate car parks landward
31	Gravel road (cease maintenance of the tarmac road, but allow the top of the barrier to be used as a carriageway)
32	Land/road bridge connecting Torcross with Strete
33	Upgrade inland routes
34	New road (inland)
35	Road toll (to fund management of the road)
36	Car ferry (allowing the existing defences and road to fail)
37	Develop adaptation plan with adaptation phases
38	Define Slapton as a CCMA and devise adaptation plan

3.3 Long-List Appraisal

3.3.1 Step 1 - Flood and Coastal Erosion Risk Management

The long-list of options were first rationalised on the basis of whether they met the aim of the BMP, which is to address flood and coastal erosion risk between Torcross and Strete Gate over the next 20 years. Along the Slapton Sands BMP frontage, flood and coastal erosion risk relates specifically to:

- Flooding by wave overtopping;
- Erosion by cut-back;
- Erosion by barrier rollback;
- Erosion by cut-back and barrier rollback; and
- Flooding and erosion related issues combined.

With that, any long-list options that did not address flood or coastal erosion risk was discounted from the options appraisal processes. Discounted options that were more akin to an adaptive solution were set-aside to consider as part of the wider preferred management approach or a recommendation in the BMP, whilst options that would be unlikely to achieve FCERM-GiA, were put-aside to consider should more alternative/more funds become available (as described in Section 3.6.2).

3.3.2 Step 2 – Long-List Appraisal

The second step of the long-list appraisal was to appraise the viability of each option against its technical suitability (considering coastal processes and build-ability), potential economic viability; and the impact that it may have on the environment (see Sections 3.3.2.1 to 3.3.2.3). This part of the options appraisal was underpinned by the information and evidence presented in the four baseline reports produced for

the BMP, including the Coastal Processes Baseline, Environmental Baseline, Defence Baseline and Economics Baseline. The appraisal considered the advantages and disadvantages of each option accordingly and from this it was determined as to whether the option should be taken through to the short-list. Any significant disadvantages were considered to be 'show-stoppers', which prevented the option being considered further and was discounted from the appraisal process.

3.3.2.1 Technical Suitability

The long-list options were assessed against the impact that it could have on coastal processes and shoreline interaction, and what the option would entail in terms of construction, maintenance and life-span of the relevant structure. This appraisal was informed by the information and evidence of the coastal processes and shoreline interactions presented in the Coastal Processes Baseline Report and coastal asset information presented in the Defence Baseline Report.

3.3.2.2 Environmental Impacts

The long-list of options were appraised against a standard suite of environmental aspects in order to identify the key positive and negative impacts on different environmental features. The appraisal also attempted to indicate the relative differences in environmental impacts between options, however this was not always possible at this high-level of appraisal that, and some aspects would only be discernible if more detailed appraisal were undertaken to develop a particular option(s). This appraisal has been informed by the information and evidence presented in the Environmental Baseline Report.

3.3.2.3 Economic implications

The economic implications are based on a high-level understanding of the likely cost based on typical unit rates for the various options and initial indications of FCERM-GiA funding (discussed in Section 2.5 and the Economics Baseline Report.

3.3.3 Options Discounted from Long-List

A summary of the options discounted from the long-list for the reasons of unviability described in Section 3.3.2 above, is presented in Table 3-2.

3.3.4 Confirm Short-List

A summary of the options carried forward from the long-list to the short-list are presented in Table 3-3.

