

Gorleston *to* Lowestoft COASTAL STRATEGY

First step in managing an important part of the coast

Strategy Document

Final



January 2016

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Introduction

Background

This Strategy covers the coastline between Gorleston South Pier in the north and Pakefield, Lowestoft in the south, and has been developed by CH2M on behalf of Waveney District Council (WDC) and Great Yarmouth Borough Council (GYBC).

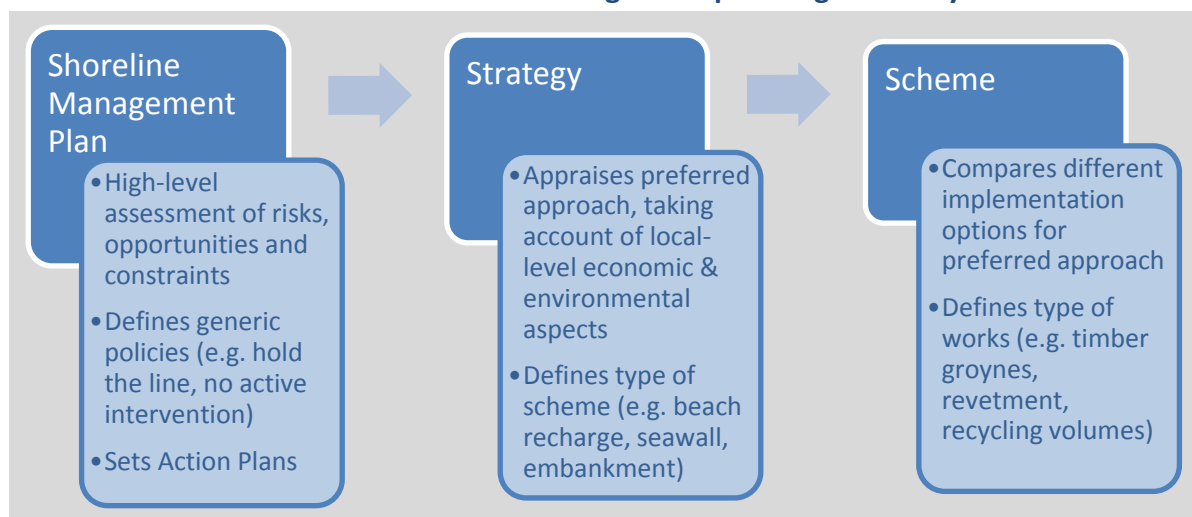
This is a highly dynamic coastline supporting a number of coastal communities and critical economic activities, with tourism a key sector. The primary risk along this coastline is from coastal erosion, with soft cliffs extending along the length of the coastline that provide little natural resistance to shoreline change. Most of the frontage is defended, but some of these defences are in a deteriorating state and are approaching or have already reached the end of their life. Without further investment, there is a risk that defences will fail, exposing coastal towns and villages along the cliff top to rapid erosion.

The fronting beaches currently play an important role in the defence system, but historically their distribution along the frontage has changed, at least partly due to the influence of a nearshore bank system on nearshore waves. This means that future management strategies need to be flexible to take account of natural changes in the coastal dynamics that may have significant impacts on the shoreline.

Coastal strategies form the second tier in the shoreline management planning hierarchy; below the high level non-statutory Shoreline Management Plans and above the local level scheme design documents. This Strategy sets out proposals for works and other management activities required over the next 5 to 10 years (to the end of epoch 1 of the Shoreline Management Plan) that are consistent with a medium and long term management framework.

The Shoreline Management Plans provide the basis for this medium to long term framework, but since development of the Shoreline Management Plans along this coastline there have been changes in both the physical dynamics of the coast and potential funding streams. On the basis of this, the Shoreline Management Plan policies have been re-assessed as part of this Strategy to ensure that the high level policies remain appropriate.

Table 1 Coastal management planning hierarchy



Structure of this document

This document presents the coastal defence management strategy and defines the recommended actions to implement the preferred approach. This document is intended to be the main reference for Coastal Partnership East in defining future management requirements and activities and for exploring future funding resources.

The Strategy Process	Explains the development of this Strategy: <ul style="list-style-type: none"> ○ describes the Strategy process ○ defines rationale behind the approach to the Strategy ○ appraises the Shoreline Management Plan policies
Strategic Plan	<div> <p>For each frontage, presents:</p> <ul style="list-style-type: none"> ○ a summary of the current situation (2016) ○ rationale behind the medium to long term strategic direction: <ul style="list-style-type: none"> - overall objective of the Strategy - planned approach - requirements & considerations ○ implementation activities (2016 -2025) <ul style="list-style-type: none"> - immediate activities - further actions </div> <div> </div>

Supporting documents

In developing the Strategy, the current situation has been fully appraised to assess: what is at risk now and in the future; the key characteristics of the coastline and how these may be affected by future management; and the costs and benefits associated with future management activities. This detailed information is available in a series of supporting documents; these, together with this report, form technical appendices to the Strategy Approval Report (StAR). The StAR sets out the business case and justification for the strategy and is required by the Environment Agency to gain approval for future schemes and help secure public grant aid monies.

Appendix A Coastal processes and shoreline behaviour (with supporting annexes)	Appendix F Economic assessment
Appendix B Assessment of existing defences	Appendix G Stakeholder engagement
Appendix C Environmental Report/ SEA	Appendix G Funding plan
Appendix D Water Framework Directive assessment	Appendix I Coastal monitoring plan
Appendix E Option development and appraisal	

The Strategy process

Overview

The primary objective of a coastal defence management strategy is to manage the risk of coastal erosion and flooding to people and the developed environment, whilst recognising possible impacts on the natural environment, potential long-term affordability and sustainability issues.

This Strategy forms the first step in establishing the future management approach of this shoreline – it is therefore important that actions in the short term are not detrimental to long term plans. The Strategy also looks to ensure an integrated approach to the management of the coastline, which takes account of how decisions in one area could affect another area. For example, there are important sediment linkages along this frontage which means that management options in one area could affect the erosion risk in adjacent areas if sediment transport is altered. There is also potential to deliver wider benefits to the Strategy area, by looking beyond individual stretches of coast.

A strategy is required in order to gain approval for future schemes and help secure public grant aid monies to contribute to the cost of defences. Economic assessment has indicated, however, that it is unlikely that any work identified by this Strategy will attract large amounts of central Government funding (referred to as Flood Defence Grant in Aid). Implementation of future options will therefore depend upon developing partnerships to source additional funds, some of which will be required in the near term and some not required until later in the Strategy timeframe. As a consequence of this Strategy a number of follow-on activities will be needed. These have been identified for each frontage and range from implementing schemes to monitoring and planning.

The role of stakeholders

To ensure that impacts to people, the local economy and the environment have been fully understood and taken into consideration, people living, visiting or working on or around the coast have been invited to take part in determining how their local coastline should be managed. This has been through advertising and making the strategy documents available on a project website, public consultation events, one-to one discussions, and the formation of a Project Advisory Group.

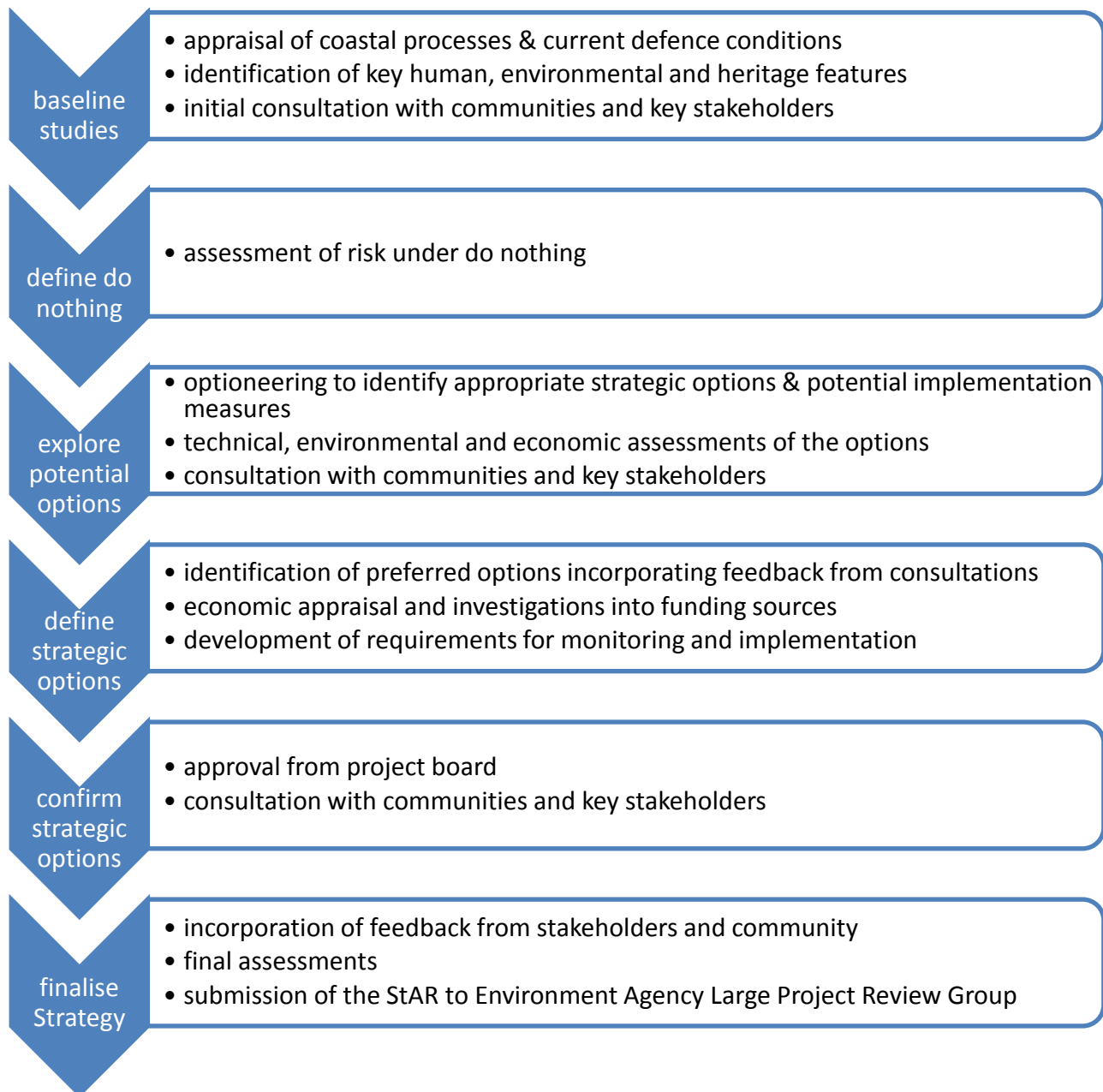
The initial public consultation was undertaken in September 2014, when the principles of the Strategy were explained. This was followed by a second 2-month public consultation between September and November 2015 to discuss the draft ideas being considered, during which a number of public exhibitions were held in the local area and consultation materials were also provided on the project website. Feedback collected during this public consultation period has been used to inform the preferred Strategy decisions. A public consultation presenting the final options was held over an 8 week period between June and July 2016.

In addition to the public consultation, individual meetings have been held with key businesses and individuals along the coast to discuss the Strategy, to learn about their aspirations and concerns regarding the future management of the coast, and to gather important evidence to support application of other forms of funding. A Project Advisory Group has also been formed of members of the community and local businesses. This has met with the Strategy team at key stages and has provided invaluable and focussed steer to the Strategy development.

Specific details are included in [Appendix G Strategy engagement and consultation](#).

Steps in the Strategy process

The following flow diagram summarises the key steps in the strategy development:



Approach to development of the Strategy

Development of this Strategy has involved consideration of the constraints and opportunities, reflecting the community aspirations, coastal dynamics and funding.

A key task has been a review of the existing policies for future shoreline management, as proposed by the Shoreline Management Plans. The rationale for this review is presented in a following section, but the changes in the coastal environmental, shoreline dynamics and funding that have occurred since these policies were set are also relevant to the concepts discussed below.

Community aspirations

A key aspect of this Strategy has been working with communities and key stakeholders along the coast to ensure that the strategy best meets their needs. Feedback from the stakeholder consultations has highlighted that the primary aspiration along the Strategy frontage is for continued protection of community and business assets to provide increased long term security and certainty. A secondary aspiration is for better beaches and improved beach access to and along the frontage.

As the first step in establishing future management of this shoreline, the Strategy sets the measures required to deliver a local community and business-driven Strategy, which will provide continued protection of community and business assets. Delivering this Strategy will, however, also depend upon the establishment of a funding plan. This is discussed below.

Coastal dynamics and implications for defence strategy

Along the Strategy coastline there are significant sediment linkages and evidence indicates that there is currently a fairly constant volume of sand and gravel held within the beach system. As well as the obvious recreational benefits of a beach, the presence or otherwise of a beach along a frontage defines the type and extent of any interventions required to provide defence to that frontage, and therefore has a major influence upon the cost of defence. Where beaches are high and wide, they provide significant protection to a seawall by reducing or eliminating wave impact. This means that current seawalls may only require maintenance and relatively inexpensive measures to continue to protect an area. Where beaches are narrow, there is a greater impact from waves on the seawall and this can result in the need for a higher structure, additional protection to bolster the defence, or even require a new seawall to be constructed to maintain levels of protection.

History has shown that beaches along the Strategy frontage have changed dramatically in the past, as a result of beach sediment moving from one area to another, and are expected to continue to do so. This means that at different times, certain frontages have both received protection from a wide beach, and been highly exposed. The problem recently experienced at Children's Corner, Lowestoft South Beach, where a formerly healthy beach has disappeared, is a good illustration of this issue, as is Gorleston where a healthy beach has recently accumulated along what was previously an exposed and vulnerable seawall. Further information is included in [Appendix A Coastal processes and shoreline behaviour](#).

In deciding how to manage the Strategy frontage in the future, different conceptual approaches have been considered. One conceptual approach is to strictly control the alongshore movement of the limited material forming the beaches, making sure a beach is held in areas of greatest need (concept 1). Another conceptual approach is to allow the sand and gravel to move freely without constraint along the shoreline, with beaches able to build and erode as nature determines (concept 2).

Concept 1 would involve the construction of cross-shore structures such as groynes, reefs/hard points and artificial headlands, which are designed to restrict the movement of beach sediment both alongshore and on-offshore. This approach would result in a series of cells or bays being created. Beach material would continue to move within these areas, but there would be limited movement of sediment beyond the limits of the cells. This may require higher initial investment to establish all of these controls, but would create a fully managed system. A piecemeal approach to future management would be avoided, but this approach would require coordination between all stakeholders to be successful.

Concept 2 would mean that beach material would be able to move freely in response to the waves and tides, with areas of beach growth or loss determined by natural processes. Where defences are needed to protect assets, these would have to be linear shore-parallel defences, such as seawalls and rock revetments, which do not disrupt alongshore transport. Defence provision under this concept would typically be more reactive rather than proactive, meaning defences would only be constructed or improved because the beach is inadequate to provide the necessary level of protection. Consequently, the initial investment is likely to be lower, as works will only be undertaken once absolutely necessary. However, on a coastline such as this, where natural changes in processes are likely to occur again in the future, the actual spend in the long term may be much greater.

It is possible that under concept 2, money would be spent on defences which subsequently become redundant due to the natural return of a beach, or that more money is spent on building larger defences along frontages because there is no beach. This concept will lend itself to a piecemeal approach to coastal defence, but it should also be noted that those defended areas could themselves become promontories that begin to disrupt the natural movement of material and exacerbate erosion elsewhere, increasing costs further. Overall, there is much less certainty with concept 2 than concept 1.

A third approach is to provide linear defences throughout. Without some form of beach control measures, it is, however, likely that with sea level rise a continuous solid reflective barrier along the coast would eventually lead to the complete loss of beaches throughout the majority of the frontage. There is a risk that concept 2 could also result in a defence system not dissimilar to this.

Based on available evidence on coastal dynamics concept 1, which involves controlling the movement of sediment along the frontage, is considered the best mechanism for delivering the community and business aspirations. By setting out a coordinated approach to management along the shoreline the Strategy will also provide a framework within which privately funded works can be undertaken by private landowners that would be more difficult to achieve through concept 2.

Funding and its influence on defence strategy

Any works undertaken to implement the Strategy rely on availability of funds. The funding from central government for managing flood and erosion risk in England is known as 'Flood Defence Grant in Aid' or 'FDGiA'. The amount of Flood Defence Grant in Aid available for a particular scheme takes into account the number of households protected, the estimated value of damages being prevented and the other benefits a particular project would deliver, such as environmental improvements.

Until recently central Government would provide 100% public funding for schemes, but only those schemes which were determined to provide the best economic benefits received this funding. Other schemes that still had a positive benefit to cost ratio, but fell below the thresholds that budgets could cover, received no funding. A change to the funding rules means that partial funding is now available, where schemes with external contributions and which demonstrably deliver wider outcomes are looked on more favourably: this is referred to as Partnership Funding.

The calculation of Flood Defence Grant in Aid available is explained the box below. As a minimum, in every case it must be demonstrated that in present value terms the expected whole-life benefits exceed the whole-life costs of the scheme. There is also a finite amount of funding available from the Government, with schemes offering greater benefits more likely to secure national funding.

In calculating the amount of Flood Defence Grant in Aid available, there are four categories of benefits (or Outcome Measures) that can be counted:

- All benefits arising as a result of the investment, less those valued under the other outcome measures, for example economic damages avoided to business premises, agricultural land, infrastructure and other assets (Outcome Measure 1)
- Households moved from one category of flood risk to a lower category (Outcome Measure 2)*
- Households better protected against coastal erosion (Outcome Measure 3)*
- Statutory environmental obligations met through flood and coastal erosion risk management (Outcome Measure 4).

**To be counted, households must be permanent dwellings built before 2012, not temporary or seasonal accommodation including mobile or static caravans.*

The maximum amount of funding for a project is based on multiplying each of the measures above by a set of payment rates, which are fixed amounts of national funding per unit of outcome or benefit achieved.

The works required to deliver the Strategy for this coast **will not be eligible for full funding from Flood Defence Grant in Aid**, but projects may qualify for partial funding and still go ahead in time if other funding can be found to meet the remainder of the cost. For example a project qualifying for 70% national funding may still go ahead if costs are reduced by 30%, a 30% contribution is available, or a combination the two.

If a scheme qualifies for partial funding, communities and local partners can decide what to do. By knowing the potential future costs of works, mechanisms to secure funding streams can be developed. Potential funding sources include:

- 'Local Levy' funding from Regional Flood and Coastal Committees
- Local businesses and property owners
- Community groups (including Parish Councils)
- Local Enterprise Partnerships (LEP)
- Others who would benefit from the scheme.

There are also going to be areas along the coast where it is **unlikely that a project would qualify for partnership funding**, so any works will need to be funded entirely by external contributions.

If funding is available

The option presented for each frontage represents the preferred approach to deliver a local community and business-driven Strategy. The overall objective of the Strategy is to continue to maximise protection of cliff top assets through retaining beaches, where beaches are currently full, and improving defences elsewhere.

Although some areas should qualify for partial funding, public money for potential schemes is not guaranteed. If contributions from non-Government sources can be secured, the chances of getting defences built during the time periods recommended in the Strategy will increase substantially.

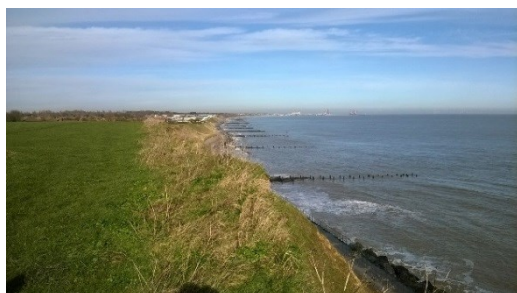
Frontages along Gorleston and Lowestoft are most likely to attract Flood Defence Grant in Aid funding, but even here they may not be prioritised over other schemes nationally unless contributions can be secured. For other frontages, such as Corton, defence schemes have much less chance of receiving Flood Defence Grant in Aid but remain appropriate schemes as long as

external contributions and funding partners can be identified. At Hopton, current defences should ensure protection to this stretch of coast through to at least the medium term, without significant maintenance, whilst there is no immediate threat to residential properties at Pakefield.

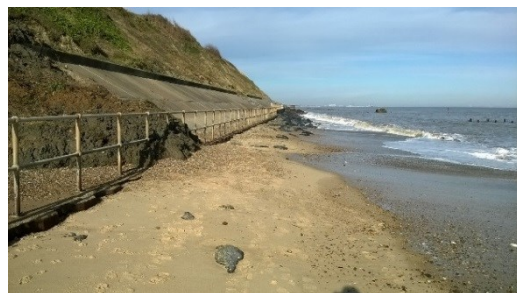
Along the less developed stretches of this coastline, for example between Gorleston and Hopton, and Hopton and Corton, the preferred approach is to allow some retreat of the coastline, to improve beach retention and create recreational opportunities. Although the benefits of schemes to achieve this along these sections are not directly attributable to the area behind, the preferred Strategy for these locations can potentially play an important role in supporting wider initiatives such as regeneration of Gorleston and Lowestoft, and also provides opportunities to improve coastal access, health and recreational aspects for the community which must be considered during the development of the wider strategy.

If little or no funding is available

If funding is not forthcoming, with only some frontages being defended this will become an increasingly fragmented coast, with no management of the finite sediment reserves. The need for future works will depend upon the state of the beaches along the frontage, but without measures to control sediment movement there will be more uncertainty regarding the future security of the developed frontages.



It is likely that the frontages of Gorleston, Lowestoft North Denes and Ness and Lowestoft South Beach would continue to be protected, but this may not be through undertaking works to either retain/ manage the beaches or improve defences. Instead, if the beach levels deteriorate along these frontages, the likely approach will be to undertake reactive management to secure sections of wall as they become vulnerable. The works are likely to involve repair of the current wall and toe protection, as has recently been undertaken along South Lowestoft Beach.



This means that although it will be possible to implement the Shoreline Management Plan policy of Hold the Line along these frontages, the approach is likely to be piecemeal, in response to the shifting beaches. The sustainability of this approach will depend upon the changes in beach levels over time; should low beaches persist along particular frontages, then it may become increasingly difficult to maintain the current seawall through minor works. There may be increased health and safety risks to beach users along both the beaches and promenades, requiring access to be restricted. This approach may also limit opportunities for regeneration due to reduced certainty over the future.



Elsewhere, the lack of funding may result in a change to a policy of no active intervention (or managed realignment) and an increased risk of defence failure. Ultimately this could result in losses of cliff top assets and long term uncertainty for communities. Unless funding can be found to remove the failed defences, these will remain in a derelict condition along the foreshore presenting an eyesore, health and safety hazard and restricting beach access.



Review of the Shoreline Management Plan policies

The Shoreline Management Plans form the framework for future management and a key stage in strategy development has been appraisal of the policies set at Shoreline Management Plan level.

There have however been changes in both the physical coast and economic justifications since the Shoreline Management Plans were developed, which has required the rationale behind Shoreline Management Plan decisions to be re-appraised.

Shoreline Management Plan Policies

Two Shoreline Management Plans cover the Strategy frontage: Shoreline Management Plan 6 (2012): Gorleston to Lowestoft Ness; Shoreline Management Plan 7 (2010): Lowestoft Ness to Pakefield. These Shoreline Management Plans proposed the following policies:

	From present day (to 2025)	Medium term (2025 – 2055)	Long term (2055 – 2105)
Gorleston	Hold the line through maintaining and, if necessary, replacing existing defences	Hold the line through maintaining, replacing and upgrading existing defences	Hold the line through a more substantial defence
Gorleston to Hopton	Managed realignment - do not maintain or replace defences, but minor short term works possible whilst social mitigation measures established	No active intervention	No active intervention
Hopton	Hold the line through maintenance of the existing defences until they reach the end of their effective life	Managed realignment - allow the coast to retreat, but minor short term works possible whilst social mitigation measures established	Managed realignment - allow the coast to retreat
Hopton to Corton	Managed realignment – do not maintain defences but allow defunct defences to be	Managed realignment , until all defunct defences have been removed, in which case	No active intervention

	managed (but not replaced)	the policy will change to no active intervention	
Corton	Hold the line through maintenance of the existing defences (but not replaced)	Managed realignment - allow the coast to retreat, but minor short term works possible	Managed realignment - allow the coast to retreat, but minor short term works possible
Corton to Lowestoft	Managed realignment - allow the coast to retreat, but manage risk to oil deposits	No active intervention	No active intervention
Lowestoft North (to Ness Point)	Hold the line through maintaining and if necessary replacing existing defences	Hold the line through maintaining, replacing and upgrading existing defences	Hold the line through a more substantial defence
Lowestoft Ness to Outer Harbour	Hold the line through maintaining existing defences	Hold the line through maintaining existing defences	Hold the line through improving all defences and raising defences in line with sea level rise
South Lowestoft to Pakefield Road	Hold the line through maintaining and repairing existing defences	Hold the line through maintaining and if necessary repairing or replacing existing defences	Hold the line through maintaining repairing existing defences
Pakefield	Hold the line through maintaining existing defences	Hold the line through maintaining and reinforcing defences as required	Managed realignment
Pakefield cliffs	No active intervention	No active intervention	No active intervention

To the **north of Lowestoft Harbour**, the key rationale behind the policies set by Shoreline Management Plan 6 was two-fold:

- 1) No economic justification for maintaining or replacing defences along the villages of Corton and Hopton beyond the first epoch.
- 2) The vision of creating a more naturally functioning coast through allowing release of sediments from cliff erosion and improving sediment links through enabling the coast to return to a more natural position. The idea was that implementation of the Shoreline Management Plan policies would, in the long term, result in realignment of the coast at Hopton and Corton and cliff erosion along the whole stretch between Gorleston and Lowestoft. The Shoreline Management Plan stated that *“The key to more sustainable management of Corton and Hopton, that will not accelerate erosion at Lowestoft, is to allow the shoreline to retreat to its “natural” position, in line with the coast to the north and the south, thus ensuring a sediment supply to support a beach”*.

To the **south of Lowestoft Harbour**, the key rationale for policies set by Shoreline Management Plan 7 was for continued protection of the South Lowestoft frontage as it provides significant economic benefit: *“There is a continuing reliance on defence but this is outweighed in favour of meeting the fundamental needs of the area”*. The Shoreline Management Plan recognised the importance of considering the whole frontage from Lowestoft to Pakefield with Pakefield Road headland considered a strong point as part of the defence of the whole frontage.

North of Lowestoft Harbour

Since adoption of Shoreline Management Plan 6 in 2012, there have been significant developments which affect future management decisions along the coast **north of Lowestoft Harbour**, namely:

- 1) change in funding rules
- 2) private construction of defences (and Great Yarmouth Outer Harbour)
- 3) change in coastal dynamics

Change in funding rules: A key constraint on the policies set at Shoreline Management Plan stage was the definition of economic and socio-economic benefits on the basis that schemes would be fully funded by the government, but only if they were shown to provide the best economic benefits.

This meant that hold the line policy could only be implemented when it was considered economically viable, following treasury rules (using Treasury Green Book, the Environment Agency Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM - AG) and Flood Defence Grant in Aid (FDGiA) guidelines). Under these guidelines the economic analysis focusses on valuing domestic and commercial properties and does not take into account wider economic aspects, such as tourism revenue.

There have been recent changes in the way that government money is allocated to flood and coastal erosion risk management projects in England, with the introduction of Defra's partnership funding policy in England in 2011. This means that the central Government will now only contribute *some* of the costs of a scheme or project, but more schemes will be considered.

Additional money needs to be contributed by others, this might be through using council funds or through encouraging investment from businesses. This approach also encourages greater involvement from the potential investors, which could include businesses and communities along the coast, with the wider benefits being used to justify implementation of works.

This means that policies that were previously rejected as being not economically viable, may now potentially be possible through private investment (subject to planning and environmental regulations).

Private construction of defences: In terms of shoreline structures there have been two major changes along the shoreline since the Shoreline Management Plan was first developed:

- construction of the Great Yarmouth Outer Harbour
- construction of privately funded defences at Hopton

The **Great Yarmouth Outer Harbour (GYOH)** was constructed in 2007-8 immediately to the north of the Strategy frontage. The GYOH breakwaters form a substantial seawards extension to the structures at the mouth of the Yare, with the potential for consequential impacts on coastal processes in the vicinity, which needed to be considered in the Strategy review. There remains disagreement between various parties involved as to the impact (or otherwise) of the GYOH on the Strategy frontage. However, as discussed below, construction of the harbour has coincided with a change in the sediment transport regime, which, at least in the short term, challenges one of the key technical/ environmental rationale in Shoreline Management Plan 6 for allowing erosion of the coastal frontages at Hopton and Corton.

At **Hopton**, new rock revetment and rock groynes were completed in 2014 along this frontage to provide protection for at least 30 years; these were paid for entirely by Bourne Leisure Ltd to

protect their substantial leisure park assets along the cliff top. The Shoreline Management Plan policy was for Hold the Line along this frontage, but for the short term only, through maintenance of existing defences. Therefore although in-keeping with the policy headline, these new defences do not align with the intention of the Shoreline Management Plan, which was to promote managed realignment of this coastline in the medium term onwards.