Table 3-2 Options discounted from the Slapton Sands BMP long-list

Option Number	Option Description	Summary of Rationale for Discounting from Long-list	High-Level Indicative Cost
1	Do nothing	This option does not directly reduce flooding or erosion.	Option not costed
2	Tidal barrier (enclosing a tidal lagoon to move the risk out to sea and generate energy)	A tidal barrier could help to reduce the wave energy reaching the shoreline, however, a tidal barrier is not viable on the basis of the tidal climate, costs and environmental impacts and is therefore considered to be a significant 'show stopper'.	£1.3 billion
3	Tidal/wave energy generation scheme (e.g. an array of surface or submerged wave energy convertors)	A tidal/wave generation scheme could help to reduce the wave energy reaching the shoreline, however, it is not viable on the basis of the available technologies, tidal climate, costs and environmental impacts and is therefore considered to be a significant 'show stopper'.	£1.3 billion
4	Offshore submerged reef (sand bags; surfing)	A submerged offshore reef is unlikely to provide sufficient protection to the coastline over the next 20 years, with repairs, maintenance and possible replacement. The success of the reef is very dependent on the local tidal and wave conditions, and therefore is unlikely to provide 'around the clock' protection. The option is costly with no proven success record in the UK. This is considered to be a very high-risk option. Considered to be a significant 'show stopper'.	£3 million
5	Offshore (partially or fully submerged) reef (sunken ships)	Sunken ships are unlikely to provide sufficient protection against erosion and flood risk. The option is costly with no proven success record in the UK. This is considered to be a very high-risk option. Considered to be a significant 'show stopper'.	Option not costed due to uncertainty
6	Inshore (partially submerged) breakwater	Although this option would provide sufficient protection for 20 years, it is a very expensive option. Sediment transport process down drift could be effected, thereby increasing the risk to erosion and flooding there. Considered to be a significant 'show stopper'.	£5.25 million to £13 million +
7	Offshore breakwater (large, offshore)	Although this option would provide sufficient protection for 20 years, it is an even more expensive option than 'partially submerged' breakwaters. Sediment transport process down drift could be effected, thereby increasing the risk to erosion and flooding there. There would also be substantial changes to the landscape/character of the area. Considered to be a significant 'show stopper'.	£8.1 million to £22 million +
8	Seawall (along the length of the barrier) (continuation of Torcross)	Although this option would provide sufficient protection for 20 years, it is an expensive option and does not work well with cross-shore processes. The option	£22 million

Option Number	Option Description	Summary of Rationale for Discounting from Long-list	High-Level Indicative Cost
		of a seawall is contrary to the SMP2 policy of Managed Realignment. Considered to be a significant **'show stopper'**.	
9	Seawall (strategically placed at specific locations)	Although this option would provide sufficient protection for 20 years, there is potential for cutback and outflanking between each section of seawall, which would leave isolated hard-points. Although cheaper than the full-length seawall, the option remains expensive as there are costs associated with patch-repairs and outflanking issues. The alignment to the SMP2 Managed Realignment Policy is also questioned as the shoreline will still be 'held' in places. Considered to be a significant 'show stopper'.	£10 million
11	Demountable defences (behind existing seawall)	In isolation, demountable defences do not provide sufficient protection against erosion and flooding. They may be used in conjunction with alternative approaches to divert the flow of overtopped water, but even then, the funds available would be better spent on an all-encompassing solution. Considered to be a significant 'show stopper'.	Option not costed due to uncertainty
12	Sheet pile wall (along the length of the barrier)	This option would provide sufficient protection for 20 years. There are a number of issues relating to the corrosion of the piles, maintenance and replacement of sheet-piles, which outweigh the pros of this option. Therefore, unlike the seawall, this option will not be carried forward via a Change Scenario. The option does not work well with cross-shore processes and there are environmental impacts. The option of a sheet pile wall is contrary to the SMP2 policy of Managed Realignment. Considered to be a significant 'show stopper'.	£11 million
13	Sheet pile wall (strategically placed at specific locations)	Although this option may provide sufficient protection for 20 years, there is potential for cutback and outflanking between each section of sheet pile wall, which would leave isolated hard-points. Although cheaper than the full-length sheet pile wall, the option remains expensive and there are costs associated with patch-repairs and outflanking issues. The option does not work well with cross-shore processes and there are environmental impacts. The alignment to the SMP2 Managed Realignment Policy is also questioned as the shoreline will still be 'held' in places. Considered to be a significant 'show stopper'.	£5 million
14	Rock revetment (along the length of the barrier)	Although this option may provide sufficient protection for 20 years, it is expensive to build and maintain. A rock revetment is less reflective than a seawall or sheet pile wall and would therefore have less impact on cross-shore processes. Rock can be readily moved in response to change, which makes it more flexible. The option of a rock revetment is contrary to the SMP2 policy of	(>£31million)