These defences should provide protection to both cliff top assets and the wider community of Hopton at least into the medium term and have therefore met the aspirations of the local community. The benefits of maintaining the defences therefore currently outweigh the benefits of removing them and it is therefore likely that they will remain for several decades to come. The decision here does however have consequences for management decisions along the rest of the Strategy frontage:

- development of a promontory here may potentially diminish sediment linkages along the coast, especially should trends of sediment movement change again, with a risk of outflanking at the end of the defences
- over a kilometre of cliff (and source of new sediment) has now been effectively been removed from the coastal system – this starts to challenge the concept of a naturally functioning, fully linked system between Gorleston and Lowestoft as sought by the Shoreline Management Plan
- if private funding can be sought, it is difficult to exclude the potential to continue to hold Corton on the basis of environmental and technical arguments alone, given the social benefits this approach would provide.

Change in coastal dynamics: At the time that the analysis of coastal processes was undertaken, it was generally accepted that despite large gross rates of littoral sediment transport in both directions along this shoreline, the net drift was southwards. Evidence suggests that this net drift direction has changed to northward movement, since at least the mid-2000s, between Corton and Gorleston. Beaches at Gorleston are now significantly larger than they were, with depletion of beaches north of Corton having taken place over the same time period.

Under the present regime any sediment released from cliff erosion between Gorleston and Hopton would be moved northwards to feed the already substantial beaches at Gorleston. This therefore challenges the rationale presented in the Shoreline Management Plan that allowing the frontages of Hopton and Corton to also erode would have the wider benefits. However, over the longer time frame, there may still be value in this concept. Analysis of beach profile data, as part of this Strategy, suggests that there may be a fairly constant volume of sediment moving within the beach system between Gorleston and Lowestoft; any addition of sediment could therefore be beneficial to the system as a whole, particularly under a future of rising sea levels. It is also likely that there will be future changes to sediment trends along the frontage, resulting in beaches that are currently building starting to deplete. Further information is included in [Appendix A Coastal processes and shoreline behaviour](#).

South of Lowestoft Harbour

Shoreline Management Plan 7 recognised the issues related to retaining the full amenity area of South Beach due to the potential longer term loss of the beach related to cyclic variation in the configuration of the sand banks.

Although along the frontage the long term policy is for hold the line, the Shoreline Management Plan also recommended that long term plans should include measures to maintain the potential

for set back in the northern corner through current planning, or consideration of enhancing cross-shore structures to maintain beach.

Since the Shoreline Management Plan, the northern end of South Lowestoft beach has depleted further, whilst beach levels at and south of Claremont Pier are much higher than previously. Storms in 2013 resulted in the need for urgent works along the frontage to bolster defences at the northern end.

The policies proposed by the Shoreline Management Plan remain valid, dependent upon finding funding sources.

Strategic Plan

The following sections set out the plans for the Strategy frontage.

To enable the development of options that take account of local variability in risk, benefits and opportunities, the coastline has been split into units, which are discussed in turn. This has not precluded the consideration of sediment linkages across the entire frontage and possible cross-boundary benefits. Where works are required to minimise the risk of outflanking, but which extend beyond the boundaries of the unit, these are also clearly defined.

Each section includes the following:

Shoreline Management Plan policy	Defines current Shoreline Management Plan policy, intent and how the Strategy will implement this. Where a change in policy is considered appropriate, this is discussed
Current situation	Summarises the key assets, coastal processes and current defence condition, based on information gathered as part of the baseline studies
Stakeholder community aspiration	Key feedback from the stakeholder engagement
Strategic direction	Defines the key objective and vision of the Strategy and the approach to achieving this. Illustrations of how implementation of the Strategy could look are included. Additional requirements and considerations are discussed, and this section highlights when activities will be affected by management elsewhere. The estimated costs of the works are identified.

Implementation Sets out the activities required over the next 10 years. At this point the Strategy is likely to be reviewed and updated, taking account of monitoring information and subsequent developments.

In some cases these activities will need to be undertaken by the Local Authority, but in other cases it may be the responsibility of the private developer or land owner.

Immediate activities: these are actions to commence (or continue) with immediate effect, and are defined as:

	Monitoring		Health and safety		Funding
	Essential works		Planning		

Further details on monitoring are provided in [Appendix I Coastal Monitoring Plan](#)

Further actions: this section discusses actions that may be necessary in the future, depending upon condition of the beach and funding availability.

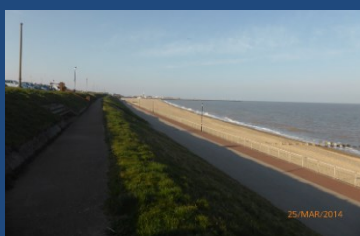
Gorleston

The Shoreline Management Plan policy (adopted 2012) for this frontage is hold the line through to the long term. This policy supports the maintenance, and if necessary the replacement, of existing defences to protect all properties and associated infrastructure. Implementation of the preferred Strategy is consistent with this policy.

Current situation (2016)



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Key assets

Gorleston is an important economic centre, with tourism a crucial business sector. The pier and beach are key attractions; other assets are located along, and inland of, the promenade.

Coastal processes

A wide beach currently exists along most of this frontage. The beach narrows towards the southern end but is still presently high enough to cover the existing timber groynes.

The beach has grown substantially since the last strategy. This is due, at least in part, to a change in the net sediment transport direction. The net sediment drift direction is northwards at present.

Historically the beach level has changed dramatically, and there is a potential risk that this could be repeated in the future, although some evidence suggests a more permanent trend has been influenced by the construction of the Great Yarmouth Outer Harbour.

Defences

The entire length is backed by concrete seawalls, bolstered by a rock toe in parts; this was placed when beach levels were extremely low. The condition of the walls is generally poor, so the beach currently provides a vital role in the coastal defence system.

Stakeholder community aspiration: ensure protection to all assets within Gorleston; retention of the beach

Strategic direction

Objective: The vision for Gorleston is to provide primary coastal defence through retaining a wide beach along the entire frontage.

Any loss of the beach in the future would expose the existing seawalls which are known to be in poor condition, and so to hold the line in future will require substantial new works if the beach levels fall below a certain point. Retaining a beach also offers considerable opportunities for recreation and tourism; such as potential rejuvenation of tourist facilities along the esplanade area at the northern end.

Approach

The approach to retaining this beach depends upon prevailing sea conditions and resultant sediment movement. Whilst the beach remains wide and high no intervention is required. Based upon current trends and knowledge there is a good probability that this will remain the position for most of this frontage over the next decade, with only the southernmost section being potentially vulnerable to narrowing.

Should the beach start to reduce in size, such as due to a reversal in net sediment drift direction, then action will be required to retain sufficient sand to maintain protection to the seawalls. Under those circumstances the preferred approach is to restrict sediment movement along the beach with a headland structure such as a long fishtail rock groyne at the southern end of Gorleston.

This would encourage growth and stabilise the beach along the southern end of the Gorleston seawall, where the beach is currently narrowest, and also provide protection to the end of the seawall and properties behind from any outflanking cliff erosion along the Gorleston to Hopton frontage.

In the longer term, should there be pockets of erosion and accretion along the Gorleston frontage it may be necessary to manage the movement of sand either through the introduction of a few intermediate rock or timber groynes to ensure minimum beach levels are achieved, or through some recycling operations.

With the headland in place however, those additional works are not expected to be a requirement in the next 20 years. The precise nature of any further activities, if required, would be a matter for a scheme stage assessment at that time.

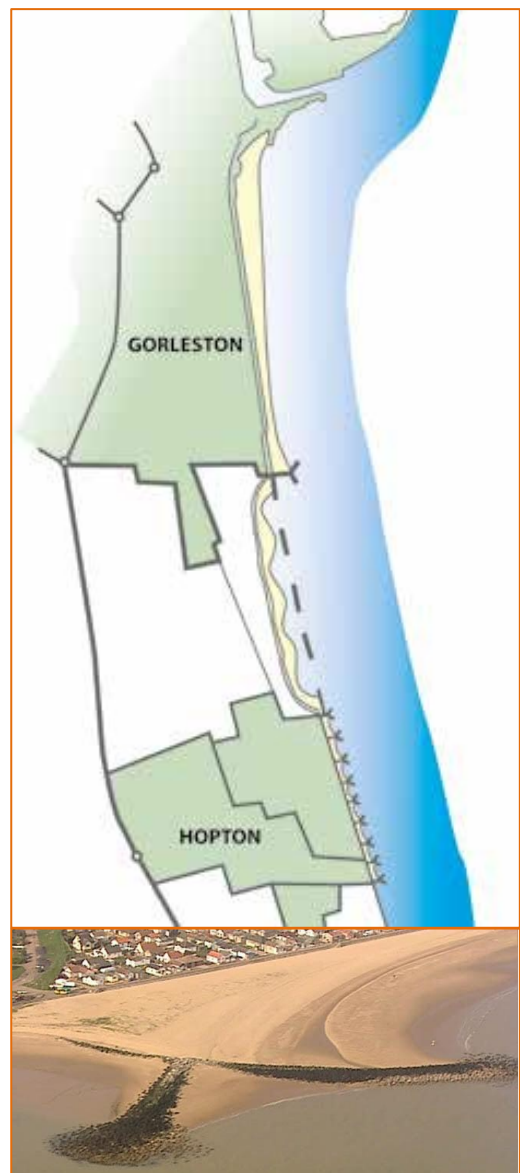


Illustration of how the proposed approach could look

Requirements/Considerations

Based upon present processes and considering the potential for any changes in those, it is anticipated that the seawalls at Gorleston would not be at risk within the next 10 years. However, the southern end may become under increasing pressure before this as the defences along the cliffs to the south fail or require removal.

There are distinct advantages to being proactive and constructing the headland structure ahead of this occurring and before the Gorleston beach experiences any deterioration.

Actively retaining the beach earlier would also provide full security to the people of Gorleston and a high degree of certainty for any potential investors in that area.

The design of the headland should both:

- retain the beach sand in front of Gorleston
- control erosion along the area directly to the south so that outflanking of the Gorleston seawall does not occur. This will protect properties at this southern end of Gorleston from erosion.

To achieve this, extending a structure slightly south of the end of the seawall should be considered. Encasing part of the timber revetment is also an option (as is the preferred approach along the Gorleston to Hopton frontage).

These works should be planned and timed to be complimentary to the approach adopted along the Gorleston to Hopton frontage.

To address any potential issues of sand retained along the Gorleston frontage not returning to beaches further south, the possibility of sand recycling, occasionally extracting some material from the Gorleston frontage and transporting to beaches to the south, should be considered at scheme design stage. The need for this measure will be informed by monitoring but is not expected to be a requirement within the next 20 years.

Estimated costs: £8 to 10M costs over the next 100 years, including works to protect the southern boundary, with approximately £5 to 6M spend on construction work in the first 10 to 20 years (depending on beach behaviour).

Implementation (2016-2025)

Immediate Activities

The immediate activity is to monitor and appraise any need for action.



- Use Coastal Monitoring Plan and defined triggers to guide future monitoring and indicate the need for advance planning of works.
- Monitor regularly against these triggers for action.



- Establish funding plan for headland construction for when required.

Further Actions

In addition to the above activities, there are two potential courses of action required depending on whether the high beach at Gorleston remains, or whether a reversal in the net drift direction occurs, resulting in erosion and loss of beach.

Scenario 1: High beach (most likely)



If monitoring indicates no deterioration in beach to defined action levels, then:

- Carry out annual visual inspections of visible structure for signs of wear and tear to the concrete walls, upper slope revetment and promenade, including any safety hazards.
- Patch and repair any degradation/damage of seawall if required.
- Maintain promenade surface to a public footpath standard, sealing joints and resurfacing as required.

Scenario 2: Low beach (unlikely in next 5 years)



If monitoring indicates deterioration in beach to defined action levels, then:

If Partnership Funding is available:

- Secure the funding contributions to enable works to proceed (including any application for Flood Defence Grant in Aid, which will likely require the production of a business case).
- Undertaken design of new headland.
- Obtain necessary permissions and construct.

If Partnership Funding is not available:

- Identify key areas for concern, based on annual inspections and consider remedial measures (see [Appendix B: Assessment of Existing Defences](#)).
- Engage with local community on potential impacts and ways forward.
- Identify what can be achieved with available funds.
- Make further applications for funding, if valid – this will determine future actions.

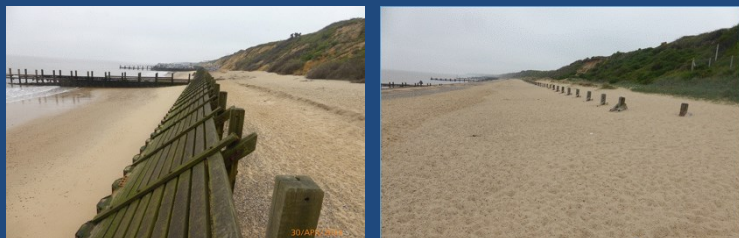
Gorleston to Hopton

The Shoreline Management Plan policy (adopted 2012) for this frontage is for managed realignment in the short term, moving towards no active intervention in the long term, with possible implementation of minor works in the short term to slow erosion and allow social mitigation measures to be established. The principle behind the Shoreline Management Plan policy is to allow the release of sediment to the system, whilst ensuring that a new promontory is not formed along the coast, which could affect the longshore distribution of beach sand. The preferred policy is in accordance with this principle, though looking to slow rather than halt erosion recognising the implications for the golf course.

Current Situation (2016)



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Key assets

Gorleston Golf Club is the main asset along the frontage. Developments along the northern and southern boundaries require those defences to extend along part of this frontage to ensure no outflanking occurs.

Coastal processes

Along the southern section of this frontage the beach has narrowed since the last strategy. There has been a drop in beach levels along the defence line, particularly along the southern section.

The net wave-driven sediment drift is northwards, which is a change from the direction observed at the time of the Shoreline Management Plan. Sand from this frontage is therefore moved northwards at present.

Defences

This frontage has been defended by timber revetments, supported with a steel sheet piled toe. These are increasingly becoming at risk of failure due to the loss of fronting beach.

Access along this frontage behind the existing structures is becoming increasingly hazardous at higher water levels, particularly when there is some wave activity.

Stakeholder community aspiration: continue protection of the Golf Club to allow time for relocation of course inland; improve accessibility along frontage; minimise risk to properties along edge of Gorleston

Strategic direction

Objective: the vision is to promote beach development and improve beach accessibility and safety, through allowing some erosion of the cliffs.

Construction of defences will require private investment as there are insufficient benefits to attract Government funding. Similarly, removal of defences does not attract Government grants and will need to be locally funded.

Approach

Simply allowing defences to fail will diminish coastal accessibility and they will become an eyesore and a health and safety risk to the public. Introducing measures to allow limited erosion will both promote beach development and reduce extent of risk to the golf club.

Hold the line is not an option for this frontage: the current alignment is not sustainable and would not achieve the strategic vision of improving the beaches. Therefore building reinforcing or replacing the current defences, like for like, is not proposed. Whilst No Active Intervention may become the default position, should funding not be sought, this is not the most appropriate option for the following reasons:

- as defences fail they will become hazardous and unsafe. Although elements of the structures would be destroyed, sections of steel sheet piling are likely to remain
- this will reduce accessibility along the frontage and may mean sections of the beach will need to be closed for health and safety reasons
- the shoreline could remain inaccessible for many years (estimate up to two decades)
- the un-managed deterioration and break up of these structures will require an ongoing clear-up operation to remove steel and timbers that could be washed away and pose a hazard to beach users elsewhere, and a navigation risk to local craft.

Managed realignment therefore represents the best option. Subject to funding, the preferred approach is to create a series of hard points to provide intermediate controls on erosion. This will reduce the extent of land loss along the golf course and will also promote development of safe and accessible beaches. These hard points would take the form of encasing selected lengths of the existing structures within rock bunds.



Illustration of how the proposed approach could look



Requirements/Considerations

Even if funding is not available to construct the hard points, the removal of defences remains the recommendation. It is more cost-effective to remove existing defences whilst still accessible by land-based plant, however consultation with Gorleston Golf Club has highlighted concerns regarding the timing of defence removal.

For this reason, it is recommended that approaches which involve the later removal of defences are considered, supported by a programme of monitoring and regular liaison with the Golf Club. Erosion beyond the northern and southern limits of this frontage, which would potentially affect property in Gorleston and Hopton respectively, will be prevented through any 'beyond-boundary' mitigation in the form of extension of the works along these areas (in place or proposed). There therefore needs to be a co-ordinated approach to management to ensure compatible timings of activities.

Estimated costs: Approximately £4M costs for works to construct hard points, all anticipated to be undertaken within the first 10 years.

Implementation (2016-2025)

Immediate Activities

The immediate activity is to monitor and appraise the optimum timing for action.



- Use Coastal Monitoring Plan and defined triggers to guide future monitoring and indicate the need for advance planning of works.
- Monitor regularly against these triggers for action.
- Regular visual inspections of the structures to assess deterioration and failure potential.



- Produce plans for removal of redundant structures:
 - include an ECI-developed detailed estimate of costs for removal operations.
 - identify the optimum time for removal of structures.
- Consult with Gorleston Golf Club on future plans to align future management activities with their timescales, if possible.



- Explore funding sources and establish funding plan for construction of hard points.

If this is not achievable:

- Establish funding plan for removal of defences alone.

Further Actions

There are two possible scenarios which require different responses. The monitoring carried out as part of the Immediate Activities informs the appropriate course of action.

Scenario 1: High beach



monitoring



essential works



health & safety

If monitoring indicates improvement in beach above action levels, such that life of the defences might be extended to between 5 and 10 years, then:

- Carry out regular visual inspections of visible structure for signs of wear and tear.
- Annual structural maintenance to include:
 - check and tighten fixings as required
 - replace rot-affected timbers
- Make good or prevent access to steps over the revetment for safety reasons.

Scenario 2: Low beach (most likely)



funding



planning



essential works



health & safety

If monitoring indicates no improvement in beach, then:

If Partnership Funding is available:

- Secure the funding to enable works to proceed.
- Undertake design of scheme, including design of rock bunds and defining lengths of defence to be removed.
- Obtain necessary permissions.
- Construct rock bunds and remove all remaining lengths of existing timber and steel defence structures.
- Provide safe access routes from cliffs onto the beach.

If Partnership Funding is not available:

- Block public access along the foreshore/foot of the cliffs and investigate re-routing of the coastal access path.
- Recover failed structural elements from foreshore and nearshore before they become a safety hazard (ongoing commitment).
- Investigate any sources of funds to remove remaining steel and timber sections and implement if and when obtained.

Hopton

The Shoreline Management Plan policy (adopted 2012) is for hold the line in the short term, through maintenance of existing defences, moving towards managed retreat in the medium and long term.

However since the Shoreline Management Plan privately-funded works have been constructed along this frontage, which with minor maintenance should ensure protection to this stretch of coast through to the medium term and possibly beyond. There would be little benefit to the coastal community of removing these defences, therefore the preferred policy is now to maintain the existing defences for as long as possible to hold the line. This is in accordance with the Shoreline Management Plan policy for the short term, but requires a change to the Shoreline Management Plan policy for the medium to long term. A change to the Policy Unit is being consulted upon as part of the strategy development process.

Current Situation (2016)



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Key assets

Much of the coastal frontage at Hopton is occupied by Hopton Holiday Village, with a number of residential properties at the southern end of the village. The heart of the village is set back from the cliff edge. Further south is a second leisure park: Potter's Holiday and Leisure Centre. The Potter's company also owns land to the south, up to and including the site of an old radar bunker which is believed to contain asbestos and is therefore a potential hazard.

Coastal processes

Failure of the defences in 2013 resulted in a stretch of the soft cliffs eroding before stabilisation works were introduced. The beach had been narrowing, linked to a change in the sediment transport trend, which now moves sediment from this frontage northwards, feeding the beaches at Gorleston. Some beach recovery has occurred since completion of the recent defence scheme, but it is unlikely that substantial beaches will develop under the current conditions.

Defences

New coastal defence works were constructed in 2014: rock revetment along the cliff-face of the northernmost section, and a rock toe along the front of the concrete and steel sheet piled wall to the south of this. The full length is also fronted by rock groynes designed to help retain a small sand beach. Plans to extend with similar works southwards to the district boundary have been recently approved and are expected to be constructed during 2016.

Stakeholder community aspiration: continued protection to Hopton; better beach access along the whole coastal frontage; extension of defences southwards; change to Shoreline Management Plan policy

Strategic direction

Objective: the vision for Hopton is to enable continued protection of the village and community assets, together with the cliff top leisure facilities

The objectives for this frontage can be achieved through maintaining the current and recently approved defences. As the primary protection afforded to these works is the leisure parks it is unlikely that such works would attract any government funds, therefore it is assumed that maintenance and repairs would be undertaken privately.

Approach

Although designed to provide 30 years of protection, the existing defences are likely to remain intact or at least provide a substantial buffer to erosion beyond that time. It is not expected that works to bolster or enhance the defences would be required within the next 20 years. Maintenance works may be required during this time, for example following any significant storm events that could displace rocks or result in damage to the concrete slabs on the upper slope along the seawall sections.

The Strategy for the frontages to the north and south is to allow some realignment, therefore some additional works will be required to ensure that the defences along this section are not outflanked, which could otherwise result in subsequent property losses.

To the north of Hopton, the defences may require extending and potentially reconfiguring in the future. An approach that compliments a scheme to provide hard points along the Gorleston to Hopton frontage would be to construct a rock bund over the top of the existing timber revetment. Alternatively, if hard points are not introduced along the frontage to the north, a future bund or extension to the rock revetment might be constructed along a line further back as the shoreline there erodes. Such details are to be determined at design stage.

To the south of Hopton, the seawalls are already failing and will not prevent erosion of the cliff face and a terminal end will need to be added to the privately-funded works planned here for 2016. This will also be necessary to prevent erosion and collapse of the former radar station bunker along this frontage.

Requirements/Considerations

With these works in place, a revision to the Shoreline Management Plan Management Policy will be required for this frontage, reverting to a longer term 'Hold-The-Line' policy. Responsibilities for funding any future maintenance, repairs and if necessary improvements to the works will need to be agreed as part of any consent for works. With ongoing sea level rise it could become increasingly difficult to retain sand between the low level groynes (depending in part upon the availability of sand), but it is understood through consultation with the Leisure Park owners, that the presence of a beach is not an essential component of the defence scheme. There is also potential for larger beaches to develop to the north and south, should the options proposed by this Strategy be implemented and the shorelines here are allowed to erode.

Works to prevent the erosion and exposure/collapse of the radar station bunker are likely to be required. These, and any works to guard against outflanking to the north, should be planned and carried out to be complimentary to the timing and approaches being adopted along those adjacent frontages.

Estimated costs: £6 to 7M costs over next 100 years, with approximately £2 to 3M spend in the first 10 to 20 years for works to counteract potential outflanking. (This does not account for approved works to be undertaken by Potters Holiday and Leisure Centre)

Implementation (2016-2025)

Immediate Activities

The immediate activity is to monitor and appraise any need for action to address any outflanking risk to the present defences.



- Use Coastal Monitoring Plan and defined triggers to guide future monitoring and indicate the need for advance planning of works to address outflanking.
- Monitor regularly against these triggers for action.
- Monitor the deterioration and risk of failure of the seawall section immediately to the south of the new works being undertaken by Potter's Holiday and Leisure Centre.



- Engage local Leisure Parks and other land owners on plans for frontages to north and south, to establish optimum approaches to frontage boundaries, and continue ongoing dialogue on developments.
- Liaise over the need to prevent radar station bunker from becoming exposed and collapsing into the sea.



- Establish funding plan for any additional works that might be required in the near term (next 5 to 10 years) for works at the southern boundary.

Further Actions

The timing of further actions will be determined through the monitoring of retreat along adjacent frontages and condition of existing structures.



- Carry out regular visual inspections of concrete wall sections for signs of wear and tear.
- Patch and repair concrete as necessary, including:
 - reseal/ repair seawall joints
 - remove and replace (with rock or new concrete) any damaged/failed sections along apron or upper slope.
- Design and implement any works to prevent outflanking at northern and southern limits if and when necessary, obtaining necessary permissions.

Hopton to Corton

The Shoreline Management Plan policy (adopted 2012) for this frontage is for managed realignment in the short term, moving towards no active intervention in the long term. This policy supports the management and removal of defunct defences. The principle behind the Shoreline Management Plan policy is to allow the release of sediment to the system, whilst ensuring that a new promontory is not formed along the coast, which could affect the longshore distribution of beach sand. The preferred policy is in accordance with this principle, through looking to slow rather than halt erosion along the frontage, recognising the impacts on private landowners if no restrictions are introduced.

Current Situation (2016)



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Key assets

The permanent buildings associated with the leisure park midway along this frontage are located over 450m from the coastal edge, but caravan pitches extend up to the edge. The remainder of the coastal strip is Grade 2 agricultural land (good quality for crop production), with Church Farm and associated properties located around 250m from the coastal edge. There is a Waste Water Treatment Centre (built 2001) located around 600m from the current cliff top.

Coastal processes

There is little or no beach present at the toe of the cliffs and where defences have failed erosion of the soft sand-rich cliffs has occurred.

Defences

With the exception of the northern-most 100m, defences consist of timber revetments. Both defence types have been supported with a steel sheet piled toe. These existing structures have already been destroyed to various extents, although many structural elements, such as deep steel piling, timbers, and large pieces of concrete with reinforcement, remain in place. These remnants now create an unsafe and inaccessible section of coastline. Public access has been restricted for the past decade.

Stakeholder community aspiration: reinstate access along frontage; improvement to beaches; conflicting views on whether coast should be totally protected or erosion reduced through creation of hard points

Strategic direction

Objective: the vision for Hopton to Corton stretch is to ultimately allow some erosion of the cliffs and release of sediment to promote beach development and improve access along the frontage.

Simply allowing defences to fail and remain as derelict structures on the foreshore will not improve the beach accessibility. There are also opportunities to explore ways in which the beaches can be improved and become an asset to the coastline. Construction of any defences to support this will need to involve private investment as there are insufficient benefits that attract Government funding. Similarly removal of defences does not attract Government grants and will need to be locally funded.

Approach

Hold the line is not an option for this frontage: the current alignment is not sustainable and would not achieve the strategic vision of improving the beaches. Therefore building, reinforcing or replacing the current defences, like for like, is not proposed. Whilst No Active Intervention may become the default position, should funding not be sought, this is not considered the most appropriate option as there would be no improvement to the current situation:

- These structures are already hazardous and unsafe. Although elements of these would continue to be further destroyed, sections of steel sheet piling would remain, meaning the foreshore would remain unsafe for beach users.
- The shoreline could remain inaccessible for many years (estimated up to two decades). The deeply driven piled toes that were installed means there is uncertainty over the time of complete failure.
- The un-managed deterioration and break up of these structures will require an ongoing clear-up operation to remove steel and timbers that could be washed away and pose a hazard to beach users elsewhere, and a navigation risk to local craft.

The favoured option is to adapt and allow some realignment along this section of shoreline. The most effective approach will be to remove the existing defences, which will mean that the rate of cliff erosion will increase, but which would mean that the foreshore area will become more accessible and useable. Subject to funding, a series of hard points could be created to provide intermediate controls on erosion. These would reduce (but not necessarily halt) the rate of erosion, reducing land loss along the frontage but allowing safe and accessible beaches to develop. These hard points would take the form of encasing selected lengths of the existing structures within rock bunds.

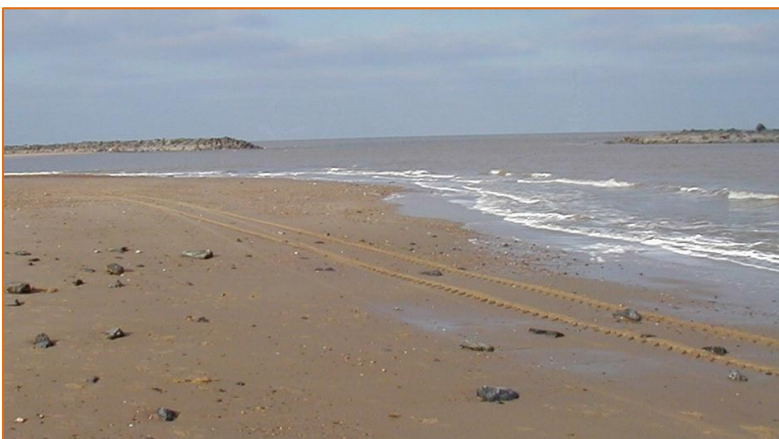
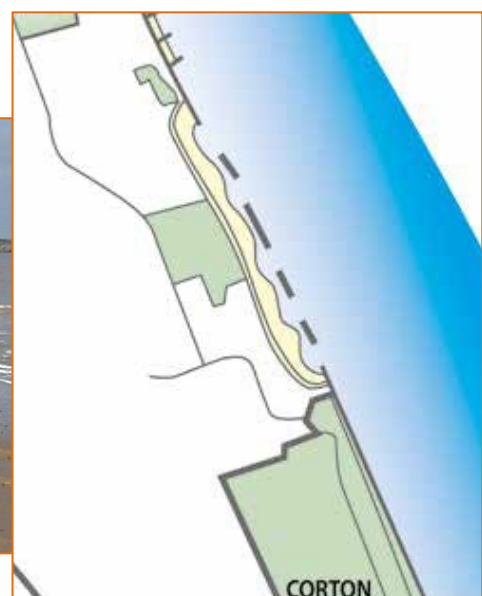


Illustration of how the proposed approach could look



Requirements/Considerations

Even if funding is not available to enable the construction of the hard points, the removal of defences remains the recommendation, although this will initially cause an increase in erosion. Changes in processes that have led to the exposure and failure of these defences, mean that marine-based equipment and operations will be necessary to remove the remains of the existing structures.