Option Number	Option Description	Summary of Rationale for Discounting from Long-list	High-Level Indicative Cost
		Managed Realignment, so if reconsidered under different change scenarios, necessary action and agreement would be required to amend the SMP2 policy.	
23	Beach recycling (move material from the road / back of the barrier back to the front)	Not considered to be an option to address flooding and erosion risk in its entirety, rather an ongoing option that will be included as a recommendation for ongoing works. Therefore, the option will not be taken through the short-list appraisal.	Not costed
24	Beach recycling (with the use of a lightweight railway built along the length of the barrier; the railway would be used to transport shingle collected from areas of accretion to two drop-off points; (i) off the sea front in Torcross; and (ii) in the region of the car park in the middle of the barrier. The recycled material would then be redistributed by natural processes. Loading at the north end could be facilitated by an overhead hopper, and unloading could be by done by using self unloading trucks, with the shingle being carried out to the edge of the sea by means of a conveyor belt at each of the two drop off locations. As for the economics of such a scheme, building costs would be low as most of it would simply be laid on top of the existing shingle, while profits from the passenger service would likely cover the cost of carrying shingle, the shingle operation probably only requiring two people to run it, thereby keeping costs to a minimum.	Recycling is considered within the options above. Costs of construction of a railway will not be funded via FCERM-GiA and not aware that there are any firm plans with investment identified to deliver such a railway, which in itself will be as vulnerable (if not more so) than the road already is without major investment in appropriate defences along the length of the frontage. Considered to be a significant 'show stopper'.	Option not costed due to uncertainty
26	Build-up (recharge) sherries bank with similar material/plastic (to reduce the wave energy approaching the shoreline)	This option is discounted on environmental grounds, in that it will not be acceptable, and that it will not provide sufficient protection to the north. Considered to be a significant 'show stopper'.	Option not costed due to uncertainty

Table 3-3 Slapton Sands BMP short-list

Option Number	Option Description	Summary of Rationale for Taking Forward to Short-List
10	Seawall (maintain and upgrade existing seawall at Torcross)	This option provides sufficient protection against erosion and flooding at the western end of the BMP frontage. Since the wall is already in place and is compliant with the current SMP2 policy, it will need to be considered alongside all other options going forward.
15	Rock revetment (strategically placed at specific locations)	This option reduces overtopping and risk of cut-back, but there is a risk of potential for cutback and outflanking between each section of rock revetment, which would leave isolated hard-points. Costs are reduced when considered against a full-length revetment. The alignment to the SMP2 Managed Realignment Policy is questioned as the shoreline will still be 'held' in places.
16	Timber groynes (along length of beach between Torcross and Strete)	This option would provide sufficient protection for 20 years. The timber groynes would act to reduce the alongshore movement of material, which is a key contributor to the erosion of this coastline.
17	Timber groynes (strategically placed at specific locations)	This option would provide sufficient protection for 20 years. The timber groynes would act to reduce the alongshore movement of material, which is a key contributor to the erosion of this coastline. There is a risk of cutback and outflanking around the strategically placed structures, which would require further construction and costs to rectify - the placement and number of groynes would need to be considered very carefully, and may even need to be considered alongside a beach recycling option.
18	Rock groynes (along the length of the barrier)	This option would provide sufficient protection for 20 years. The rock groynes would act to reduce the alongshore movement of material, which is a key contributor to the erosion of this coastline.
19	Rock groynes (strategically placed at specific locations)	This option would provide sufficient protection for 20 years. The rock groynes would act to reduce the alongshore movement of material, which is a key contributor to the erosion of this coastline. There is a risk of cutback and outflanking around the strategically placed structures, which would require further construction and costs to rectify - the placement and number of groynes would need to be considered very carefully, and may even need to be considered alongside a beach recycling option.
20	Terminal groyne at Pilchard Cove (to prevent northerly transport of material north towards Black Pool Sands)	A groyne at this location would prevent the loss of material from the Slapton Sands frontage, however, alone it doesn't allow for the movement back of material to the south. This option will only be successful if considered in conjunction with beach recycling.
21	Beach recycling (move material along the beach from area of accretion in the north to area of erosion in the south)	Beach recycling is an agreeable option when considering costs, impacts on coastal processes and the environment. It is relatively low cost, however, movement is strongly linked to weather patterns and the ability for the material to move to the right place at the right time. This option would work better with beach control structures to help reduce the uncertainty.
22	Beach recycling (strategic movement of material along the coast, in support of beach retaining structures such as wooden groynes)	This option would provide sufficient protection for 20 years. Beach recycling is an agreeable option when considering costs, impacts on coastal processes and the environment. It is relatively low cost, however, movement is strongly linked to weather patterns and the ability for the material to move to the right place