Key to progressing works here is the involvement of local businesses and landowners, to develop an approach and outcome that best fits with their aspirations.

Erosion beyond the northern and southern limits of this frontage, which could potentially affect assets in Hopton and Corton respectively, will be prevented through any 'beyond-boundary' mitigation in the form of extension to the works in place or planned for those particular frontages. Activities here should however be co-ordinated with plans for implementation actions at those locations to ensure that their timing is compatible.

Estimated costs: Approximately £5M costs for works to construct hard points, all likely to be required within the first 10 years.

Implementation (2016-2025)

Immediate Activities

The immediate activity is to plan the actions to implement the proposed works.



- Use Coastal Monitoring Plan and defined triggers to indicate the need for advance planning of works.
- Monitor shoreline position and foreshore level trends against these triggers for action.
- Regular visual inspection of the structure to determine any further deterioration/total failure along each section.



- Produce plans for removal of structures:
- include an ECI-developed detailed estimate of costs for removal operations;
- identify the optimum time for removal of structures.
- Consult with local Leisure Park and other land owners on potential impacts, ways forward, and timing to best accommodate their needs, and continue ongoing dialogue on developments.



- Explore funding sources and establish funding plan for construction of hard points.

If this is not achievable:

- Establish funding plan for removal of defences alone.

Further Actions

The nature of further actions is dependent upon availability of private funding. If funds are unavailable the Strategy will revert to a 'do nothing' option.



If Partnership Funding is available:

- Secure the funding to enable works to proceed.
- Undertake design of scheme, including design of rock bunds, defining lengths of defence to be removed and planning safe access routes to the beach.
- Obtain necessary permissions.
- Construct rock bunds and remove all remaining lengths of existing timber and steel defence structures.
- Provide new safe access routes from cliff to beach.

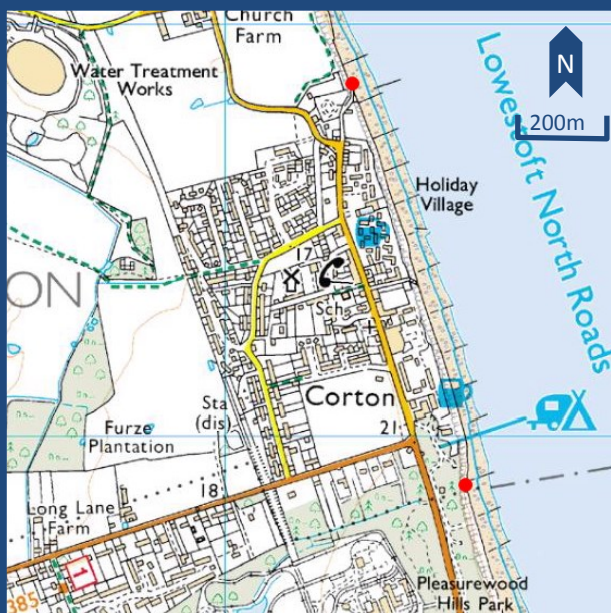
If Partnership Funding is not available:

- Continue to restrict public access along the foreshore/foot of the cliffs.
- Recover failed structural elements from foreshore and nearshore (as funds and access permit).
- Investigate any sources of funds to remove remaining concrete, steel and timber sections and implement if and when obtained.

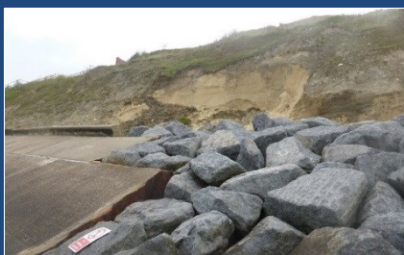
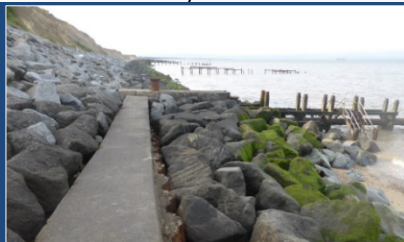
Corton

The Shoreline Management Plan policy (adopted 2012) is to hold the line in the short term, through maintenance of existing defences, moving towards managed retreat in the medium and long term. Minor works are permitted in both the medium and long term to slow erosion. The vision behind the policy was to allow natural straightening of the coast at both Hopton and Corton, thereby improving sediment linkages and moving towards more sustainable long term management. However, since the Shoreline Management Plan, privately-funded works have been constructed at Hopton and there has been a change in the sediment processes, which mean that this vision cannot be achieved. Therefore the preferred policy is to hold the line through improving the existing defences. This aligns with the short term Shoreline Management Plan, but relies on funding and would require a policy change for the medium to long term.

Current Situation (2016)



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Key assets

Corton is a small settlement with important tourism value: much of the coastal strip land use is tourism, comprising both caravan and leisure parks. Access to the seawall is restricted, especially in the winter months. Residential and commercial properties align the main road (The Street) and extend further inland. The cliffs at the southern end are designated a Site of Special Scientific Interest.

Coastal processes

Only a narrow strip of sand exists at low water at the toe of the cliffs. This is not continuous along the entire frontage. Sediment from this frontage is likely to be moved both north and south and there is poor sediment retention along the toe of the defences due to the frontage having become a promontory.

Defences

Defences are present along the full length, consisting of a concrete walkway and sloping upper concrete slab revetment, fronted by a sheet piled toe and rock toe. In places further rock has been placed on the upper cliff slope where sections of the concrete revetment had previously failed. The rock was placed in 2004 to delay the failure of the wall for 20 years, and it is likely that this will be achieved unless foreshore levels fall. However, continued wave attack at high water will cause ongoing cliff erosion and there are signs of some sections of the upper concrete revetment slabs are now vulnerable to displacement.

Stakeholder community aspiration: securing protection to Corton; change Shoreline Management Plan policy; larger defences; beach access; better beaches

Strategic direction

Objective: The vision for Corton is to enable continued long term protection of the village and community assets, together with the cliff top leisure facilities

To maximise protection to cliff top assets involves defending the present line. There are strategic reasons to hold this position to support the evolution of a semi-stable bay to the north and help to retain beaches to Gunton Warren to the south. A further aspiration is to retain, and preferably improve, public access along this frontage. The main community of Corton is set back from the coastal edge, therefore the primary beneficiary of defence works would be the caravan and leisure parks. It is unlikely that such works would attract substantial government funds, therefore this Strategy approach will rely significantly on alternative sources of funding.

Approach

It is unlikely that a beach that would be substantial and permanent enough to provide significant protection to the existing seawall and cliff could now form naturally. Although the rock revetment may have helped prevent further lowering of the foreshore since 2005, levels here fluctuate and it is unlikely that a fuller beach could be sustained in front of Corton without considerable works and costs involving recharge and large control structures.

Therefore it is considered unlikely that a scheme such as that recently constructed at Hopton, would be successful in retaining a beach sufficient to provide protection. The preferred approach is to build a more substantial structure over and above the existing wall, capable of providing more robust, longer term protection. This could take the form of a new seawall or rock revetment. The latter is less expensive but would not accommodate continued access, so a hybrid solution might be sought depending upon cost and funding. Details will be developed at scheme design.



A larger rock revetment could look similar to this

To the north of the concrete wall, the rock extends along the cliff face with a substantial revetment protecting this up to the boundary with the remnants of the timber revetment along the frontage to the north. Maintaining, and possibly reconfiguring this into a bund (as the area to the north erodes) with modest enhancement, should be sufficient to prevent outflanking.

To the south, the concrete wall continues beyond the end of the rock toe behind a section of Gunton Warren. Should this become vulnerable to erosion, then works similar to that along the main Corton frontage may need to be extended to prevent outflanking.

Requirements/Considerations

Flood Defence Grant in Aid for any scheme at Corton will be small, so involvement of local businesses is key to ensuring the right option is in place to support the local economy and the community. It is essential, however, that there is a co-ordinated approach to funding these works to avoid piecemeal solutions. It is desirable that any scheme should consider incorporating safe public access along the frontage. With agreements for funding works in place, a revision to the Shoreline Management Plan Policy will be required to a longer term 'Hold the Line' policy. Responsibilities for funding any future maintenance, repairs and if necessary improvements to the works will need to be agreed as part of any consent for works. While outside the remit of this Strategy, it is recommended that works are needed to continue to maintain or improve the current drainage works carried out as part of the Pathfinder project.

Estimated costs: £20 M costs to defend Corton and prevent outflanking, with most on construction work during the first 10 to 20 years.

Implementation (2016-2025)

Immediate Activities

The key activity is to plan for new works to achieve the objectives for this frontage, whilst also monitoring risks and the requirement to accelerate the implementation of those works.



- Use Coastal Monitoring Plan and defined triggers to indicate any acceleration in the implementation of works.
- Monitor shoreline position and foreshore level trends against these triggers for action.
- Regular visual inspection of the structure to determine any further deterioration or total failure along each section.



- Engage with local Leisure Parks and other land owners on plans for defending this frontage, taking into account the requirements set out, to agree nature of preferred scheme.
- Engage with local Leisure Parks and other land owners on plans for frontages to north and south, to establish optimum approaches to frontage boundaries, and continue ongoing dialogue on developments.
- Instigate formal changes to Shoreline Management Plan Boundary and Policy to reflect this Strategy, once a funding plan has been developed.



- Explore funding sources and establish funding plan.
- Identify scope for any Flood Defence Grant in Aid contribution (which will likely require the production of a business case).

Further Actions

Further action will be required along this frontage at some point with timing informed by the monitoring.

Scenario 1: High beach



monitoring



essential works



health & safety

If monitoring indicates improvement in beach levels, then:

- Regular visual inspections of concrete wall sections and rock armour for signs of wear and tear.
- Patch and repair concrete as necessary, including:
 - repair and reseal cracks and joints along walkway and upper slabs
 - remove failed slabs on cliff face and replace (if economic to do so) with alternative short term protection, e.g. rock gabions
- Regularly appraise safe public access along seawall, restricting access as necessary.

Scenario 2: Low beach (most likely)



funding



planning



essential works



health & safety

If monitoring indicates further deterioration in beach levels to defined action levels, then:

If Partnership Funding is available:

- Undertake design of scheme, obtain necessary permissions and construct.
- Instigate formal changes to Shoreline Management Plan Boundary and Policy.

If Partnership Funding is not available:

- Identify key areas for concern, based on annual inspections (also see [Appendix B: Assessment of Existing Defences](#)).
- Identify what can be achieved with available funds.
- Actions will be determined by findings but are likely to include:
 - Remove timber steps over the rock revetment and close access to wall from cliffs and beach.
 - Patch and repair structures.
 - Remove failed upper revetment sections before they become a safety hazard.
 - Plan for safe removal (and re-use if possible) of structures once they can no longer be maintained.
- Engage with local community on potential impacts and ways forward.
- Monitor and regularly assess erosion risks.
- Continue to review public access.
- Make further applications for funding, if valid.

Gunton Warren

The Shoreline Management Plan policy (adopted 2012) for Corton to Lowestoft is for managed realignment in the short term, moving to no active intervention in the medium and long term. The long term aim is to enable a naturally-functioning coast along this frontage. Implementation of the preferred Strategy is consistent with this policy.

Current Situation (2016)



Key assets

The coastal strip is a County Wildlife Site and the exposed cliffs at the northern end are designated a Site of Special Scientific Interest. The vegetated shingle and dunes of Gunton Warren are of very high environmental importance and these habitats are complemented by the adjacent heathland. Further inland lies a mature woodland (Local Nature Reserve), a Theme Park and Pitch & Putt. To the south are a number of residential properties that lie along the cliff top. The B1385 runs through this unit (in places less than 100m from the cliff edge), which links Corton to Lowestoft. There are also gas and sewage pipelines along Corton Road. Tramps Alley is a key access point and this and the promenade are used by local fisherman. Within the dunes are buried oily deposits, which are of low toxicity but a potential hazard if exposed.

Coastal processes

There is a wide, generally stable beach backed by low dunes/ sand cliff. The frontage sets back from that to the north, which has allowed the accumulation of sand and shingle. The cliffs are, however, prone to slumping due to groundwater issues.

Defences

Over the northern section of frontage is a low concrete wall at the base of the cliffs, a continuation of the original wall at Corton. Although the beach width narrows towards Corton, the wall is at present still fronted by a wide and high beach. The remains of old redundant timber and steel groynes exist throughout the full length of Gunton Warren.



Stakeholder community aspiration: retain natural character of coastline

Strategic direction

Objective: the vision for Gunton Warren is to allow this area to remain as natural as possible, whilst minimising the risk of outflanking to the north.

Currently there is a wide sand-shingle beach that provides the primary defence along this frontage. There has been recent erosion at the southern end, but accretion to the north. Slumping of the cliffs at the back of the beach is currently an issue at the northern end of the frontage, although this is a groundwater issue rather than related to coastal process induced erosion. The cliffs here are designated a Site of Special Scientific Interest (SSSI) for their geological exposures.

Approach

There is no justification for defence structures in the foreseeable future, due to the wide expanse of generally stable sand and shingle. The only works may include the removal of hazardous elements of redundant groynes for health and safety reasons. However, should the current beach status change in the future there may be a need for measures to prevent erosion of the cliffs, such that assets along the cliff top, including the B1385 road, would not be lost and to prevent outflanking of the defences at Corton.

Requirements/Considerations

Any requirements to address potential issues along the northern part of this frontage (outflanking at Corton) or south (exposure of wall at North Denes) are addressed in the discussions for those areas. This frontage is a potential sink and store for beach material and the beach has been generally stable over recent years. It is therefore considered unlikely that there would be reactivation of the cliffs and erosion risk to the cliff top highway and properties within the lifespan of this Strategy.

While outside the remit of this Strategy, there is a need to investigate issues of cliff slumping along the frontage which appears to be the result of land drainage issues. Previously drainage works have been undertaken at Corton as part of the Pathfinder project and works to maintain and improve these are recommended (although outside the remit of this Strategy).

Estimated costs: Less than £0.3M for removal of redundant groyne elements.

Implementation (2016-2025)

Immediate Activities

The immediate activity is to monitor the beach in conjunction with the frontages elsewhere along the Strategy shoreline to understand any longer term trends and linkages.



- Use Coastal Monitoring Plan and defined triggers and monitor shoreline position and foreshore level trends against these triggers.
- Visual inspections of the cliff face to assess issues related to drainage and cliff slumping, including access along the 'prom' path.