Option Number	Option Description	Summary of Rationale for Taking Forward to Short-List
		at the right time. The use of a control structure would help to retain the material where paced, but does come with its own pros and cons.
25	Beach nourishment/recharge	This option could provide sufficient protection for 20 years. The success of this option will ultimately depend on the ability to source appropriate material and achieve associated licensing approval.
27	Reactive realignment of the road, with all planning requirements in place (emergency works)	This option could help to maintain the road link over the next 20 years, however, it will be focused on an isolated area of the coastline and does not therefore protect the length of Slapton Sands from flooding and erosion risks. It should be considered alongside other beach management options that aim to reduce the risk of flooding and erosion, and subsequently road loss.
28	Pro-active realignment of the road at locations identified as 'erosion hotspots' (similar to Option 29)	This option could help to maintain the road link over the next 20 years, however, it would only be successful if that particular section of coastline is at risk. Similar to reactive realignment, it will be focused on an isolated area of the coastline and does not therefore protect the length of Slapton Sands from flooding and erosion risks. It should be considered alongside other beach management options that aim to reduce the risk of flooding and erosion, and subsequently road loss.
29	Realignment of the A379 road, either side of the previous realignment	This option could help to maintain the road link over the next 20 years, however, it would only be successful if that particular section of coastline is at risk. Similar to reactive realignment, it will be focused on an isolated area of the coastline and does not therefore protect the length of Slapton Sands from flooding and erosion risks. It should be considered alongside other beach management options that aim to reduce the risk of flooding and erosion, and subsequently road loss.

3.4 Short-List Appraisal

The purpose of the short-list appraisal was to assess the viability of the short-listed options in more detail, which required a more vigorous assessment of their technical suitability (considering coastal processes and build-ability), potential economic viability, and the impact that it may have on the environment. The appraisal process is described below with details of the differences between the long-list and short-list appraisal shown in shaded text. As with the long-list appraisal, the short-list appraisal draws from the four baseline reports already completed for the, to provide an assessment of the advantages and disadvantages of each short-listed option.

3.4.1 Technical Suitability

The options were assessed against the impact (be it positive and negative) that it could have on coastal processes and shoreline interaction, and what the option would entail in terms of construction, maintenance and life-span of the relevant structure. For the short-list appraisal;

- Consideration has been given to alternative layouts within an option (i.e. sub-options). This included defining a series of assumptions, such as the length of coastline over which the structure would extend, the number of groynes/length of groynes, and m^3 of beach recycling required.

3.4.2 Environmental Impacts

Each option has been considered against a standard suite of environmental aspects in order to identify key potential impacts. For the short-list appraisal, this also included:

- A range of other impacts might be introduced by construction or modification of new and existing coastal defence structures. Many parts of the BMP area are currently popular tourism resources and provide amenity use for residents throughout the year. Changes to coastal defences in these locations will influence the amenity use of the areas and may also create a visual impact to residents and the wider area.
- Some options introduce additional Health and Safety concerns by including concealed structures or allowing members of the public to access structures that may pose trip hazards and wider Health and Safety concerns. Such impacts are identified where appropriate in the options appraisal.

PLEASE NOTE: The assessment of environmental impacts presents the case for social and natural considerations, and it is not so easy to draw a clear-cut conclusion on whether an option is acceptable. For example, an option may result in the coastline behaving 'naturally' but this could result in impacting on socio-economics, which may not be considered as a positive outcome'. This was flagged in the options appraisal process, but further consultation with representatives of Natural England/Devon County Council/South Hams etc. is recommended to firm up the overall thought(s) on the options from an 'environmental perspective'.