- Extract and/or make safe steel sheet piling remaining within the existing redundant groynes.

Further Actions

In addition to the above activities, there are two potential courses of action that may be required, depending upon beach behaviour, although it is highly unlikely that the low beach scenario will occur within the 10 years covered by this implementation action plan.

Scenario 1: High beach (most likely)



If beach levels remain high, then:

- Carry out occasional visual inspections of visible areas of seawall for signs of wear and tear to the sloping concrete walls.
- Patch and repair low sea wall as required.

Although outside of the remit of the Strategy, occasional visual inspections to assess slumping due to groundwater/slope instability are recommended and to retain access to the 'Prom' path.

Scenario 2: Low beach



If monitoring indicates further deterioration in beach levels to defined action levels, then:

- Carry out regular visual inspection of structure for defects and any potential remedial works.
- Identify key areas for concern, based on annual inspections (see [Appendix B: Assessment of Existing Defences](#)).
- Actions will depend upon findings.

Lowestoft North Denes seawall

The Shoreline Management Plan policy for this frontage is to continue to hold the line through to the long term, through maintaining, replacing and upgrading the existing defences. Implementation of the preferred Strategy is consistent with both this policy and the policy for Gunton Warren, which recognised that there are limited advantages of allowing a southerly movement of beach sediment onto the Lowestoft North Denes frontage.

Current Situation (2016)



Key assets

At the northern end of the unit is a public carpark and large public open space, beneath which lies a former landfill. There are also a number of buried services that pass beneath the site. Various leisure facilities lie to the south of this within the Denes area, including North Denes Caravan Park. The former net drying area, an important heritage feature, lies south of this, with the Birds Eye factories at the southern end of the frontage. Much of the residential area is located further inland along the top of Lowestoft Cliffs, but there are a number of residential and commercial properties located along the western side of Whapload Road.

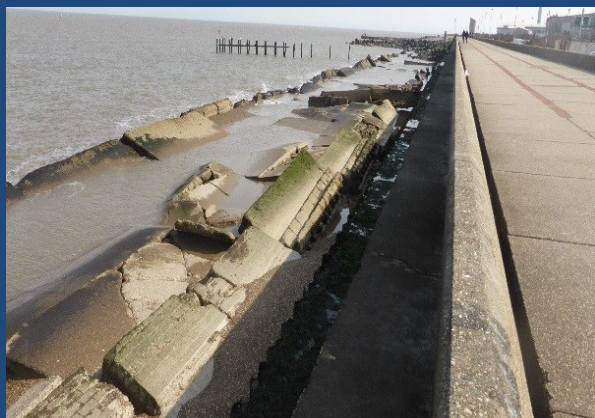
Public access is closed along the southern section of beach for safety reasons.

Coastal processes

Although in the past a beach extended along this frontage, this has now been almost completely removed by natural processes.

Defences

A vertical concrete wall, with a steel sheet piled toe to retain fill beneath and behind it, runs along this frontage. This is the third generation of wall along this part of the coast; the previous ones having failed. The concrete, steel and timber debris from the previous walls and former groynes now litter the foreshore at the base of the present wall. The current seawall is at risk from potential undermining and wave overtopping. This may lead to restrictions on public access along the promenade along the top of this wall, and localised flooding in extreme events.



Stakeholder community aspiration: no significant change from present, repair of seawall

Strategic direction

Objective: The vision for North Lowestoft is to provide improved protection against erosion and flooding to shoreline assets, including the industrial area towards the southern end and the extensive landfill site that occupies a large area behind the northern section of the wall.

Approach

This Strategy considers the risk of erosion and flooding from overtopping of the coastal defences. A separate strategy, Lowestoft Flood Risk Management Strategy is being undertaken concurrently to address the risk of tidal flooding from the Outer Harbour.

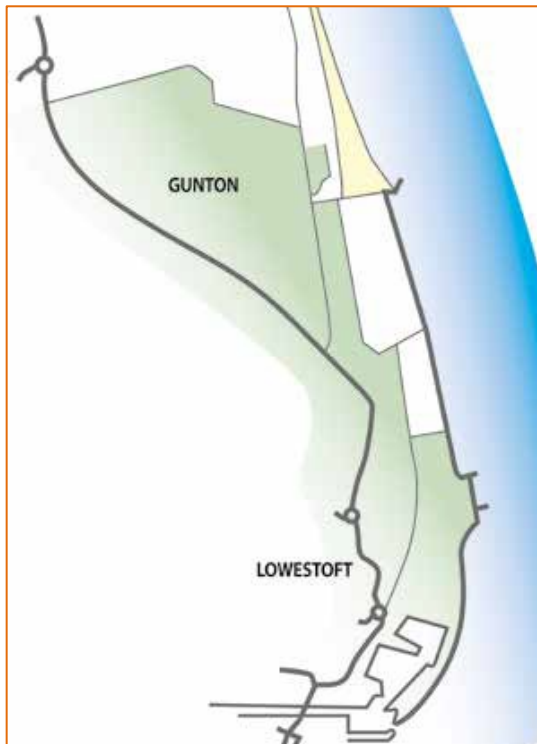
This section of shoreline protrudes into the sea and it is therefore very unlikely that a beach of any substance would reform in front of the seawall along the entire frontage, in the future. To maintain the current defence line will require improvements to the existing seawall.

Those improvements also need to dissipate wave energy to address the increasing overtopping issue along the wall, and therefore constructing a full height rock revetment in front of the seawall, such as that at Ness Point, is the preferred approach.

To implement this it may be appropriate to also secure the toe stability (e.g. grouting) before the rock revetment is placed, to prevent future issues of steel sheet pile deterioration.

There will also be a need to raise the wall, but only by a metre or so and this would therefore should not restrict the sea view, and may also improve safe access along the wall. It would also be possible to undertake that wall raising at a later date to accommodate sea level rise, that is, only when required.

Further investigation to determine the most appropriate implementation will be undertaken as part of the scheme design appraisal. It is assumed that there will be no removal of the debris of the old walls along the foreshore.



It will be necessary prevent outflanking of the wall along its northern termination (Links Road), where the landfill site is located. The preferred approach is to retain the beach at the southern end of Gunton Warren, through constructing a headland structure connected to the North Denes seawall. This would take the form of a long rock groyne, oriented to create a stable beach directly to the north of the Denes.



Illustration of how the terminal headland at Link Road could look

Requirements/Considerations

It is unlikely that a beach could be retained along this frontage without considerable expense and risk. The benefits of a beach at this location are also not significant, as the key recreational area for Lowestoft is South Beach and there is also a wide expanse of beach at Gunton Warren, just to the north.

It is assumed that a proportion of funding for these works can be obtained through Flood Defence Grant in Aid given the nature of the benefits provided here, although there will be a need for external contributions. If partnership funding is not obtained, the standard of protection may need to be reduced to create a more affordable solution. This may mean that repair of the seawall will be funded but not the costs associated with improving the level of flood protection.

This site also has several characteristics that may present opportunities for incorporating wave energy generating devices within the defence structure. That could create a range of wider benefits locally as well as further partnership funding possibilities. This potential should be considered when progressing options for this frontage.

Estimated costs: £30 to 35M costs in total over the next 100 years to raise and protect the seawall, with £20 to 30M of that during the first 20 years.

Implementation (2016-2025)

Immediate Activities

The immediate activity is to monitor and assess structural integrity of the existing walls and plan the works to implement the Strategy.



- Carry out visual inspections for signs of damage, wear and tear, and settlement, to the concrete walls, promenade and rear slope protection.
- Undertake visual inspection of sheet piling for signs of corrosion and abrasion, and exposure of the bottom of piling which could lead to loss of retained fill.



- Patch and repair as required: resealing cracks and joints to the wall, promenade and rear face slabs – this may be restricted due to access issues.



- Undertake investigations to establish extent of future works required, including:
 - assessment of exposure depth and corrosion/abrasion of piles, and ultrasonic gauge to assess residual thickness of toe piling to determine need for additional works.
 - if necessary, further investigations into extent of additional vertical/raking piles beneath seawall and wall stability with/without these.
 - appraisal of requirements and options to raise the wall/place revetment to establish most acceptable and economic scheme.
- Engage with local businesses/prospective funding partners on potential issues and options.
- Undertake a technical and environmental feasibility study into the potential for harnessing wave energy as part of the scheme development.



- Establish the funding plan for undertaking new works.
- Submit application for Flood Defence Grant in Aid, which will likely require the production of a business case.



- Maintain promenade surface to a public footpath standard, including re-setting raised slabs.
- Introduce temporary hand railing or similar safety measures along the front edge of the wall until scheme including permanent measures is implemented.
- Fully block access to steps that lead down onto foreshore.
- Introduce signage and warnings regarding dangerous structures and underwater hazards to deter or prevent swimmers or boat users from entering this area.
- Introduce signs warning the public of buried hazards within the remaining section of beach.
- Block access to exposed areas of old concrete and steel from south of remaining beach.

Further Actions

The key factor for further actions is the availability of funding to enable the implementation of works.



If Partnership Funding contributions are available:

- Secure the funding contributions to enable works to proceed.
- Undertake design of new works for the seawall and the headland at Links Road scheme.
- Obtain necessary permissions.
- Construct new defences as per the scheme designs.

If Partnership Funding contributions are not available:

- Seek emergency funding for essential 'do minimum' remedial works to reduce risk of catastrophic failure.
- Implement any emergency works as required.
- Reassess residual life of seawall and risks.
- Engage local businesses on potential impacts and ways forward.
- Develop adaptation strategy.

Lowestoft Ness

The Shoreline Management Plan policy for Lowestoft Ness is to continue to hold the line through to the long term, through maintaining, replacing and upgrading the existing defences, with the possibility of building more substantial defences in the long term. Implementation of the preferred strategy is consistent with this policy.

Current Situation (2016)



Key assets

This frontage includes Ness Point promontory, the most easterly point in England, and the remaining section of wall south to the harbour boundary; a total length of approximately 600m.

Behind the sea wall is an industrial site which incorporates Birds Eye factories and a range of commercial properties.

The area also supports substantial infrastructure, including Gas Main and Holder Station, a sewage pumping station and head works, wind turbine and a sewage rising main.

There are no residential properties at risk.

Coastal processes

There is no beach along this frontage and it is extremely unlikely that one would naturally reform at this exposed location.

Defences

The whole length is defended, comprises a concrete apron, fronted by steel sheet piling and a rock revetment, and backed by a concrete wave wall.

Two rock groynes exist to help deflect strong currents away from the revetment toe, one of which houses an Anglian Water sewer outfall.



Stakeholder community aspiration: none voiced by community

Strategic direction

Objective: To maintain, repair and improve the present structures to ensure continued protection of critical infrastructure and business from erosion and flooding, into the future.

Although the existing defences are fairly substantial, a key issue is the condition of the steel sheet piling that runs behind the rock work, which is likely to need replacing at some point in the coming years.

Approach

This Strategy considers the risk of erosion and flooding due to failure of the coastal defences. A separate strategy, Lowestoft Flood Risk Management Strategy is being undertaken concurrently to address the risk of tidal flooding from the Outer Harbour.

The sheet piling behind the rock work is vulnerable to holing. If not addressed this will eventually lead to loss of fill and potential collapse of the apron.

The piling is inaccessible for either inspection or replacement, therefore the likely works will be to locally remove parts of the apron and drive new piling behind the existing line.

Requirements/Considerations

The requirement for works (timing and extent) will need to be determined through continued monitoring, but are likely to be carried out in phases, as needed. It is possible that some of these works will be required within the coming 10 years, but some may not be necessary for another 20 to 30 years.

There is an opportunity for enhancements in this area, for example, to incorporate a low wall or hand railing to improve safe public access, and this should be considered when works are planned.

Investment is also likely to be required at some point to refurbish/replace the steel in the sewer outfall.

Estimated costs: £7 to 8M costs for remedial works, with an estimated £2 to 3M of that likely to be required in the first 10 to 20 years.

Implementation (2016-2025)

Immediate Activities

The immediate activity is to monitor and assess structural integrity of the existing piling and plan works to address any issues.



- Undertaken dip measurements beneath the apron (annually) to assess potential settlement of fill beneath.
- Visually inspect concrete apron for any signs of cracks and settlement that might indicate loss of fill from beneath.
- Carry out occasional visual inspections for armour displacement/ signs of settlement.



funding

- Establish the funding plan for undertaking new works, should they be required.
- Establish case and funding for improving safe public access along this frontage.



health & safety

- Maintain areas accessible by the public to a safe standard, including maintenance of necessary warning signage.
- Fully block public access to outfall structure at Ness Point.

Further Actions

Monitoring will identify when additional actions are necessary to address the risk of sheet piling failure/apron collapse.

Scenario 1: No change in failure risk



essential works

If there is no increased risk identified through monitoring, then:

- Patch and repair as required, including: resealing cracks and joints to the wall, promenade and rear face slabs.

Scenario 2: Increased risk of failure



funding



planning



essential works

- **Should the monitoring indicate that there is an increased risk of localised failure, then:**

If Partnership Funding contributions are available:

- Secure the funding contributions to enable works to proceed (including any application for Flood Defence Grant in Aid, which will likely require the production of a business case).
- Undertaken design of new works.
- Obtain necessary permissions and construct.

If Partnership Funding contributions are not available:

- Seek emergency funding for essential 'do minimum' remedial works to reduce risk of catastrophic failure.
 - Implement emergency works, e.g. grout filling voided areas.
 - Reassess residual life and risks.
 - Engage local businesses on potential impacts and ways forward.
- Consider ways forward through discussion with land owners.

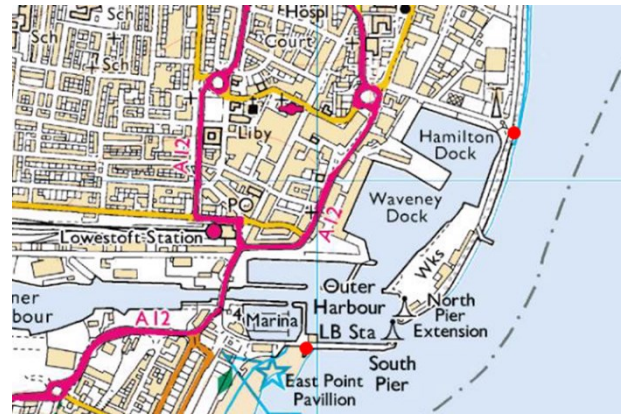
Lowestoft Harbour

The Shoreline Management Plan policy for this frontage is to continue to hold the line through to the long term, through maintaining, replacing and upgrading the existing defences, with the possibility of raising defences in line with sea level rise.

The Harbour and associated structures are owned and maintained by Associated British Ports (ABP), who would be responsible for any future works. Associated British Ports have confirmed that their intention is to maintain the current line of the existing structures.

The Lowestoft Tidal Defence Scheme is developing a flood protection scheme designed to protect residential and commercial properties within Lowestoft from the combined effects of tidal, fluvial and surface water flooding.

Implementation of both these will support the Shoreline Management Plan policy.



Immediate Activities



- Continue to liaise with Associated British Ports (ABP) over their future plans for the area.

Further Actions

Further actions will depend upon the conclusions from the Lowestoft Flood Risk Management Strategy.

Lowestoft South Beach (north)

The Shoreline Management Plan policy for this frontage north of Triton Statue is to continue to hold the line through maintaining and if necessary repairing or replacing existing defences. The possibility of some realignment of the frontage in the long term was also noted by the Shoreline Management Plan to be a future consideration. Implementation of the preferred Strategy is consistent with this policy.

Current Situation (2016)



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Key assets

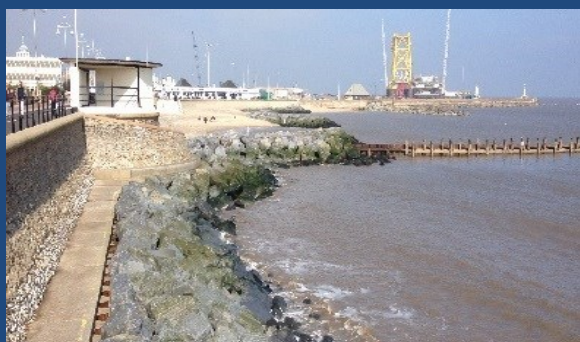
Lowestoft is a key centre of commerce and tourism along the Strategy frontage. The seafront is characterised by a wide promenade which is backed by public open spaces and recreational facilities. Most residential and commercial properties are located over 50m inland of the current defences, but there are a number of commercial properties along the coastal strip.

Coastal processes

Beach levels along this frontage have dropped significantly over the last decade and remain very low with the sea reaching the walls on every tide. In the past the beaches have been both wider and as narrow at times; consequently it is possible that through natural cyclic behaviour a beach could return. Beach behaviour and sediment transport is related to the position/morphology of the nearshore banks, which affect the nearshore wave heights and direction of approach. These are expected to continue to change in the future.

Defences

There are different sections of seawall, all backed by an asphalt surfaced promenade. These include a high vertical faced concrete wall at Children's Corner, a mass concrete ramp, and 'The Old Flint Wall'; a flint faced, masonry wall dating back to the 1800's. In addition, a rock armoured groyne/breakwater forms a spur off the Harbour South Pier, providing sheltering to Children's Corner. Most recently (2015) additional rock hard points have been introduced along this beach. These are not substantial structures; their purpose is to minimise the risk of seawall failure whilst beach levels here are low; directly through toe protection and indirectly through aiding retention of sand at the toe of the wall.



Stakeholder community aspiration: retain beach as important asset; improve beaches; groynes accepted as a possible solution

Strategic direction

Objective: The vision for South Lowestoft is to provide primary coastal defence through retaining a wide beach along the entire frontage, thereby also protecting a key asset of the town.

The presence of a beach is of high importance to local businesses and its provision will continue to provide further opportunities for investment and regeneration in the town. Therefore the preferred approach is to retain a beach along this frontage, which will form a primary element of the defences.

Approach

It is known that areas of accretion and erosion along South Beach have varied through the years; when lower beaches were experienced to the south of Claremont Pier, higher beach levels existed here. Through a continuation of natural cyclic behaviour, it is quite possible that a beach will naturally return to this frontage, with retention assisted by the newly placed rock structures. Should that be the case, then no further intervention should be necessary.

It is also possible, however, that beach levels here will not recover naturally. In this situation, further action may be needed in several years' time to address this, for example through control structures, and/or nourishment of the beaches. This could involve sand dredged from offshore or sand recycled from beaches south of Claremont Pier.

Control structures to retain a beach could include a headland rock groyne and/or an additional or reconfigured shore-parallel rock structures, working in conjunction with some refurbishment of the existing spur breakwater to control sediment movement along this northern section of South Beach.

Precise details can be deferred until a future review of Strategy implementation.

With the immediate stability of the walls now assured, the next few years will involve monitoring the performance of these structures and the beach.

Requirements/Considerations

The recent urgent repair works are consistent with the proposed approaches, and may be adapted to support any of the above options.

Works to improve the stability and thus effectiveness of the spur breakwater will be required as part of the preferred approach. The crest is presently in poor condition with rocks displaced due to larger than designed-for waves.

The design of new works may require some numerical modelling to establish the optimum configuration of the structures for beach stability. Likewise, the ability for nourished sand to remain stable without the introduction of new controls would also require numerical modelling to establish. There is an option to assess this by 'trial and error', particularly if this is simply recycled from elsewhere along the beach and can be undertaken at low cost.

Estimated costs: £2 to £9M costs over the next 100 years, depending upon beach behaviour and any requirement to undertake further works.

Implementation (2016-2025)

Immediate Activities

The immediate activity is to monitor and appraise any need for action within and beyond this period.



- Use Coastal Monitoring Plan and defined triggers to guide future monitoring and indicate the need for advance planning of works.
- Monitor regularly against these triggers for action.
- Assess effect of new structures on beach behaviour.



- Continue to appraise public access to the foreshore area and restrict/permit accordingly.

Further Actions

In addition to the above activities there are two potential courses of action required, depending upon the response of the beach to the recent works. Monitoring will inform the approach but it is unlikely that substantial works will be required in this time frame.

Scenario 1: High beach



If monitoring indicates sustained improvement in beach level to defined levels, then:

- Carry out occasional visual inspections for signs of wear and tear to the old flint wall, concrete walls, promenade and spur groyne.
- Patch and repair as required, including any further re-facing of the flint wall, sealing cracks and joints to the concrete walls.
- Maintain promenade surface to a public footpath standard, sealing joints and resurfacing as required.

Scenario 2: Low beach



If monitoring indicates no improvement or deterioration in beach to action levels, then:

- Assess the potential for any beach re-nourishment to be successfully retained without additional control structures.
- Establish funding plan for any works.

If Partnership Funding is available:

- Secure the funding contributions (including application for Flood Defence Grant in Aid).
- Undertake design of new works and obtain necessary permissions and construct.

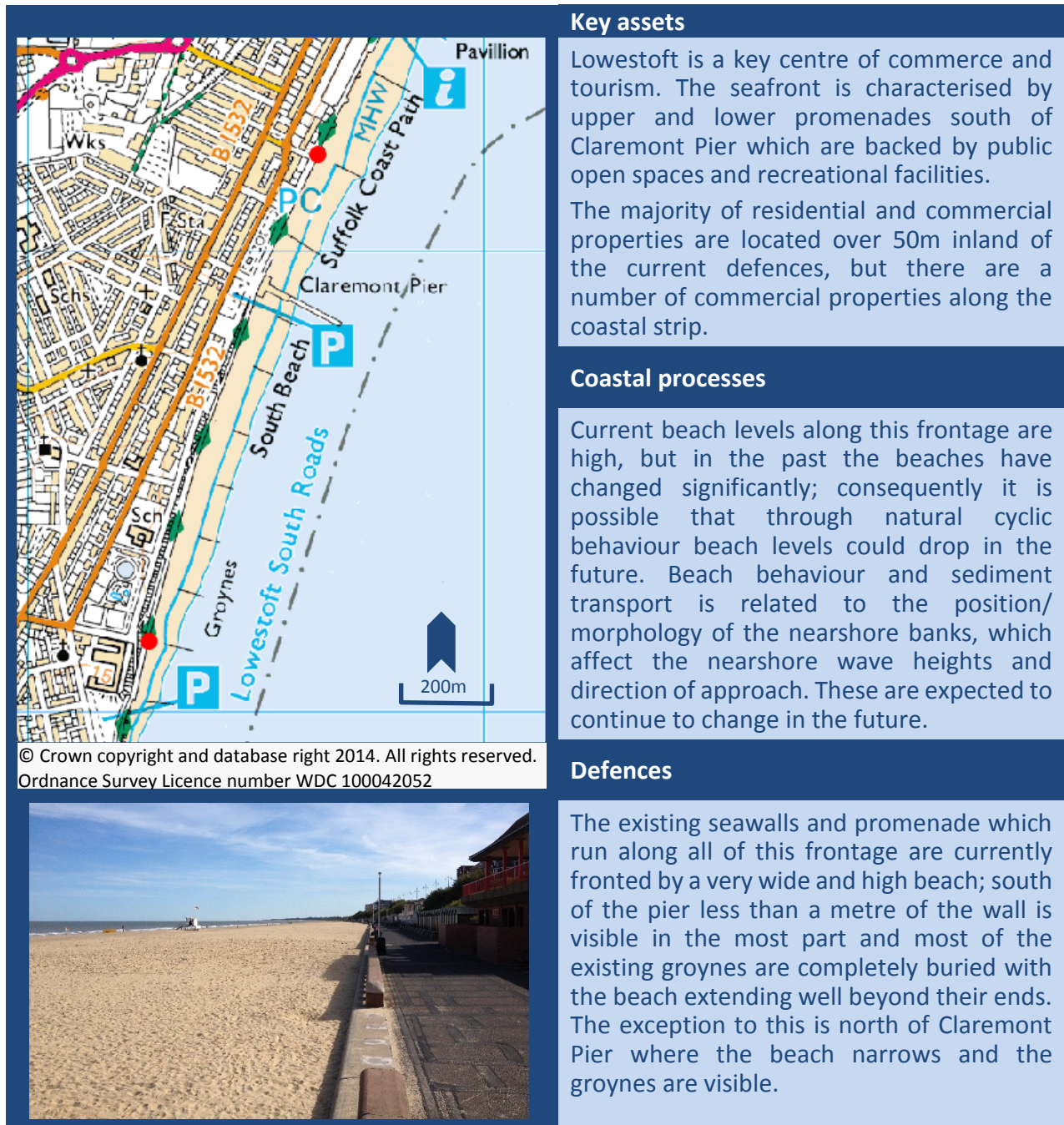
If Partnership Funding is not available:

- Identify key areas for concern and consider remedial measures.
- Identify what can be achieved with available funds.
- Actions thereafter will be determined by findings.

Lowestoft South Beach (south)

The Shoreline Management Plan policy for this frontage is to continue to hold the line through maintaining and if necessary repairing or replacing existing defences. Implementation of the preferred Strategy is consistent with this policy.

Current Situation (2016)



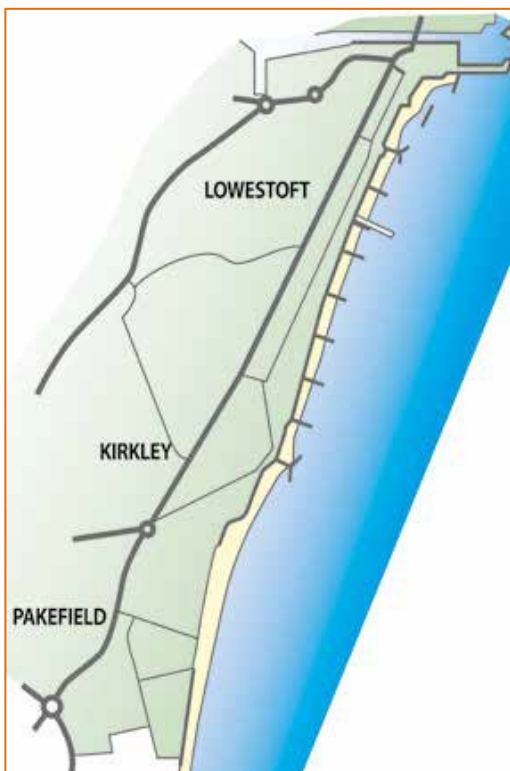
Stakeholder community aspiration: retain beach as important asset; improve beaches; groynes accepted as a possible solution

Strategic direction

Objective: The vision for South Lowestoft is to provide primary coastal defence through retaining a wide beach along the entire frontage, thereby also protecting a key asset of the town.

The presence of a beach is of high importance to local businesses and its provision will continue to provide further opportunities for investment and regeneration in the town. Therefore the preferred approach is to retain a beach along this frontage, which also forms a primary element of the defences.

Approach



Whilst the beach remains wide and healthy no intervention is required. This is expected to remain the situation for the next decade. Intervention would not be undertaken unless there were signs of change taking place.

If and when the beach does begin to reduce in width or level, due to a changes in the movement of beach material, then action will be required to retain sufficient sand to maintain protection.

Depending upon how the beach moves, then the necessary beach management might be achievable through localised recycling of sand along the beach to maintain levels. Should beach levels drop such that exposure of the seawalls poses a threat to their stability then it would be necessary to introduce shore normal structures to help interrupt drift and trap material in front of the seawalls.

The possible options include timber groynes or rock groynes. The precise nature of any works would be a matter for scheme appraisal stage assessment.

An illustration of how the coast could look

Requirements/Considerations

It has previously been accepted that areas of beach accretion and erosion have varied through the years and it may not be essential to achieve a full beach over the entire length, all of the time. However, that decision may have been in part due to limited funding. Depending upon what funds might be sourced, it might be possible to achieve a fuller beach across the entire frontage.

Should beach levels drop and are not stabilised proactively, then there is likely to be a need to undertake maintenance and repair works to some sections of the existing concrete seawall and promenade to prevent failure. Such a piecemeal and reactive approach to maintain and even potentially have to rebuild sections of the seawall is however going to be more expensive than the preferred approach. A short section of wall beneath Claremont Pier requires immediate attention to address its poor state of repair and associated safety issues.

Estimated costs: £3 to £9M costs over the next 100 years, depending upon beach behaviour and whether new groynes are required.

Implementation (2016-2025)

Immediate Activities

The immediate activity is to monitor and appraise any need for action within and beyond this period.



- Use Coastal Monitoring Plan and defined triggers to guide future monitoring and indicate the need for advance planning of works.
- Monitor regularly against these triggers for action.



- Carry out necessary works to the wall beneath Claremont Pier (ownership and funding responsibility to be identified).

Further Actions

There is some uncertainty whether the high beach at this location will remain, or whether there will be a reversal in the net drift direction resulting in erosion and beach loss. Two possible scenarios are therefore considered, which will require different activities.

Monitoring will inform the most likely scenario, but it is considered unlikely that the risks associated with a low beach will be within the next 5 to 10 years, but planning will be required in advance.

Scenario 1: High beach (most likely)



If monitoring indicates no change in the currently high beach, then:

- Carry out annual visual inspections for signs of wear and tear to the groynes, concrete walls, upper slope revetment and promenade, including any safety hazards.
- Patch and repair any degradation/damage of seawall if required.
- Maintain promenade surface to a public footpath standard, sealing joints and resurfacing as required.