3.4.3 Economic Implications

The economic implications of the short-list options are based on the indicative likely cost for the various options, and initial indications of Flood Defence Grant-in-Aid (FCERM-GiA) funding (as presented in Table 3-4). For the short-list appraisal, this included:

- An assessment of option costs (based on typical unit rates). This utilised Government guidance, best practices and previous scheme examples, and included optimism bias of 60% (also in line with current costing guidance).

- The costs estimated have been used alongside the monetary damages/benefits estimated to determine indicative benefit:cost ratios that can be fully carried by FCERM-GiA funding (and those that would require partnership funding.
- The amount of FCERM-GiA estimated to be available for works at Slapton between Torcross and Strete Gate is £1,778,000 (as described in Section 2.5). On this basis, the amount of partnership funding required for each short-listed option was also calculated. Note: The amount of FCERM-GiA is wholly dependent on existing damages; it does not change if more third party contributions become available.
- A key source of third party funding for road management is Devon County Council (Highways). Responsibility to safeguard the A379 road falls to Devon County Council (DCC) (Highways); they currently maintain the road and have contributed to the previous road realignment.

Table 3-4 Short-list indicative option costs and third party funding requirements

Option Number	Option Description	Indicative Cost (20 year discounted Present Value whole life cost)	Third Party Funding Required
10	Seawall (maintain and upgrade existing seawall at Torcross)	£376,244	£376,244
15	Rock revetment (strategically placed at specific locations)	£6,155,904 to £14,452,992	£4,378,305 to £12,675,393
16	Timber groynes (along length of beach between Torcross and Strete)	£15,954,244	£14,176,645
17	Timber groynes (strategically placed at specific locations)	£2,991,421 to £6,847,030	£1,213,822 to £5,069,431
18	Rock groynes (along the length of the barrier)	£12,559,955	£10,782,357
19	Rock groynes (strategically placed at specific locations)	£2,374,348 to £5,677,788	£596,749 to £3,900,189
20	Terminal groyne at Pilchard Cove (to prevent northerly transport of material north towards Black Pool Sands)	£2,218,383	£440,784
21	Beach recycling (move material along the beach from area of accretion in the north to area of erosion in the south)	£1,278,200	£0
22	Beach recycling (strategic movement of material along the coast, in support of beach retaining structures such as wooden groynes)	£1,278,200	£0
25	Beach nourishment/recharge	£8,947,399	£7,169,800
27	Reactive realignment of the road, with all planning requirements in place (emergency works)	£892,875	£0
28	Pro-active realignment of the road at locations identified as 'erosion hotspots' (similar to Option 29)	£1,434,233	£0
29	Realignment of the A379 road, either side of the previous realignment	£1,590,128	£0

3.5 Preferred Option(s)

The preferred options carried through from the short-list address the aims and objectives of the BMP, are technically suitable, economically viable, and are environmentally acceptable. A summary of the options carried forward from the short-list to be the preferred options are presented in Table 3-5.

Table 3-5 Slapton Sands BMP preferred options

Option Number	Option Description	Indicative Cost (20 year discounted Present Value whole life cost)	Third Party Funding Required
10	Seawall (maintain and upgrade existing seawall at Torcross).	£376,244	£376,244
27	Reactive realignment of the road, with all planning requirements in place (emergency works) (location will be dependent on where the road fails).	£892,875	£0
29	Realignment of the A379 road, either side of the previous realignment (as per existing planning application).	£1,590,128	£0

3.6 Preferred Management Approach

The preferred options, together with other management elements (i.e. the adaptive solutions described in Section 3.3.1), form the preferred management approach to reduce the flood and coastal erosion risk between Torcross and Strete Gate over the next 20 years. The preferred management approach is described here, split into three topics:

- Structure maintenance and modification (Section 3.6.1)
- Beach management (Section 3.6.2)
- Coastal change management and adaption (Section 3.6.3)
- Monitoring Programme (Section 3.6.4).

3.6.1 Structure Maintenance and Modification

3.6.1.1 Option 10 - Seawall (maintain, improve and upgrade existing seawalls at Torcross)

The purpose of this option is to provide a robust defence for the properties at Torcross against flooding via wave overtopping and protection of the road behind from erosion.