Scenario 2: Low beach



If monitoring indicates deterioration in beach levels to defined action levels, then:

- Establish the funding plan for the construction of new control structures.

If Partnership Funding is available:

- Secure the funding contributions to enable works to proceed (including any application for Flood Defence Grant in Aid).
- Undertake design of new works.
- Obtain necessary permissions and construct.

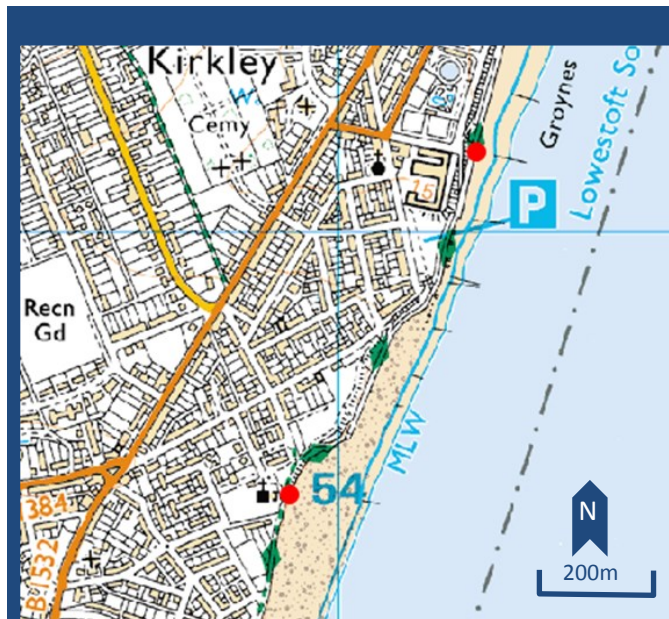
If Partnership Funding is not available:

- Identify key areas for concern, based on annual inspections.
- Depending on visual inspection findings, carry out structural inspections of the steel sheet piling and the concrete condition.
- Consider remedial measures.
- Actions thereafter will be determined by findings and further applications for Flood Defence Grant in Aid.

Pakefield North

The Shoreline Management Plan policy for this frontage is to continue to hold the line through to the long term, through maintaining, replacing and upgrading the existing defences. Implementation of the preferred Strategy is consistent with the principle of this policy, although if necessary, a beach structure is proposed which would help stabilise the beach.

Current Situation (2016)



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Key assets

This section covers the coast between the CEFAS laboratories to All Saints Church.

The cliff top properties are a mixture of residential and guest houses, along with other commercial properties, such as a care home, hotels and restaurants. It also includes the southern section of the CEFAS building and public car park. The lower promenade continues along this section, and there are beach huts along the toe of the cliffs.

Coastal processes

There is currently a wide, high beach along this length, level with the promenade and completely burying most of the existing timber groynes. This has not always been the case: in the past when the beaches have behaved differently, the promontory formed a 'pinch point' with beaches here lower and narrower, and the seawall prone to overtopping, scour and risk of undermining. Beach behaviour and sediment transport is related to the position/ morphology of the nearshore banks, which affect the nearshore wave heights and direction of approach. These are expected to continue to change in the future.

Defences

The existing wall construction down to its termination near All Saints Church is similar to that between Claremont Pier and Kensington Road. South of All Saints Road, the seawall steps back as a result of historical erosion.

Stakeholder community aspiration: retain beach as important asset; larger seawall undesirable as it would encroach on beach; improvements to both lower and upper promenades

Strategic direction

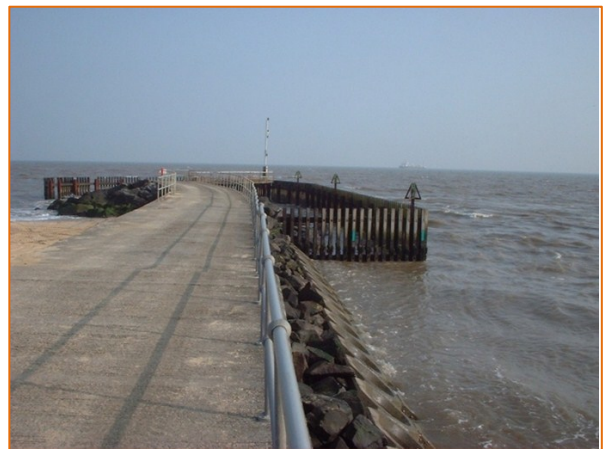
Objective: The vision for Pakefield is to continue to provide protection to the clifftop assets through retaining the existing defence position, as part of achieving the wider objective for the entire Lowestoft frontage.

Retaining the current seawall position has implications both locally and further afield as this has been recognised as an important control on the wider scale beach behaviour.

Approach

Whilst the beach remains wide and healthy no intervention is required. This is expected to remain the situation for the next 5 to 10 years. Intervention would not be undertaken unless there were signs of change taking place. Should the beach here remain wide and high, with no exposure of the seawalls, then there should be no need for any works other than maintenance of the existing walls and groynes (where exposed).

However, should beach behaviour alter this could potentially expose the seawalls to wave impact and threaten their stability. In this situation, the preferred approach is to construct a headland structure in this area to help build and retain beach material in front of the seawalls directly to north and south. With no beach, the existing defences would need to be replaced with much larger and expensive seawalls. This headland also has wider strategic significance in aiding stability of beaches further north along the main Lowestoft frontage, and to the south at Pakefield.



This headland would most likely take the form of a rock structure, which would extend seaward of the present wall alignment and would be shaped to aid beach stability, e.g. a T-head or Y-shaped groyne. Additional shorter groynes to north and south may also be introduced to compliment this, but those would not be required immediately and only if necessary to further stabilise the beaches locally. This requirement would be addressed as part of any scheme design. Should beach levels fall to the south of this headland, only minimal works to bolster or patch and repair the existing seawall are recommended as this exposure is anticipated to be only temporary (less than 20 to 30 years) due to the northward progression of Benacre Ness which is expected to supply considerable volumes of sand and shingle to the frontage.

Requirements/Considerations

The headland structure could be designed to have some form of infill and pavement on top to enable public access and provide some recreational benefit, for example, a fishing pier or observation platform. The design of new works may require some numerical modelling to establish the optimum length and configuration of the structure for beach stability. This headland is not likely to be required within the next 10 years. However, the residual life of the existing wall could be as short as 5 years, so should beaches change and the seawall become exposed action would need to be taken quickly. Monitoring here is very important, as is having a funding plan should works need to be implemented. A proactive approach to construct the headland before the beach reduces substantially and the wall becomes exposed is essential.

Estimated costs: £2 to £9M costs depending upon beach behaviour and any requirement for new structures to be built.

Implementation (2016-2025)

Immediate Activities

The immediate activity is to monitor beach levels and appraise any need for action within and beyond this period.



- Use Coastal Monitoring Plan and defined triggers to guide future monitoring and indicate the need for advance planning of works.
- Monitor regularly against these triggers for action.



- Establish funding plan for construction of defences for when required.

Further Actions

In addition to the above activities, there are two potential course of action required depending upon whether the beach at this location remains high.

Change here can be rapid so although substantial works to deliver the long term objective are unlikely to be needed in this time frame, developing plans in advance would enable actions to be taken expediently if and when required.

Scenario 1: High beach (most likely)



If monitoring indicates no change in the currently high beach, then:

- Carry out annual visual inspections of visible structure for signs of wear and tear to the groynes, concrete walls, upper slope revetment and promenade, including any safety hazards.
- Patch and repair any degradation/damage of seawall and upper slope if required.
- Maintain promenade surface to a public footpath standard, sealing joints and resurfacing as required.

Scenario 2: Low beach



If monitoring indicates deterioration in beach levels to defined action levels, then:

If Partnership Funding is available:

- Secure the funding contributions (including any application for Flood Defence Grant in Aid).
- Undertaken design of new works.
- Obtain necessary permissions and construct.

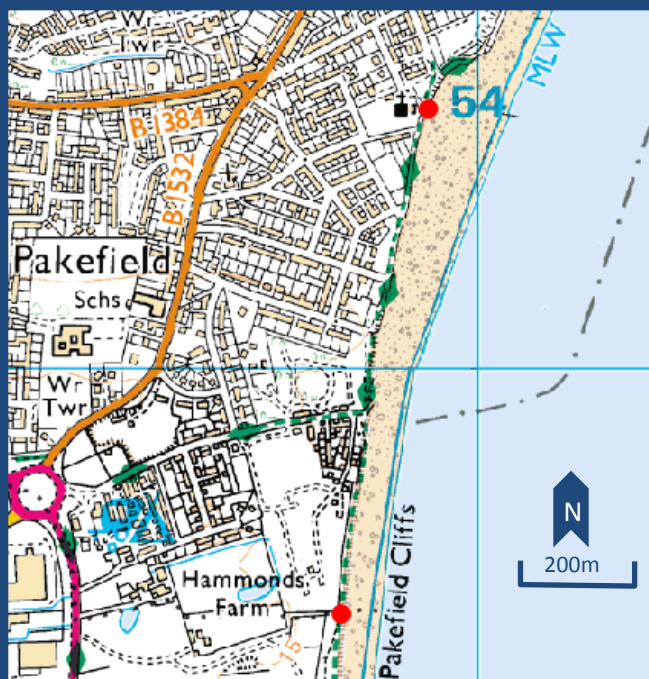
If Partnership Funding is not available:

- Identify key areas for concern, based on annual inspections.
- Consider remedial works necessary.
- Actions thereafter will be determined by findings and further applications for Flood Defence Grant in Aid (which will be dependent upon defence and funding policy at that time).

Pakefield South

The Shoreline Management Plan policy for this frontage is to continue to hold the line along the village frontage through the medium term, but looking to managed realignment in the long term. Further south, along the southern end of the caravan park frontage the plan is no active intervention. Implementation of the preferred Strategy is consistent with the principle of this policy, although in the longer term it is anticipated that the natural growth of the beach, due to the northwards migration of Benacre Ness will form the primary defence.

Current Situation (2016)



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Key assets

Residential properties, holiday lets, small businesses and community facilities are located along the cliff top. At the southern end of the frontage is Pakefield Caravan Park. Pakefield cliffs and beach are very important County Wildlife Sites.

Coastal processes

The cliff line is well vegetated along much of its length, fronted by a wide and healthy shingle beach, although this does narrow towards the southern end. Beyond the boundary of this section, and the end of the area covered by this Strategy, the beach is narrower and the undefended cliffs are currently rapidly eroding. There are signs that this erosion is progressing northwards.

As along the rest of this frontage, the patterns of beach sediment movement are strongly affected by the morphology and position of the nearshore banks, therefore there is a risk that the beach along this frontage will suffer erosion in the next few years.

Further into the future, if current trends continue then northwards movement of Benacre Ness (a large shingle mass) will eventually provide protection to Pakefield.

Defences

To the south of All Saints Church, the cliffs are thought to be undefended: there are some reports of walls and groynes possibly extending further south of here at one time, but these are not visible at present. It is therefore assumed that no formal defences along this section.

Stakeholder community aspiration: long term protection of Pakefield and the community and businesses its supports

Strategic direction

Objective: The vision is to continue to provide protection to the properties and businesses in Pakefield through retaining the existing defence position.

Whilst the beach remains wide enough in front of Pakefield village to provide a primary function in the defence of this frontage, no works will be required to achieve the objective. Measures may be required in the medium term, but in the long term beach levels are anticipated to increase due to the northward movement of Benacre Ness.

There is a greater risk of erosion at the southern end, in front of the caravan park, where beaches are visibly narrowing and works to secure this frontage could be required in the short term. This Strategy would therefore not preclude minor works being undertaken privately at the southern end of this frontage, subject to planning consent. There should, however, also be considerable of adaptation measures.

Approach

Given the currently healthy beach along most of this frontage, the cliffs in front of Pakefield village are unlikely to come under pressure in the next few years, and may not even become exposed during the lifetime of this Strategy. The stability of a beach here would be further enhanced by the implementation of the preferred Strategy at Pakefield north (headland).

However the southernmost stretch, in front of the caravan park, is becoming increasingly vulnerable due to narrowing beaches. The cliffs to the immediate south are already eroding.

Ultimately, the area should become protected naturally by shingle and sand moving north from Benacre Ness. In the meantime there may be a need to undertake some interim work to prevent erosion, or alternatively adaptation to accommodate it. It would not however be sensible to commit large sums of money to long term or substantial defences, as these would become redundant within a short space of time due to the ness.

Any interventions to prevent cliff erosion would be best restricted to low-tech, low-cost and short-term measures designed to slow down any process during the interim period of low beach levels.

Requirements/Considerations

Monitoring of beach levels here should be undertaken in conjunction with monitoring of levels along the frontage to the north. Should levels fall along the Pakefield north frontage, the recommended Strategy response is to construct a headland. This structure should help to also stabilise beach levels along Pakefield south, which may mean works here are not necessary.

At the southern end of the frontage there has been some recent erosion and further monitoring is needed to determine whether this is an ongoing trend. Where possible, it may be more appropriate to relocate any moveable assets (such as caravans), although that is a consideration for the landowner. In the long term it is expected that this area will become protected by Benacre Ness, as it moves north. The impacts of any works introduced are therefore likely to be only short to medium term. On this basis, should the leisure park at the southernmost boundary wish to fund and undertake works to help protect their property, this would be acceptable subject to observing the requirements set out in this plan, and planning consents.

Estimated costs: Up to £3M costs if any works south of present defences are required.

Implementation (2016-2025)

Immediate Activities

The immediate activity is to monitor beach levels and cliff erosion to appraise any need for action within and beyond this period. It is expected that the caravan site will be at risk of erosion in the near future therefore there will need to be plans made to address this either through short-term works or adaptation.



- Use Coastal Monitoring Plan and defined triggers to guide future monitoring and indicate the need for advance planning of works.
- Monitor regularly against these triggers for action.



- Engage with Leisure Park regarding any concerns, options and technical assistance that can be provided to develop appropriate interventions or adaptation approaches.



- Explore funding sources and establish funding plan for any intervention works or adaptation approaches.

Further Actions

It is thought likely that the current high and wide beach will remain for some time along the majority of the frontage in front of Pakefield village. This situation could change in the future, therefore two possible scenarios are considered for this stretch of coast.

Scenario 1: High beach



If monitoring indicates no change in the currently high beach, then:

- Monitor cliffs for signs of increased activity, such as erosion or slumping.

Scenario 2: Low beach



If monitoring indicates deterioration in beach levels to defined action levels or onset of cliff erosion, then:

If Partnership Funding is available:

- Undertaken design of new works.
- Obtain necessary permissions and construct.

If Partnership Funding is not available:

- Carry out regular assessment of erosion risks.
- Engage with local community on potential impacts and ways forward.
- If necessary, develop adaptation and exit strategies.