In developing the short-list/preferred list of options, it was recognised that the maintenance of the Torcross seawall alone does not fully address flood and coastal erosion risk at this location, and further, the wall could also be at risk from outflanking in the future. Therefore, Option 10 has been extended to include protection of the coastline adjacent to the Torcross seawall, as a means to prevent erosion of the road behind and outflanking of the existing seawall. Under current guidance, FCERM-GiA can be used for to extend the useful life of an asset beyond its original design. Therefore, funding would be sought via FCERM-GiA, as well as SHDC/DCC (Highways), to make improvements to the defences adjacent to the Torcross seawall.

(a) Maintain the Existing Seawall at Torcross

The purpose of this activity is to ensure that the existing seawall at Torcross continues to provide a robust defence for the properties at Torcross against flooding via wave overtopping and protection of

the A379 road behind from erosion. It is not anticipated that the seawall is upgraded and made higher due to landscape issues.

Future maintenance of the existing seawall will be undertaken by the Environment Agency as part of their asset maintenance programme. The timing and scale of future maintenance, improvements and upgrades of the structure should be informed by ongoing monitoring completed as part of the defence inspections completed for the BMP frontage.

(b) Existing Defences Adjacent to Torcross Seawall

Works to maintain or improve/upgrade the existing defences adjacent to the Torcross seawall should be undertaken to provide a more robust line of defence and protect the seawall from outflanking and in turn protect the road from erosion. There are four elements to this work, as outlined below.

1. Maintain Existing 23m Concrete Seawall Along Landward Edge of Slipway

Works to the maintain the existing 23m of concrete seawall that runs along the landward edge of the slipway to be undertaken to address signs of cracking and loss of structural concrete at the crest and to ensure that a consistent line of defence is provided between the northern end pf the Torcross seawall and the adjacent defences. The timing and scale of future maintenance should be informed by ongoing monitoring completed as part of the defence inspections completed for the BMP frontage.

2. Maintain Existing 60m Sheet Pile Wall at Torcross

Following emergency works in 2016, the sheet pile wall should be maintained. Future maintenance will be undertaken by SHDC as part of their asset maintenance programme. The timing and scale of future maintenance, improvements and upgrades of the structure should be informed by ongoing monitoring completed as part of the defence inspections completed for the BMP frontage. The estimated costs to undertake these works could be in the region of £250k (Dan Field, *Pers. Comms.*, 2018).

3. Upgrade and Improve Existing 60m Concrete Seawall at Torcross.

Improvements to the existing condition and level of protection provided by 60m long concrete seawall should include upgrading the wall to the same standard as the adjacent sheet pile wall to the south.

4. Upgrade and Improve 700m of Rock Revetment at Torcross

Repairs to approximately 700m of rock revetment that has become displaced along the barrier. At present, some of this rock is providing some degree of protection to the barrier from wave attack. Works are to include recovery and re-profiling of the rock, in line with the SMP2 Policy. The estimated costs to undertake these works could be in the region of £500k (Dan Field, *Pers. Comms.*, 2018).

3.6.1.2 Option 27 – Reactive Realignment & Option 29A – Reactive Realignment

The A379 road should be managed as an emergency measure in response to failure as and when it occurs. The activity can be assisted by ensuring that any necessary preliminary studies, consents and planning works are undertaken and in place, so emergency works can be undertaken as quickly and smoothly as possible.

An existing planning application has been submitted to realign the road to the north of the junction of the A379 and the road to Slapton village in anticipation of future storm damage to the road. Any further works required to implement the northern realignment should be undertaken as per the existing planning application, and as much preparatory work relating to consents, planning and funding should be undertaken from the remainder of the A379 along 'The Line' to facilitate a prompt realignment should the need arise.

Should storm damage result in failure of the road to a state that is repairable within budgets available at the time, it is anticipated that funding will be made available for reactive realignment through FCERM-GiA and DCC (Highways).

The next steps to implement this activity would be to undertake any necessary preparatory work relating to consents, planning and funding.

3.6.2 Beach Management (Undertake Periodic Beach Recycling)

Strategic movement of beach material could be undertaken to bolster areas along the beach where levels are low. Material would be moved from areas of accretion to areas of erosion periodically to raise beach levels to a healthier level and thereby provide some buffer to wave energy at Torcross and along the length of 'The Line'. Beach recycling would not provide protection to the full length of the eroding frontage.

There are many uncertainties and risks associated with recycling, including the volumes required, frequency of movement, the likelihood that the beach material will stay in place and provide a sufficient level of protection. There is no guarantee the material will stay in place, and in the absence of control structures this material could be removed in one storm. and, as the appraisal process has identified, there are pros and cons to implementing such structures.

Therefore, any planned movement would need to take consideration of observed weather patterns and their influence on beach erosion/accretion and be informed and guided by the latest beach monitoring data. Such uncertainty could also be further reduced by undertaking modelling of the beach under various weather conditions.

Beach recycling may attract some FCERM-GiA contribution if supporting measures to address outflanking of the Torcross seawall. However, if undertaken to protect the road, it is less likely to achieve FCERM-GiA funding. Therefore, in order for this option to be implemented, it recommended that funds are identified via SHDC and/or DCC (Highways) to support any FCERM-GiA that may be available.

The next steps to implement this activity would be to define better areas of accretion and erosion of the beach using the latest monitoring data and if possible reduce uncertainty through the completion of numerical modelling. Once a better understanding has been achieved, then funding could be sought.

3.6.3 Coastal Change Management and Adaption

It is evident from undertaking the Slapton Sands BMP that funding for the management of flood and coastal erosion risk at Slapton Sands is limited and that there is little that can be done to combat the effects of ongoing coastal change. Over time, the road may become irreparable and even breach. It is therefore important to formally recognise this in the immediate future and define 'The Line' as a Coastal Change Management Area (CCMA) in order to drive future coastal change adaptation efforts in the area.

In the first instance, this should include:

- Update the Plymouth and South West Local Plan (PSWLP) to include the BMP study area and the associated areas at risk from flooding and erosion within the CCMA (*as defined by Policy Dev38 and shown on SUB3 Policies Map: Thriving Towns and Villages Policy Area (South Hams), plymouth.gov.uk*).
- Prepare a Coastal Change Adaptation Plan (CCAP) for the BMP study area. The CCAP could take the form of a Supplementary Planning Document to be appended to the PSWLP as well as the BMP.

3.6.4 Monitoring Programme

In support of the preferred management approach, set out in Section 3.6, to reduce the risk of flooding and coastal erosion between Torcross and Strete Gate over the next 20 years, an ongoing comprehensive monitoring programme is required. The monitoring activities, described in subsequent sections, provide a greater level of quantitative field data to:

1. Provide information on the condition of the existing coastal defence assets.
2. Aid an improved understanding of the coastal processes operating along the Slapton Sands BMP frontage and wider coastal area.
3. Inform future management decisions.

3.6.4.1 Annual Visual Inspection

The existing coastal defences should be re-inspected regularly to ensure that they remain in good-condition and, where not, used to inform an ongoing maintenance works to improve their condition. The visual inspections should take place once every year and utilise the inspection proforma presented in the BMP.

3.6.4.2 Post-Storm Visual Inspection

Visual inspections to monitor the coastal defence assets after storms should also be undertaken since damage to the structures is most likely to occur during storms.

3.6.4.3 Defect Monitoring

When either routine inspection (such as the annual visual inspection) or rapid assessment (such as the post-storm visual inspection) identifies a defect in the coastal defence asset, be it a crack in the defence or damage to public safety aspects of the defence (e.g. buckled hand railings or trip hazards, etc.) then, whichever is relevant, increased defect monitoring or remedial works should be undertaken.

3.6.4.4 Detailed Inspection

Over a less frequent interval, approximately every five years, it is recommended that a full structural inspection of the coastal assets along the BMP frontage is undertaken.

3.6.4.5 Beach Monitoring

Beach monitoring is primarily undertaken by two parties, Plymouth Coastal Observatory via the South-West Regional Coastal Monitoring Programme (SWRCMP) and the Plymouth University. Beach profile data along the length of the Slapton Sands was collected by the Slapton Field Studies Centre over the period 1972 to 2003. However, these profiles were only sporadically collected and are no longer monitored.

Routine annual/bi-annual surveys and post-storm surveys should continue to be undertaken as part of the SWRCMP and Plymouth University. Bathymetric survey data, aerial LiDAR and aerial photography should continue to be collected via and in line with the schedule set by the SWRCMP.

3.7 Options if More Funding Becomes Available in the Future

The estimate of available funding via FCERM-GiA is based on present-day conditions, which as calculated for the Economics Baseline Report, is limited. However, it may be that in the future more funds become available to invest in coastal protection measures at Slapton Sands through the likes of third-parties, lobbying or increased funding pots etc. Considering this potential eventuality, a sensitivity test was

completed as part of the options appraisal processes to determine if there may be options, otherwise discounted from the appraisal process, that could be reconsidered in the future should more funding become available. The sensitivity test, considered a situation or 'Change in Circumstances Scenario', whereby there would be an availability of 'unlimited funds'. Following the test, six options were considered to be appropriate for the Slapton Sands BMP study area under a scenario of 'unlimited funds'. The options are summarised in Table 3-6.

Table 3-6 Options considered under a 'change in circumstances scenario'

Option Number	Option Description	PV Cost (20 year PV whole life cost)	Third Party Funding Required
16	Timber groynes (along length of beach between Torcross and Strete)	£15,954,244	£14,176,645
18	Rock groynes (along the length of the barrier)	£12,559,955	£10,782,357
22	Beach recycling (strategic movement of material along the coast, in support of beach retaining structures such as wooden groynes)	£1,278,200	Not priced
25	Beach nourishment/recharge	£8,947,399	£7,169,800
28	Pro-active realignment of the road at locations identified as 'erosion hotspots' (similar to Option 29)	£1,434,233	Not priced
29	Realignment of the A379 road, either side of the previous realignment	£1,590,128	Not priced

Considering the impacts each of the six options could have technically and environmentally, the pros and cons on coastal processes, shoreline interaction, the buildability of each option, and the impacts that they could have on the environment, there was one clear option that would be suitable technically and environmentally. This is Option 22 - Beach recycling. The key reasons for this are:

1. Improves the height and width of the beach, thereby helping to protect the A379 from erosion by providing a buffer to storm activity.
2. Works most favourably with coastal processes and recycled material can be taken from areas of beach accretion and re-placed at specific locations where beach levels are low.
3. Does not leave a legacy for future generations.
4. Relatively affordable.

SECTION 4

Next Steps

4.1 Modelling

In support of any future beach recycling along the BMP frontage, there is a need to define better areas of accretion and erosion of the beach using the latest monitoring data and if possible reduce uncertainty through the completion of numerical modelling. Once a better understanding has been achieved, then funding could be sought. It is therefore recommended that the following two linked modelling exercises are undertaken:

1. Detailed numerical modelling: this is required in order to better understand the inshore wave conditions along the length of Start Bay under different scenarios. This can then feed into detailed alongshore transport modelling which will enable the quantification of alongshore transport rates and sediment gains/losses along the bay under different wave scenarios.
2. Process-based morphodynamic modelling: this is required to fully assess the vulnerability of the barrier system, and hence the A379 road, to overwash and breaching under different wave and sea-level scenarios.

4.2 Develop Outline Business Case

To advance the recommendations made by the BMP and progress the preferred options, the next steps will be to prepare an Outline Business Case and submit it to the Environment Agency's National Project Assurance. This will include work to refine the economic case and confirmation of funding contributions.

4.3 Apply for Third Party Funding

Simultaneously with the development of an Outline Business Case, third party funding will need to be sort in addition to Environment Agency FCERM-GiA in order to make-up the difference in option costs.

4.4 Put in Place Adaptation Measures

Recognising the uniqueness of the Slapton Sands BMP study area, allowing for the fact that funding for the management of flood and coastal erosion risk at Slapton Sands is limited, adaptation measures should be implemented with immediate effect. In the first instance, this should be to:

- Update the Plymouth and South West Local Plan; and
- Prepare a Coastal Change Adaptation Plan for the BMP study area.